INTERNATIONAL
LANDMARK STATUS FOR WOODHEAD DAM
National Infrastructure Maintenance Strategy
BKS-SAICE Bridge Building Competition
ON THE COVER
Liviero Civils, part of the Liviero group, which this year celebrates twenty-five years of active construction in South Africa, was formed in 2005. As a result of the superior expertise it has taken on board, including its group of professional engineers, it has already become a serious player in the market.

EDITORIAL 1
The Woodhead Dam is awarded ASCE International Landmark status

EDITORIAL 2
It takes two to tango — ASCE and SAICE

URBAN AND RURAL: WATER FOR CAPE TOWN
Water for the tip of Africa
The dam on a mountain top
Water shortages bring unification to Peninsula municipalities

Ninham Shand inherits Stewart’s mantle

URBAN AND RURAL: INFRASTRUCTURE
The National Infrastructure Maintenance Strategy, and its implementation

URBAN AND RURAL: WATER FOR GAUTENG
The culture of civil engineering and the history of the Gauteng water supply system

HISTORY AND HERITAGE
Past Master 18: John Gamble
Past Master 19: Thomas Stewart

GENERAL INTEREST
A moral and ethical dilemma: systems that fail
Coaching in Construction
Innovation in Civil Engineering

OTHER PROJECTS
South Africa’s largest permeable paving project to date

IsiXHOSA FEATURE
Indoda enombono

PEOPLE
Amazing Russian couple at Bateman
C&CI chief retires after 26 years’ service

IN BRIEF
SBA constructs waste water treatment works at Ballito
State-of-the-art solar water heater launched

SAICE AND PROFESSIONAL NEWS
SAICE History and Heritage Panel
Nail-biting FUN (Bridge Building Competition)
SAICE 2008/9 essay topics for professional registration
Call for reviewers
SAICE Training Calendar 2009
SAICE Student Chapter at the University of Stellenbosch
The Woodhead Dam is awarded

ASCE International Landmark status

SAICE WAS ASKED BY the American Society of Civil Engineers to put forward a South African project for recognition as an International Civil Engineering Landmark. We are delighted to report that our first nomination, the Woodhead Reservoir on Table Mountain, was accorded this honour. The commemorative plaque was handed over at a ceremony at the Silver Tree Restaurant, Kirstenbosch, during the visit of the ASCE President to Cape Town on 1 August this year.

ASCE has been running the International Landmarks programme for some 40 years and has identified about 50 projects as International Civil Engineering Landmarks and another 250 as National Landmarks in the United States. To qualify for inclusion a project must basically be over 50 years old and have made a significant impact on civil engineering in its region. In actual fact, the selection criteria are much more stringent and ASCE gave us a few anxious moments with requests for additional information before the good news arrived.

The programme is an excellent model should SAICE decide to set up a similar initiative to recognise local historic sites, and the motivation for doing so has been...
summed up very clearly. ASCE believes that its Landmark Programme has the following objectives and benefits:

- It will encourage all civil engineers to become more aware of the history and heritage of their own profession.
- It will increase appreciation by the public of civil engineering contributions to the progress and development of the United States and the world.
- It will identify and designate national historic civil engineering works that have made a significant contribution to the development of the United States and other countries and to the profession of civil engineering in particular.
- It will encourage, where appropriate and feasible, the preservation of significant historic civil engineering works.
- It can provide a documented archive of Civil Engineering Historic Landmarks for the use of engineering students, professional writers, researchers, and historians.
- It can promote the inclusion of information on Historic Civil Engineering Landmarks in encyclopaedias, guidebooks and maps used by the general public.

Most non-American works on the list of ASCE International Landmarks are in the United Kingdom and include the famous Telford and Stephenson Bridges and Brunel’s Great Western Railway. The Eiffel Tower, Sydney Harbour Bridge and the Suez and Panama Canals are obvious inclusions, but ancient works such as Macchu Pichu and the Lake Moeris Quarry Road in Egypt have also made the list. The latter and the Victoria Falls Railway Bridge appear to be the only works in Africa recognised to date. Surprisingly the only dam outside the US to feature is the Zuiderzee Enclosure Structure in the Netherlands.

After considering various other projects, the SAICE History and Heritage Panel selected the Woodhead Dam for our first nomination because it was felt that it best conformed to the ASCE criteria. Apart from being situated on a famous mountain, it was the first dam of any consequence to be built in the sub-continent and the first significant project to be undertaken by Thomas Stewart, the father of the consulting engineering profession in South Africa. Construction was fascinating and innovative, and the dam continues to play a part in Cape Town’s water supply. Hopefully this is only the first of several works which will make the ASCE list, and the History and Heritage Panel is already looking for further candidates.

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1. The Woodhead Dam straddling Disa Gorge
2. The Woodhead Dam from the Gorge
THE DAY HAD arrived and all was ready for the 1897 Woodhead Dam on Table Mountain to become an International Civil Engineering Landmark.

This was an initiative by the American Society of Civil Engineering (ASCE), the first ‘foreign’ engineering institution to invite SAICE into the international engineering ranks in 1994, after the historic democratic elections that had taken place in South Africa earlier that year.

SAICE’s first visit to ASCE happened towards the end of 1994 when the then President, Brian Bruce and his late wife Rita, and my wife Ria and I, attended the ASCE International Round Table in Atlanta at their annual convention.

During that visit we not only had the opportunity to network with engineering institutions from across the world, but for the first time ever we met our African colleagues, particularly those from Ghana and Zimbabwe.

We returned inspired and enthusiastic and eager to start an African Round Table, similar to the ASCE model. From this idea sprung the Africa Engineers Forum as we know it today.

We salute our ASCE colleagues for their acknowledgement of our Institution and for their contribution towards the civil engineering profession on the African continent. Over the past fourteen years ASCE and SAICE have liaised on various matters and have developed a strong and fruitful relationship that benefits both institutions. Having a previous SAICE staff member, Meggan Maugham-Brown, on the ASCE team as their Director International Relations and Strategic Planning of course helps to streamline mutual visiting arrangements!

A LADY, A BOY SCOUT AND A VOORTREKKER

The SAICE Western Cape Branch had the dedication set up and organized to the last detail, except for one small problem - this was the last week of winter in the Cape of Storms and it threw the Mother of Storms at us in the Mother City!

Trusting that the weather would clear in time for the dedication ceremony on the mountain, the ASCE and SAICE parties in the meantime enjoyed hot soup and toasted sandwiches (appropriate fare on this bitterly cold and wet day) at a rustic restaurant in Constantia Nek, which served as the assembly point. A 4x4 fleet was already lined up to take the...
group to the dam after lunch.

Walking up from Constantia Nek along the steep 8 km ‘jeep track’ was never really considered an option, except that there was of course an adventurous challenge to it. Well, boys will be boys, with Boy Scouting and ‘Voortrekker’ in the blood of some. Not to even mention some tough Girl Guides! So it did not take much persuasion from Kevin Wall to get Heidi and me to walk up with him ahead of the entourage. This was an unplanned opportunity to experience magnificent nature and vistas of the Kaapse Vlakte.

Unfortunately our attire was not at all suitable and the biting northwestern relentlessly dumped intermittent, but heavy showers and ice rain on our advance party. Walking almost became wading and my leather jacket steadily soaked up water to eventually become as heavy as a sack of coal. But we made it!

We experienced a minor dilemma, as we had no cell phone reception up there, and Tony Murray, in a most responsible way, had called off the 4x4 attempt because of pouring rain at Constantia Nek. A freezing delay…. and then, up at the magnificent Woodhead Dam, the sun broke through for twenty minutes. The Cape became the Cape of Good Hope again for a short while.

By this stage we were virtually frozen, but elated, especially when two of the 4x4s came up the road to rescue us, albeit without the V1 Guests.

Photographs were quickly taken and this time those frozen smiles were real. Warm cars were welcome sanctuaries, and then, once again, it RAINED. The Cape of Storms does not give up easily.

But neither do a Lady, a Boy Scout and a Voortrekker!

**GETTING TOGETHER AROUND A PLAQUE**

The wet and freezing weather could not dampen the spirits though, and that evening everyone concerned and interested, including a host of dignitaries, descended on Kirstenbosch’s Silver Tree Restaurant for the official ceremony. While those present were enjoying a pleasant cocktail, and meeting old acquaintances again around a cozy log fire, the plaque, succinctly summing up the story of the Woodhead Dam, drew much attention. The handing over of the plaque by ASCE’s President David Mongan to the representative of the Cape Town City Council, Arne Singels, was performed to enthusiastic applause.

We would like to thank the SAICE Western Cape Branch, and Tony Murray in particular, for having arranged this great event so ably, and for so heartily welcoming every guest into their midst.
Drenched but happy – Kevin Wall (left), Heidi Bolton, and Dawie Botha

The Woodhead Dam on a rainy day – notice the magnificent stonework

The President of ASCE, David Mongan, handing the commemorative plaque to Arne Singels, representative of the Cape Town City Council

The story of the Woodhead Dam eloquently summed up on the plaque

David Mongan (left), ASCE President, and his wife Janet, together with Patrick Natale, ASCE Executive Director, and his wife Sheila

Standing from left to right: Marianne Vanderschuren (chair SAICE Western Cape Branch), Johan de Koker (SAICE President), David Mongan (ASCE President), Patrick Natale (ASCE Executive Director), Meggan Maugham-Brown (ASCE Director International Relations & Strategic Planning). Front: Tony Murray, left (chair SAICE History & Heritage Panel), Dawie Botha (SAICE Executive Director).

The committee from the SAICE Western Cape Branch who organised the Woodhead Dam event with such enthusiasm

Tony Murray, chairman of the SAICE History & Heritage Panel and a long-standing member of the SAICE Western Cape Branch, with his wife Libby. Tony was hugely instrumental in the Woodhead Dam receiving International Landmark status.
Seen at the party around the plaque

All photos (except photos 1 and 2): Angus Rule
Urban and Rural: Water for Cape Town

Water for the tip of Africa

Early water supply systems for Cape Town

Cape Town owes its foundation to the presence of fresh water, specifically from the stream which once flowed into Table Bay from the Platteklip Gorge which bisects Table Mountain. The stream was prominent in pre-settlement times. A sketch by Peter Mundy in 1634 shows this as a prominent feature of the valley below the mountain: “a Prettie Brooke which cometh from the Monstrous Cleft”.

The governing board of the Dutch East India Company resolved to set up a temporary settlement at the foot of Table Mountain and sent Jan van Riebeeck to establish the Company Gardens just below the area where the Platteklip Stream split naturally into two. He diverted it into channels around both sides of the cultivated area, and installed a system of minor furrows for irrigation. The major stream, which he named the “Varsche River” then continued down to the sea where it was the source of drinking water for both the settlement and passing ships.

In 1660 he widened and deepened the stream bed, which now assumed the status of ‘gracht’ or canal, and he built a dam for filling water casks near the jetty. Van Riebeeck’s successor, Wagenaar, replaced this with a larger cistern in 1670, and the remains of this structure were unearthed during the construction of the Golden Acre project in the 1970s where they are on display, in situ, today.

In all their colonies the Dutch harked back to their homeland and built canals, and even in the cash-strapped Company town at the Cape, a network of channels soon evolved. The main Heerengracht canal was augmented by a stream along Plein Street, while a cross canal along Strand Street drained from the slopes of Signal Hill. Other canals flanked Strand Street, Wale Street, Queen Victoria Street (then called Tuinstraat) and Long Street. The Kaisersgracht along the present Darling Street was built in 1693.

But the “prettie brooke” and its fresh,

1 John Chisholm: Cape Town Water Superintendent 1821-1856
2 Peter Mundy’s 1634 sketch of the “prettie brooke”
clear water was soon a thing of the past. The “Varsche River” became polluted with dust blown in by the southeaster and by the run-off from the rudimentary streets, while slaves found it a convenient dumping place for household waste. Within a short while the canal water was undrinkable.

In 1707 Willem Adriaan van der Stel procured 200 lead pipes from the VOC to bring fresh water from the foot of Table Mountain to the jetty. A four-jet fountain supplied the local needs, and Cape Town was, waterwise, considered to be well provided for. A well in Greenmarket Square was the main source of drinking water when the fountains were dry. As the population increased, slaves had to bring drinking water to the citizenry from springs on the mountainside.

The directors of the Dutch East India Company, the Here Sewentien, were very reluctant to spend any money on ‘unnecessary’ infrastructure. Very little was done in the eighteenth century to improve services, and by the end of the era the Company had declined into near bankruptcy and had no money to spend on any improvements.

BRITISH RULE

When the British took permanent occupation in 1806 the population of the town was about 17 000, but municipal services had progressed very little since van Riebeek’s time.

The shortage of water in the town required urgent attention, and the Home Government appointed the leading engineer of the day, John Rennie, to investigate augmentation of the supply. His solution was to build a 250 000 gallon reservoir in what is now Hof Street in 1814. A water superintendent, Mr John Chisholm, was appointed to implement the Rennie scheme, and he held this post under various titles until his death in 1856. Under his guidance the first cast-iron pipeline of 12-inch diameter was laid down Long Street, and branches of smaller bore were extended to the cross streets. He built several pumps to lift water from underground tanks, filled by mountain springs, for the use of the public. One example, the Hurling Swaai Pump, still exists in Princes Street, Oranjezicht, and has been declared a National Monument. However, by 1850 only 20% of the town buildings had running water. All others relied on slaves collecting water from the public fountains, or carrying water from the mountain springs.

In about 1827 the town canals had long passed their usefulness for supplying household water and Chisholm made a start on covering them over with stone or brick barrel arches. By all accounts these drains were not constructed to the engineering standards of the day. It also is unlikely, given the resources at the disposal of the fledgling municipality, that any proper maintenance was carried out. The stenches that emerged from these foul sewers – for such they had become – were cause for concern and annoyance, if not action.

By the mid 1840s the summer flow from the Platteklip Stream had all but dried up, and in 1849 Chisholm built a 2.5 million gallon reservoir to store winter flow. The main source of supply was the spring on the farm Oranjezicht. The supply chamber is still in existence and delivers about one Megalitre per day, although the quality is no longer considered potable. A 12 million gallon reservoir followed in 1856. These open tanks, Service Reservoirs No 1 and No 2, are still in use and can be seen below Camp Street in the Gardens.

Around the world public health reform was taking root, and in mid-century significant changes to London’s drainage began to take place. By 1850 it had been amply demonstrated that cholera was spread by infected drinking water, and there were vigorous movements to install and improve drainage and sewerage in European cities. The medical practitioners who came to the Colony from Europe brought ideas about waterborne sewerage with them, but the municipality was not prepared to invest in sanitary services. Cape Town was, however, not only unpleasantly smelly, but unmistakably...
unhealthy, and action was needed. In 1857 the situation was becoming intolerable, and the newly established House of Assembly decided to flex its muscle. It appointed a Select Committee to report on the sanitary state of Cape Town. The Committee heard extensive evidence, and one can only marvel at the thoroughness and perspicacity of the Chairman of the Committee, the well-known John Fairbairn, who led the questioning. The obvious solution was to install proper sewerage, but there would not be sufficient fresh water to allow for waterborne sanitation and proper flushing of sewers.

The possibility of damming the Platteklip Stream was examined in some detail, but rejected, and there were brief thoughts on building dams on Table Mountain and exploiting the Newlands Spring. These were rejected in favour of a reservoir above the town, and augmentation from springs on the property of a Mr van Breda in the area now known as Oranjezicht. Again, however, there was no legal machinery to expropriate the rights to such resources, and significant improvements were still some time away.

Nothing happened for over twenty years, when enabling legislation to permit a reservoir to be constructed on the Van Breda property was eventually passed in 1877. In fairness to Council and its officials, it does appear that the ratepayers had refused to raise a loan of £10 000 for construction of main sewers. In 1880 the town was in a shocking state. Unrestrained winter torrents gouged out roads and flooded homes. Sand enveloped the town in clouds of red dust during southeasters, blinding and knocking down unfortunate pedestrians. Waste accumulated in covered grachtts and released stinking gases. Night soil and refuse collection was inefficient and the contents of the latrine pails were frequently emptied directly into the streets. The city fathers were conservative to the point of lethargy and did little to promote proper sanitation. However, the water supply was becoming critical, so the new dam was given the green light.

The Molteno Reservoir was designed to hold 40 million gallons (about 180 Megalitres). This earth dam was completed in 1880, but the following year was exceptionally dry and the mountain streams dried up, so there was no winter inflow. Water restrictions had to be applied, and the public had to make do with three hours supply on alternate days. When the drought was broken in 1882, the reservoir burst, and it was not restored until 1886.

As the Colony expanded there was a clear need for proper expertise to organise the supply of water for the growing towns and villages. John Gamble was appointed as Hydraulic Engineer to the Colony in 1877, and amongst his wider duties was asked to find a more adequate and permanent source of water for Cape Town. Some older engineers had suggested that the plateau behind Table Mountain was a likely source. Gamble, who had set up rain gauges across the country, could confirm that there would be sufficient rainfall on the mountain top to justify a bold scheme to bring supplies from the back of the mountain through the Twelve Apostles to feed the Molteno Reservoir. He identified dam sites which could be used to store winter rainfall for consumption during the dry summers.

In the late 1880s a more progressive group of Councillors took control of the municipality and boldly decided to implement the proposals. Thomas Cairncross was appointed as City Engineer and he designed the tunnel through the Twelve Apostles which was completed in 1891. Initially water from the Disa River was simply diverted into the tunnel, and then piped to the Molteno Reservoir, but after a year or two it was plain that a dam would be necessary. And so, in 1894, construction commenced on the Woodhead Reservoir.

At the same time the main sewerage scheme was implemented, so by the time the dam was completed the demand for water had grown appreciably. By 1899 Cape Town could at last be called a clean, healthy and modern city, but the water situation was again critical. At the end of the Anglo-Boer war – during which the influx of large numbers of troops added to the water shortage – a start was made on the Hely-Hutchinson reservoir, while three dams were built nearby to supply the separate municipality of Wynberg.

But these measures did not quench Cape Town’s thirst, and in the 20th century a succession of much larger dams were built in the Hottentots Holland Mountains. The latest dam on the Berg River near Franschhoek will increase the available quantity of water sufficiently to prevent water shortages in the region until 2013, after which innovative sources would have to be found to meet the demand.
The dam on a mountain top

The Woodhead Reservoir: A bold scheme to solve Cape Town’s 19th century water shortages

OLD-TIME ENGINEER PATRICK Fletcher was one of the first to suggest that Cape Town’s water supply problems could be solved by a dam on Table Mountain. The idea took root when John Gamble, the Colonial Hydraulic Engineer, set up rain gauges on the mountain top and proved that the precipitation and the storage area would justify building a dam. The site chosen by Gamble was on the Disa River, a small stream which meandered across the “Back Table” – a plateau about 1000 feet below the famous flat top of Table Mountain – before plunging down a magnificent gorge to emerge in the Hout Bay valley.

A tunnel had been built through the flanking range, the Twelve Apostles, between 1887 and 1891 to access the Disa River, but a simple diversion of its waters was only a temporary measure; a storage dam was needed to ensure supply throughout the year. The City Council was however not convinced that the expense would be justified, but after many heated debates they eventually gave the go-ahead for work to commence. Tom Stewart, a young Scottish engineer who had recently set up a consulting practice in Cape Town, was appointed to design the structure and arrange for its construction.

It was a daunting prospect. The easiest access to the dam site was from Kloof Nek via the newly constructed pipe track to Kasteelpoort Gorge, through which, after an energetic scramble, the Back Table and the dam site could be reached. This route would suffice for personnel, small equipment and provisions to reach the dam site, but how would casks of cement, granite facings for the structure and heavy equipment be transported? Stewart’s response was to build a cableway from Camps Bay to the summit of Kasteelpoort and then to lay rail tracks across the plateau to the construction site. This solved the problem, but it was still impractical for the workforce to ascend the mountain on foot each day. The cableway seated only two, and the round trip took about twenty minutes.

So Stewart arranged for a small town to be built at the work site to house the 500-strong workforce who would build the dam.

Next problem: no construction of this type had previously taken place in the country. Where would the expertise and musclepower be found? Skilled stonemasons and quarrymen were recruited from Scotland to excavate the sandstone blocks from the mountainside for the rubble masonry core; others dressed the granite facings and placed them to form the durable and elegant skin to the walls. Local labour was initiated into the rigours and skills of civil engineering construction, and soon struck up a working relationship with the artisans, despite the difficulties of understanding the Scottish tongue.

The construction town, which included a post office and a bank, must have rivalled the Wild West for atmosphere. It was a man’s world where hard men toiled in heat and cold, working like Trojans, but also having fun. A womanless community of fights, whisky, football, chess and piano for entertainment. The workmen were all well cared and catered for and in the end produced the goods.

Work began in 1894 and Tom Stewart’s bold design slowly grew out of the gorge. Deep foundations were carved into the
mountainside to allow for faults and weak layers in the treacherous sandstone. The section across the deepest part of the gorge is an arch, some 40 metres high and 17 metres wide at the base; the flanking walls are relatively low, and the overflow spillway is spanned by an elegant little bridge.

All machinery and fittings were imported from Scotland, and were dismantled at the base station, hauled up the mountain by the cableway and reassembled on the summit. Cement, also imported, arrived in casks, and must have tested the little ropeway. Coal to power the steam crane came from Cardiff. When the Hely-Hutchinson reservoir was being built, a little steam locomotive, the "Mountain Meg", was procured, dismantled and reassembled, and used to replace the mules which had dragged the materials along the rail tracks to the construction sites. It is still on the mountain today, in a tiny museum on the edge of the reservoir, together with various other relics of the construction, which Waterworks Engineer Terence Timoney preserved for posterity.

The dam was named after the Mayor Sir John Woodhead, who laid the last stone in May 1897, and was knighted for his vision in promoting the project.

1. The Back Table of Table Mountain, showing the five dams constructed by Thomas Stewart between 1893 and 1907. The Woodhead Reservoir is at bottom right with the Hely-Hutchinson alongside. The three Wynberg dams are at the top of the photograph.
2. Construction work under way on the dam wall
3. Cement casks being lifted to the dam site by the primitive cableway
The Woodhead Reservoir had scarcely been completed when demand for water again outstripped supply, and it was agreed to build a second dam upstream of the first structure. Stewart gathered together his old workforce, revived the cableway and the construction town, and started work on the Hely-Hutchinson dam and three smaller reservoirs on the mountain. Progress was interrupted by the Anglo-Boer War, and the new dam was only completed in 1904. There were thoughts of building further reservoirs on the mountain, but Stewart could point out that the resources of the mountain were now fully utilised. Water supplied for the growing city and its suburbs would in future have to be found from further afield.

The two main reservoirs each hold about 1,000 cubic metres of water and are still in service, contributing about 1% of today’s total consumption in Cape Town and its environs – but the city, and the South African civil engineering industry, have grown beyond all recognition since Tom Stewart implemented a bold plan for a dam on a mountain top.

The centenary of the Woodhead Reservoir was celebrated in May 1997 when more than 100 people gathered at the site. The visitors included several relatives of the engineers and stonemasons who worked for four-and-a-half years to construct the elegant stone-faced dam.

With acknowledgement to André Foot of the Mountain Club of South Africa.
THE PRIMARY PURPOSE OF government, it is sometimes forgotten, is to provide services to the governed, while giving them a say in the process. In view of this, it is surprising how few examples there are of civil society demanding a restructuring of the local government system in order to better provide these services.

The unification of the small local authorities of the Cape Peninsula in 1913 was motivated almost entirely by the need for services reform. The argument was advanced that only in unification was there hope that the backlog of and innovation required for major services could be addressed. Indeed, the need for adequate water was the single most compelling reason for the institution of one local government for the whole metropolitan area.

The municipalities had grown around a series of nodes. Some of these small urban areas were still physically separate from one another, but within a decade were likely to form one contiguous urban area. Furthermore, some areas were much better served than others. It was apparent that substantial economies of scale were available, particularly in respect of providing water and waterborne sewerage, and that the smaller urban areas could not afford to improve their services unless they joined forces.

HISTORICAL BACKGROUND
In 1900 there were no less than eleven local authorities in the Cape Peninsula. They were the Cape Rural Council and the municipalities of Cape Town, Green Point and Sea Point, Woodstock, Mowbray, Rondebosch, Claremont, Maitland, Wynberg, Kalk Bay and Simon’s Town.

Towards the end of the Anglo-Boer War the Cape Colony Government appointed a commission to review local government in the Peninsula, from Sea Point to Simon’s Town, and particularly to deal with water, drainage, sewerage and lighting. The majority report, which recommended one municipality from Sea Point to Simon’s Town, met with a chilly reception in municipal circles. Most of the municipalities expressed the desire to remain independent.

RE-AWAKENING OF INTEREST IN UNIFICATION
Towards 1910 there was a re-awakening of interest in unification, thanks largely to a realisation by many prominent citizens that the long-term interests of efficiency and economy lay in the unified provision of municipal services. Indeed, it was realised that in respect of certain services, especially sewage disposal and water supply in certain areas, the ONLY hope for the timely provision of these services lay in unified provision.

From 1910 the crusaders for unification formed a “Peninsula Municipal Union Society”, whose chairman was John Parker, an architect and Cape Town councillor. He described the problem as follows: “Eight municipalities, each widely contiguous with, or closely wedged in between its municipal neighbours, perma-
nently hampered and embarrassed alike by the want of space for the requirements of its position, unable to carry out independently any scheme for water supply, drainage, or sewerage.” He noted that the 1904 census had counted a population of 170,000 of all races in the area, of which 78,000 were citizens of the Municipality of Cape Town.

Cape Town (which also supplied Green Point and Sea Point) and Wynberg had barely sufficient water reserves for their populations. The Suburban Municipal Waterworks Board, in which Woodstock, Mowbray, Rondebosch and Claremont were partners, was able to provide a supply totally inadequate for existing needs. Cape Town and Wynberg both possessed dams on Table Mountain, but the other municipalities depended upon wells, springs and small streams.

It was obvious to many that the municipalities had to unite in exploiting water sources distant from Cape Town. “Such a supply would be obtained only from a source distant at least forty miles from Cape Town.”

Water was also needed for sanitation – as early as 1902 “nearly all” of the houses in Cape Town were connected to a waterborne sewerage system, but this experience was not matched in the southern suburbs. For example, Woodstock, Maitland, Mowbray, Rondebosch and Claremont continued to be served by a pail system.

It was also perceived that, whereas water supply and sanitation would greatly be facilitated by unification, there would also be significant advantages in metropolitan planning and the supply of street lighting, storm water drainage, fire protection and public transport, and other minor services.

UNIFICATION GAINS SUPPORT

The proposals drew considerable support. In 1912 a “Municipal Union Conference” was held, attended by delegates from all the municipalities except Wynberg, which declined to take part in any way. Following a detailed analysis, including a projection of population increase and of water consumption, the Conference reached the conclusion that within five years, taking the Peninsula as a whole, the water supply “position might be serious if no adequate steps were taken to augment the water supply, whilst at the end of ten years the position would be disastrous to the health and prosperity of the community. ... [The necessary] augmentation will be more efficiently and economically carried out by a Unified Municipality than under the existing conditions.”

RESULTANT LEGISLATION

Largely thanks to these efforts, the Ordinance to provide for the combination and better government of Municipalities in the Cape Peninsula was promulgated on 28 July 1913. Not only did the eight municipalities of Cape Town, Green Point and Sea Point, Woodstock, Mowbray, Rondebosch, Claremont, Maitland and Kalk Bay amalgamate, but additional areas were also taken over. These latter consisted principally of the township of Camps Bay, the area today known as Athlone (then “West London”), and parts of Retreat, Steenberg and Zandvlei. Furthermore the Ordinance expressly provided for taking over all assets of the Suburban Municipal Waterworks.

Thus the unified City Council of Cape Town inherited the problems of each municipality. Chief among these problems was the water shortage.

ADDRESSING CIVIL ENGINEERING CONCERNS

Despite the five reservoirs built on Table Mountain between 1890 and 1907, the need for increased supplies of water remained of first importance among municipal services matters. Consulting engineer Thomas Stewart reported in 1901 that Cape Town Corporation’s reservoirs could only provide 3 million gallons per day. Cape Town was soon in trouble, as the daily water consumption had risen to nearly that level by 1905 years.
the daily water consumption had risen to nearly that level by 1905.

Several alternative Table Mountain schemes were put forward, but the bulk of Table Mountain water was already being utilized, and to implement any of them would have involved expense out of proportion to the advantages received.

A commission considered the problem, and its findings were startling. It recommended that no large additional works should be constructed on Table Mountain, and that the only viable solution would be “a scheme giving at least 10 million gallons per day, for which it would be necessary to go a distance of up to 50 miles from Cape Town”.

When the municipalities amalgamated, the new Council was forced to take action.

Once the Administrator of the Cape Province had approved the Unification Ordinance, the City Engineer (WJ Jeffries, succeeded in 1914 by DE Lloyd-Davies), faced the onerous task of integrating into a single entity the engineering departments and branches, some of them run on highly individual lines, of the eight municipalities concerned. He now had to take control of all water supplies, roads, drainage and sewerage in an area of some seventy-six square miles.

WATER SUPPLY RECEIVES PRIORITY ATTENTION

Prior to 1913 the independent municipalities of Mowbray and Rondebosch had purchased options on farms in the Steenbras Valley some 70 km from Cape Town with a view to obtaining water. After unification these facilities became available to the city as a whole. In 1916 the Board of Engineers, consisting of Lloyd-Davies and others, after investigating both the Wemmershoek Valley on the Berg River and the Steenbras Valley, recommended that Steenbras should be developed as a water supply for the City.

Construction work began in 1918. This was none too soon, because, before the dam was completed in 1921, water rationing was imposed. Supplies were cut by as much as 20 hours per day. In order to keep ahead of rising demand, the dam was raised for the first time only a few years later, thus securing the water supply until the mid-1940s.

Lloyd-Davies’s other priority was to advise Council on the main drainage of the southern suburbs. His report inter alia recommended the construction of a treatment plant at Athlone and the laying of some 240 km of sewers. Work on the Athlone project began in 1921.

VERDICT OF HISTORY

In due course the water supply position in Wynberg Municipality, sufficient in 1913, changed to one of impending shortage, and Wynberg joined the union.

The verdict of history has been entirely favourable to the 1913 unification. Slater, the Provincial Secretary, writing in 1972, was able to state that: “Just imagine the overlapping and chaotic conditions which would certainly have developed had this amalgamation not taken place. The authorities of those days deserve the highest of praise and thanks for their forethought.”

Civil Engineering | October 2008

19
IN 1932 WHEN TOM STEWART was contemplating retirement, a young consulting engineer was erecting his brass plate just a few doors away from the doyen’s chambers in St Georges Street. This was Ninham Shand, who had graduated from the University of Cape Town with the Gold Medal in 1919 and whose guiding hand would influence the water supply to Cape Town for the next century.

On obtaining his degree Ninham joined the Department of Irrigation and was posted to the construction works for the Kamansie Dam near Oudtshoorn. This was followed by a year with a contractor, after which he travelled to the United States to widen his experience. There he worked for the US Bureau for Reclamation, the national body responsible for dams and irrigation in that country.

As Cape Town’s water resources again became critical after the First World War, the city looked towards the Hottentots-Holland Mountains for its future water needs. Tom Stewart had already tramped the valleys and discovered two or three potential sites, and a Board of Engineers comprising the City Engineer (the well-known David Lloyd-Davies), WA Tait (a Scottish water supply specialist) and Stewart opted for a dam on the Steenbras River above Gordon’s Bay.

The first Steenbras Dam was a masonry structure in the manner of Stewart’s Table Mountain dams, and impounded 2,740 megalitres behind an 8 metre high wall. This soon proved inadequate and in 1926 the dam was raised by 13 metres to provide a capacity of 27,240 megalitres. “Raising” was scarcely accurate: the entire old structure was enveloped in a mass concrete structure, which has survived to this day, although the crest of the dam was subsequently raised.

On returning to South Africa in 1926, Ninham Shand spent two years as Assistant Resident Engineer on this second ‘raising’ of the Steenbras Dam. He worked under Jack Hawkins, another distinguished water engineer who went on to found the practice known for decades as H2O. Hawkins was an able mentor and he introduced Ninham to the peculiar characteristics of Table Mountain sandstone, which would stand him in good stead on future jobs. At weekends the young engineer would go walking in the mountains, noting rock properties, looking out for dam sites and developing the awesome stamina for which he became noted. When the dam-raising was completed, Ninham was appointed as Resident

Site Staff at Steenbras 1926
Ninham Shand is in front second from the right. Jack Hawkins, the founder of the firm HHO is next to him holding a hat.
At the turn of the century Tom Stewart had identified the Wemmershoek valley as a potential dam site, and in fact he had preferred it to Steenbras. It was an obvious site to turn to, and Solly Morris, the recently appointed City Engineer, invited Ninham Shand to join the Board of Engineers to control the project.

In 1952 Ninham had been on one of his busman’s holidays to the United States and had paid particular attention to rockfill dams, which were becoming popular technology. Thinking along those lines, he suggested that an old friend and former Head of the United States Bureau of Reclamation, Dr John Lucian Savage, should be the third member of the team, to which Dr Morris readily acceded.

Ninham proposed a rockfill embankment with a clay core and filters. Washed alluvium would be placed using huge water jets to consolidate the dumped rockfill in accordance with practice in the United States at that time. Dr Savage supported Ninham’s proposal, and the design was implemented accordingly, saving some half million pounds in foundation costs.

The Wemmershoek Dam and its pipeline were successfully completed in 1958.

During investigations for this dam Ninham realised that a much larger dam site was available on the other side of the watershed, but would require extensive delivery tunnels to bring the water to augment the Cape Town system and to irrigators along the Berg River. In due course this site became the Theewaterskloof Dam, which was built by the Department of Water Affairs and Forestry (DWAF) in the early 1980s and is a vital component of the Western Cape water supply system.

STEENBRAS PUMPED STORAGE SCHEME

After Ninham’s death in 1969 his younger colleagues Walter Powrie, Neville Pells and Robin MacKellar reported to Eskom on the potential for pumped storage in the Western Cape and identified that the Steenbras Dam, perched high on the mountains, would offer possibilities for such a scheme.

At the time Cape Town was beginning to experience shortages in peak electric power, and the City Electrical Engineer, Denis Palser, cast his eye around for efficient solutions. Shands, together with electrical consultants Merz and McLellan, suggested that Cape Town should consider the Steenbras option, and Walter Powrie went overseas to link up with designers of similar schemes in the British Isles. Their report convinced Mr Palser, and the Shands team was appointed to design and implement the project.

The existing Steenbras Dam may well have been used for the upper reservoir, but the structure was not considered suitable for raising to provide the head required by the hydro turbines. Instead the decision was made to construct a separate embankment dam within the reservoir. This upper dam served a dual purpose in that it not only increased the head available for the generating system but it also augmented the total water supply to Cape Town by doubling the effective capacity of the original Steenbras reservoir.

The 30 metre high receiving dam is sited below the power station on the western slopes of the Hottentots Holland Mountains to augment the supplies.

First up were improvements to Ninham’s old friend the Steenbras Dam, which had the potential for extra storage if the wall could be raised. Ninham was familiar with the innovative prestressing techniques of the celebrated French engineer M Coyne, and together they devised a system of pinning a 2 metre high extension onto the old dam wall, which increased the capacity of the dam by some 60%. This relieved Cape Town’s thirst for a few years, but by the mid 1950s signs of a crisis were reappearing.

WEMMERSHOEK DAM

At the turn of the century Tom Stewart had identified the Wemmershoek valley as a potential dam site, and in fact he had preferred it to Steenbras. It was an obvious site to turn to, and Solly Morris, the recently appointed City Engineer, invited Ninham Shand to join the Board of Engineers to control the project.

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Mountains near Gordon’s Bay and is also an embankment dam.

This was a landmark project for both Shands and the City of Cape Town, whose R60 million investment was to prove an extremely good one by creating significant savings in the cost of power purchases from Eskom, as well as providing additional capacity for water supply to the ever-thirsty city.

With the usefulness of the pumped storage principle having been established through the Steenbras Scheme, Eskom in conjunction with DWAF took the matter further and constructed the 1 000 MW Drakensberg Pumped Storage Scheme. This was followed by the Palmiet Pumped Storage Scheme, adjacent to Steenbras, where the firms of Ninham Shand, VKE and Electrowatt formed the SVE consortium to undertake the design and contract administration of the project.

BERG WATER PROJECT

When Ninham passed away prematurely in 1969, his son Mike joined the firm and in due course became a nationally respected water engineer. One of his most significant achievements was to lead the team which compiled the Western Cape System Analysis of 1992, highlighting the state of local water resources – Cape Town’s water resources were once again in a precarious situation.

This eventually led to the implementation of the Berg Water Project where Shands joined forces with Goba and Knight Piesold to form the Berg River Consultants to win the design and supervision contract for the scheme, which has a gross storage capacity of 130 million cubic metres.

It is quite remarkable that one man could have had such an influence on the water supply of a city. Ninham Shand accepted the challenge to continue where Tom Stewart had left off, and he and his colleagues have served Cape Town with great distinction. Their work is not yet complete, as Cape Town seeks to exploit new sources of water in the 21st century.

This article is based on the book “Ninham Shand – the Man and the Practice”, edited by Tony Murray, which is due to appear early in 2009.
The National Infrastructure Maintenance Strategy (NIMS) was approved by Cabinet in 2006. This Strategy sets overarching policy for sector-based initiatives and describes the framework for a coordinated programme of actions. It is an essential part of government’s vision of delivering infrastructure services to all. The simultaneous infrastructure investment and maintenance that will result from this Strategy will not only improve infrastructure performance and underpin the sustainability of services, but will also contribute significantly towards national and local economic growth, and create long-term jobs. Background to it, and progress with its implementation, are described in this article.

ALL THREE SPHERES OF government, together with the state-owned enterprises, manage major portfolios of immovable infrastructure assets. Although there is much emphasis on the ‘delivery’ of infrastructure, delivery does not in fact end with the commissioning of the infrastructure asset. After commissioning, various activities are necessary for continued performance – such as the allocation of necessary budgets and the retention of appropriate staff to operate and maintain the asset over its whole design life.

Despite the good performance in some sectors, there is strong evidence that in other sectors much of the infrastructure, of both pre- and post-1994 vintage, is not being properly maintained. Older infrastructure is often not being refurbished and renewed when it needs to be, and there is inadequate planned preventative maintenance on new infrastructure. (In this article, ‘maintenance’ is used as a generic term to include planned maintenance, repair, refurbishment and renewal, and provision for replacement of the infrastructure.)

Generally, the larger institutions, e.g. Eskom and DWAF water resources, are performing the best with regard to maintenance, but some services in rural-based municipalities have already failed.

It is evident that a holistic national infrastructure maintenance strategy is needed, without which many institutions are unlikely to be able to improve their maintenance policies and practices. With this in mind, the National Infrastructure Maintenance Strategy (NIMS) was formulated, and presented to Cabinet, which approved it in August 2006. (DPW et al. 2006) Its aim is to promote sound maintenance of infrastructure and facilities across the whole of the public sector. NIMS was launched by Minister Thoko Didiza in May 2008.

Infrastructure maintenance must be regarded as a strategic tool to promote improved service delivery, to unlock funding to extend infrastructure to historically disadvantaged communities, and to support the nation’s economy. Maintenance of existing infrastructure should not be seen as of secondary importance to the apparently more attractive prospect of creating new infrastructure.

REVIEW AND ANALYSIS

The findings of the sector-by-sector review of the state of infrastructure and facilities, the state of their management, and current initiatives to enhance maintenance undertaken for the purposes of the Strategy, remain valid (DPW et al. 2006; Construction Industry Development Board (cidb) 2007).

The review indicated that all public sector institutions could be placed in one of two broad categories described below and set out in Table 1:

- **Category A.** These institutions have
  sound asset management plans for most of their strategic infrastructure, maintenance budgets are adequate, capacities and skills are adequate, and their leadership has a strong maintenance ethic. Or they are largely missing one or more of the elements listed above but this is recognised and improvements are being programmed.

- **Category B.** These institutions are not as strong in each of the elements as the institutions of Category A. This situation is not improving and might even be deteriorating. Or they do not have
The National Infrastructure Maintenance Strategy, and its implementation

Asset management plans, maintenance budgets are not adequate, they lack capacity, and their leadership does not regard maintenance as very important. Other significant differences between Category A institutions and Category B institutions relate to political and senior administrative emphasis on maintenance, design and construction quality; and, sometimes, external forces requiring that maintenance be attended to (e.g. regulatory and safety requirements) etc.

Many of the Category B institutions are not able to improve their maintenance practice without some level of the assistance and regulation that implementation of the Strategy will provide. Although the Category A institutions are not the target of the Strategy, it is likely that the infrastructure maintenance of many of them will also benefit from some of these measures.

It is important to identify which Category B infrastructure and facilities sectors constitute the greatest problem regarding issues such as effects on human health and economic growth, lack of effective countermeasures in the event of failure of the service, etc. For example, wastewater treatment works are often problematic. These sectors must be the main focus of efforts to assist the Category B institutions.

**ACTION PLAN**

The four thrusts of the NIMS are:

1. Strengthening the regulatory framework governing planning and budgeting for infrastructure maintenance
2. Assisting institutions with non-financial resources
3. Developing the maintenance industry
4. Strengthening monitoring, evaluation and reporting, and feeding this into a process of continuous improvement.

Specific actions follow within each thrust area.

**Strengthening the regulatory framework governing planning and budgeting for infrastructure maintenance**

An effective way to address the needs of institutions that have not adopted sound infrastructure maintenance policies and practices would be to strengthen the performance requirements.

- **Action 1.** Review, strengthen and harmonise the strategic planning regulatory framework so that it includes requirements for planning and budgeting for maintenance, especially of infrastructure of a strategic nature.
- **Action 2.** Create links between the capital budget, the operating budget and the infrastructure asset management (IAM) plan of each institution to ensure that financial provision for maintenance is specifically linked to currently owned strategic infrastructure and to decisions on investment in new capital infrastructure. Also create mechanisms to monitor this and to apply corrective action where necessary.
- **Action 3.** Treasuries (national and provincial) plan for increasing global allocations for maintenance over time (based on adequate motivations) until such time as maintenance funding approaches an optimal level.
- **Action 4.** Gazette regulations requiring adequate planning for prioritised maintenance (including organisational structures and skilled staff) especially for infrastructure which underpins the core economic and social development of the country.
- **Action 5.** Incorporate in the regulatory framework requirements for identifying key strategic infrastructure, specifically budgeting for its adequate maintenance and for reporting performance.
- **Action 6.** Audit heritage sites in order to identify work to make them compliant with government policies and regulations.

**Assisting institutions with non-financial resources**

Improving human resources capacity and providing better-practice guidelines are measures that will assist institutions to improve maintenance. To this end, norms and standards for the maintenance of different types of infrastructure (roads, water, sanitation, etc.) need to

<table>
<thead>
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<th>Table 1: Public sector institutions by their state of maintenance</th>
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<tr>
<td>Category</td>
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<tr>
<td>A</td>
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<tr>
<td>B</td>
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</tbody>
</table>
be developed, and appropriate capacity-building, mentoring and direct support programmes put in place. Budgeting norms will also be developed to facilitate accurate long-term maintenance budget forecasting, taking into account the type, age and condition of infrastructure.

The norms will also take account of resilience, which will be determined by what constitutes ‘failure’, what the consequences of failure are, and mitigation plans. For example, if the downtime of the asset must not exceed, say, 1% of the time, the maintenance norms need to be a lot more stringent than if downtime as high as, say, 10%, could be accommodated.

**Action 7.** Develop and promote guidelines, norms and standards for the maintenance of infrastructure – covering financial, technical and skills aspects. Extend the cidb “Toolkit for Infrastructure Delivery Management” so that it will support public sector officials to improve the delivery and maintenance of infrastructure.

With regard to human resource capacity, a Joint Initiative on Priority Skills Acquisition (JIPSA) initiative through the cidb is an audit of existing technical skills in the construction and maintenance industry, together with projections of the skills requirements over the next 15 years.

**Action 8.** Carry out a study of the non-technical human resource capacity requirements for improving infrastructure maintenance, and identify actions to address the identified skills shortages.

**Action 9.** Identify the Category B institutions, and build targeted capacity within them, through the Infrastructure Delivery Improvement Programme (IDIP), Project Consolidate and other capacity-building programmes. In particular, assist them directly to prepare IAM plans.

### Developing the maintenance industry

Appropriate infrastructure maintenance also creates jobs since it can only be done, or can best be done, by labour-intensive methods, and it is thus important that government’s plans for employment creation and the Expanded Public Works Programme (EPWP) give prominence to maintenance.

Given the skills shortages and equity imbalances in the infrastructure maintenance and construction industry, there is a need for the government to play a role in developing the maintenance industry, particularly with regard to skills development, SMME development and the promotion of BBBEE in the maintenance industry.

**Action 10.** Build the maintenance sector within the construction industry, including developing models, guidelines and procedures for procurement of maintenance services, particularly ongoing long-term maintenance contracts that will promote SMME development, involvement of women, local employment, etc. Also build capacity in the industry – the EPWP will play an important role in this regard.

### Strengthening monitoring, evaluation and reporting, and feeding this into a process of continuous improvement

Monitoring and evaluation processes must be strengthened and implemented – with mechanisms for feedback to result in the necessary improvements. In this way performance change can be measured and the attention of the institutions concerned can be drawn to non performance. The annual reporting requirements and the forthcoming GIAMA regulations provide the framework for this.

**Action 11.** Strengthen and implement monitoring and evaluation processes.

### IMPLEMENTATION PLAN

Recognising the importance of infrastructure maintenance within government and the role that effective maintenance will play in support of service delivery, Cabinet approved the NIMS two years ago. The Minister of Public Works was given the responsibility of providing political oversight of NIMS within Cabinet, and the national Department of Public Works (DPW) was appointed to lead implementation of the programme.

Membership of the broad-based Programme Steering Committee, established to oversee implementation of the NIMS programme, will include the Presidency, national DPW, National Treasury, Department of Provincial and Local Government, Department of Public Enterprises, and Department of Water Affairs and Forestry.

In addition, an Advisory Group is to be constituted in order to provide specific inputs and insights to the Programme Steering Committee and task teams. Membership may include institutions such as DBSA, SALGA, IMESA and SANRAL.

A number of Task Teams have been or are being established:
- **Task Team 1** – Strategic Planning and Regulatory Framework
- **Task Team 2** – Non Financial Resources
- **Task Team 3** – Developing the Maintenance Industry
- **Task Team 4** – Monitoring and Evaluation

The cidb will provide overall programme management for the NIMS.

### PROGRESS

The NIMS is only one (admittedly, one of the most significant, if not the most significant) of a number of national IAM initiatives, planned to complement one another. They are all part of the process of promoting sound maintenance of infrastructure and facilities across the whole of the public sector, and setting parameters for the performance of public sector institutions.

NIMS is not an isolated initiative. It will need to synergise with, and will in turn vary in varying degrees be supported by, many current initiatives. To emphasise – it is not a separate programme, but implementation is to be across all spheres of government, and within departments.

Thus, in terms of NIMS, national Government’s integrated approach to IAM macro planning and implementation is “work in progress” in respect of the following initiatives, among others:
- Define an adequate IAM strategy and policy for government, which will strengthen government’s role to oversee and enforce compliance
- Information sharing within or across sectors that will help avoid duplication of efforts
- Promote IAM, as a tool to help meet regulatory requirements
- National support initiatives to promote IAM throughout the public sector

Reflecting the four thrusts of NIMS, Government’s aim is to empower and guide public sector institutions responsible for infrastructure, and to promote IAM, by means of initiatives such as the following:
- Legislation
- Guidance: strategy, policy and tools to manage IAM
Much progress has already been made. The following is a brief summary:

- The Government Immovable Asset Management Act (GIAMA), tabled in Parliament by DPW, has been law for the best part of a year. GIAMA makes it obligatory for public sector institutions to draw up sound multi-year infrastructure asset management plans. Regulations are currently being drawn up by DPW.
- The Public Finance Management Act is being amended to incorporate stronger provisions on IAM.
- National Treasury, with cidb, is continuing to develop and improve IAM guidelines. (These emphasise that their purpose is “to provide [public sector owners of infrastructure with] a start to improving budgeting for infrastructure maintenance”, and they are not “a substitute for proper infrastructure asset maintenance, which should be the ultimate goal in supporting the service delivery improvement.”) “It is essential to treat each infrastructure asset as a separate element and plan the infrastructure maintenance accordingly.” Therefore these guidelines provide “indicative minimum budgets” only.) (“National Infrastructure Maintenance Strategy: infrastructure maintenance budgeting guideline”, cidb, in course of preparation.)
- National Treasury has begun a process to amend the Standard Chart of Accounts, which apply to all government departments, by the inclusion of appropriate line items relating specifically to IAM. This will enable budgeting and expenditure against these line items to be tracked, thereby providing an important monitoring tool.
- Other measures that National Treasury has taken to increase provincial and local government accountability for assets include the regulations that it has published requiring municipalities to do impairment testing at both the asset and network level.

- Department of Provincial and Local Government (DPLG) in 2006 released guidelines for IAM in local government, and during 2008 formulated a guideline for Comprehensive Infrastructure Plans. The latter will incorporate maintenance and total live cycles costing principles.
- The IDIP, at present targeted within selected provincial departments, has been revised in order to strengthen the maintenance requirements.
- The cidb is identifying current norms and standards for IAM, with a view to reviewing and re-issuing these.
- The National Water Services Infrastructure Asset Management Strategy is in an advanced stage of preparation by DWAF. The latter is one of a number of “sector strategies” on infrastructure maintenance that, it is intended, will be prepared by the appropriate national government department in respect of each infrastructure sector – all of these under the ‘umbrella’ of NIMS.

Finally, it is one of the objectives of the NIMS to raise the profile and the priority of IAM right across the public sector.

NOTES
1. As an important aside – National Treasury has made it clear that implementa-
tion of the provisions of NIMS is not going to attract additional funding. The Department’s attitude, as expressed forcefully by the Minister of Finance on numerous occasions, is that many public sector institutions are not able to spend their budgets, and therefore should have no difficulty in reallocating capital funding to maintenance purposes.
2. From October a progress report will be available on the cidb website (www.cidb.org.za).

REFERENCES
The culture of civil engineering and the history of the Gauteng water supply system

As a result of the discovery of gold in South Africa in 1886, the City of Johannesburg was founded, resulting in the need for an adequate water supply for the region. To meet this need the Rand Water Board (now Rand Water) was established in 1903. Entwined in the history of the Board and in the development of Johannesburg, is the golden thread of the civil engineering profession. Over the years the profession increasingly became recognised as part of the very fibre of society.

Events such as the 2010 FIFA World Cup, which provide unique opportunities for civil engineering practitioners to focus on economies of scale, offer further occasion to grow the culture of civil engineering, thereby generating future growth benefits for all the peoples of Africa.

RAND WATER – THE FIRST 50 YEARS: 1900 TO 1950
TEMPELHOF (2003), IN HIS COMPREHENSIVE REPORT ON THE CENTENARY HISTORY OF RAND WATER, GIVES SOME FASCINATING DETAILS, WHICH WILL BE ABBREVIATED IN THIS ARTICLE.

As a result of the intensive development of gold mining operations, the industrial sector was the major consumer of water on the Witwatersrand in the period after 1901. Shortly after the British forces had taken over Johannesburg in the Anglo-Boer War, the British commander, Lord Roberts, appointed Major WAL O’Meara of the Royal Engineers to take control.
of Johannesburg’s local affairs until civil authority could be restored. Public health was considered a primary responsibility of local government and consequently water and sanitary matters featured prominently in the recommendations that O’Meara made in a report of April 1901 – the private water companies were to be replaced by a public utility. What lay ahead was a daunting challenge to the brightest of engineering minds.

**Appointing the engineers**

In its report of February 1902, the Water Commission recommended that an engineer be appointed as soon as possible to report on the proposed water supply system, and in December 1904 it decided to appoint Mr D Leitch, the Town Engineer of Johannesburg, who had considerable local experience.

The government also agreed in June 1902 to the appointment of top-class consulting engineers from Britain to conduct an investigation into the proposed water supply for the colony. In 1903, shortly after the Rand Water Board started with operations, the firm of Middleton, Hunter & Duff of London was appointed to the task. Their report was completed in April 1904.

**Water quality and availability**

With the opening up of the underground water supply of the Klip River at Zwartkopjes south of Johannesburg it became necessary to start with water treatment. Early problems included a percentage of iron ore (0.7 parts per million) in the water supply from Zwartkopjes, leading to the growth of weed in the mains. A small amount of copper sulphate (one part in 3.5 million) was added to the water to halt this. Bacilli of the typhoid type were also found at one stage and new boreholes showed indications of bacterial content, especially when the rainfall was high.

The Board’s Engineering Division was aware that, with the growth of population and industrial development, sterilisation had to become a standard procedure, and in 1916 – 1917 a chlorination plant was built at Zwartkopjes. The hardness of the Board’s water supply also came under scrutiny.

When William Ingham became the Board’s Chief Engineer in 1910 he immediately started with a programme to pump more water from Zuurbekom, pushing the supply up from 11,25 to 32,85 Ml/day. At the end of the 1913 financial year, Zuurbekom was providing 40.92% of the Board’s total water supply and the water from Zwartkopjes was progressively declining. It was obvious that a new source of supply was needed for the Witwatersrand and planning began in earnest. The Vaal River, including construction of the Barrage in 1922 and construction of the Vaal Dam in 1928, was to play an important role.

Notwithstanding the two World Wars, the Great Depression of the early 1930s and the first major drought of 1933, the rapid rate of industrial development in South Africa continued. Many of the technological innovations of the world wars were now being put to good use in civilian society. The black township of Alexandra was also a beneficiary of the rapid developments taking place to the north and east of Johannesburg when in 1938 a pipeline was installed from the Signal Hill Reservoir to the northern portion of Edenvale, the Modderfontein Dynamite Factory and the Germiston municipality.

Perhaps the definitive civil engineering accomplishment in the Rand Water Board’s first half century was that, contrary to the trend with most modern consumption goods, but true to economies-of-scale, the tariff of the Board’s water had in fact dropped since it started operations in 1903. The average inclusive charge for water to all consumers was as shown in Table 1.

### Table 1 Drop in the price vs consumption of water vs relative income 1910–1950 (Tempelhoff 2003)

<table>
<thead>
<tr>
<th>Year</th>
<th>1910</th>
<th>1920</th>
<th>1930</th>
<th>1940</th>
<th>1950</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost/4.5 KL (pennies)</td>
<td>35.14</td>
<td>19.46</td>
<td>20.83</td>
<td>11.68</td>
<td>9.81</td>
</tr>
<tr>
<td>Consumption (Ml/day)</td>
<td>18.45</td>
<td>49.95</td>
<td>60.75</td>
<td>208.8</td>
<td>407.25</td>
</tr>
<tr>
<td>Relative income</td>
<td>648.3</td>
<td>972.0</td>
<td>1265.4</td>
<td>2438.8</td>
<td>3995.1</td>
</tr>
</tbody>
</table>

**The Vaal Triangle**

On 26 May 1950 the Board responded favourably to a suggestion by Chief Engineer JP Leslie to give particular attention to the potential socio-economic development of the Vaal River basin region, which he considered to be the natural economic and industrial centre of South Africa.

In the Vaal Triangle region industrial development was taking place at a rapid rate. Apart from the major industrial town of Vereeniging, there were two new towns: Vanderbijlpark, where Iscor established its modern iron and steel factory, and (on the other side of the Vaal River) Sasolburg, which was established to provide housing for the employees of the first synthetic fuel manufacturing plant in South Africa, Sasol I. Within a short space of time a number of related industries were established in the region that came to be known as South Africa’s Sheffield. One of the major reasons for these developments was the availability of a water supply from the Vaal River.

**Zuikerbosch and Vereeniging Pumping Stations**

Chief Engineer Leslie conducted extensive investigations into the question of pollution and how the Board could improve the quality of the water. He informed the Board in 1943 that the Klip River and Zuikerbosch River, the two tributaries of the Vaal River between the Vaal Dam and the Barrage, were severely polluted. This had started more or less in 1938 and coincided with the industrial development of the Far East Rand.

Leslie felt that the existing Vereeniging filtration and pumping station should not be extended further. To cope with an anticipated increased consumption to 682 Ml/day, the new station should be 1.5 km upstream from the Zuikerboschrand River to make it possible to extract water for the Board primarily from the Vaal River. This was to become the Board’s most important purification and pumping station and it was the first pumping station to be completely reliant on electricity from Eskom.

Before the plan was approved, the best possible treatment system for the water at Zuikerbosch was researched. At the new plant aluminum sulphate
As a vital part of laying the foundation for the world-class, modern industrial business area of Gauteng, Rand Water proved its great worth within the space of less than 100 years by helping to establish civil engineering in this country as a culture and a profession of substance.

(alum) was to be added in two stages. Alternatively, lime would be added as a primary process, followed by alum as a secondary process. Compared with lime, the price of alum was high. Its advantage was that small quantities of the substance went a long way towards providing the desired flocculation effect. The operations also became more sophisticated in that the plant calcined its own lime for water purification. This allowed it to provide sufficient quantities of carbon dioxide for the pH correction of the water in the lime coagulation process.

**RAND WATER – THE SECOND FIFTY YEARS: 1950 TO 2000**

In the period after World War II the political landscape in South Africa changed markedly. The National Party under the leadership of Dr DF Malan came to power in 1948. Although the Rand Water Board was an apolitical institution, it was indirectly affected by the political transformation, but the engineering section nevertheless maintained a strong English character. Until the 1980s an English-speaking South African had always held the position of Chief Engineer to the Board.

**Peri-urban areas**

The Peri-Urban Health Board was one of the first government offices to take note officially of the urban sprawl that was now occurring. This encompassed the region from Florida in the west to Edenvale in the east (including Soweto), in the north Pretoria and Rustenburg, and in the south the northern Free State. The Board had to make plans to supply all these areas with water.

By the end of 1961 it was evident that Soweto was in need of a lot of water. As a short term solution, a pipeline with a diameter of 900 mm was laid between Meredale-Moroka at a cost of US$150 000. In September 1961 the construction of the Meredale Reservoir with a capacity of 112,5 Ml was given the green light by the Board (construction cost estimated at US$190 000).

In February 1962 the Northern Free State Water Board (NFSWB) was established with the intention of supplying water for urban, industrial or agricultural purposes within the district of Sasolburg. Instead of a smaller pipeline with a maximum diameter of 575 mm, Deputy Chief Engineer RJ Laburn recommended a pipeline with a diameter of 725 mm. The whole project was estimated to cost US$800 000, but the Rand Water Board was eager for the service to be extended to the NFSWB, which also shared the Vaal River.

During drought conditions in 1966 Mr Laburn (by then the Chief Engineer) reported to the Board that an additional 450 Ml/d from the Vaal Dam was available if it gave up its right to generate hydro-electric power. It happened in the prime industrial months of October-November that the Board’s supply system had to work under great pressure and so the proposal was accepted.

**Water supply from the Tugela River and Lesotho**

The Tugela-Vaal Water Scheme was conceived for the first time in the 1950s as a means of augmenting water from the Vaal River. It was at the time one of a few alternatives left to planners to secure the continued growth of the region.

The first constructed scheme started with operations in 1974 when water was pumped from the Tugela River to the Sterkfontein Dam. The Board acted as consultants to the Department of Water Affairs on the design and construction of all the pumping, pipeline and ancillary plant for the scheme. The Sterkfontein Dam had an initial storage capacity of 1 196 752 Ml, which was increased in the second phase to 2 656 000 Ml and was equivalent in capacity to the Vaal Dam, but with a smaller surface area and much lower evaporation potential.

South Africa negotiated agreements of friendship with the landlocked neighbouring kingdom of Lesotho to secure for the interior of South Africa a strategic water supply without which the country’s economy would have been hamstrung. For the Rand Water Board the water was to be provided by the Lesotho Highlands Water Project (LHWP). In the early 1980s a series of four dams were planned that would be used to transfer water over a distance of some 400 km from the highlands of Lesotho by means of gravity tunnels and river courses to the Vaal Dam. Included in the agreement with Lesotho was a 120 MW hydro-electrical power station. Of the four dams, the Katse Dam was to become the tallest dam on the African continent. The LHWP was completed in 1997, supplying a minimum of 18 m³ per second from the Katse Dam in Lesotho to the Liebenbergsvlei River tributary of the Vaal Dam – a massive civil engineering project by any standards.

**THE POST-MODERN SOUTH AFRICAN ENVIRONMENT**

After the 1994 fully democratic elections, the Witwatersrand was incorporated into an enlarged provincial area called Gauteng. Global warming became an international talking point and locally an effective anti-developmental issue despite a lack of consensus among scientists and engineers as to the significant root causes of the phenomenon. The fringes of South African cities and towns became planned areas for free basic water and electricity justifiably promised to the previously disadvantaged and rural poor. However, adequate sanitation and its affordability was a debatable issue, even among certain engineers. Black Economic Empowerment policies, although necessary to correct some of the imbalances of the past, simultaneously created additional tensions in the new ‘rainbow’ society, and the exodus of white engineering and other professional skills from South Africa began.

**The vital new need: capacity-building**

Despite efforts to increase the number of civil engineering students, there are bottlenecks at the facilities of South African tertiary educational institutions and the numbers of teaching staff are often inadequate to accelerate the throughput of students. In addition, the poor quality of maths and science teaching at many schools frustrates efforts to produce...
much-needed engineering graduates of the right calibre for South Africa - this factor often adds years to the teaching process (SAICE 2007).

South Africa is addressing this challenge as well as it can, but it is becoming increasingly evident that adequate and sustainable civil engineering capacity is an international problem which could severely retard Africa’s development.

CONCLUSION
Notwithstanding that a century is but a brief period of time in comparison with the history of humankind, a series of mining, civil engineering, political and socio-economic events can have a lasting effect on society. As a vital part of laying the foundation for the world-class, modern industrial business area of Gauteng, Rand Water proved its great worth within the space of less than 100 years by helping to establish civil engineering in this country as a culture and a profession of substance.

The civil engineering planners of Rand Water and their South African consulting engineers were able to render a service of great value to society. Rand Water started out as a public utility, shaped on the format of a British metropolitan institution. On the South African Highveld the forces of colonial governance ultimately made way voluntarily and democratically for the transition to a typical dynamic South African organisation. Despite political turmoil, economic fluctuation and social change, Rand Water has continued in an unobtrusive manner to provide the service that it had been established for in the first place – supplying high-quality bulk water to its consumers. Sound planning made it possible to provide an assured water supply in what was actually a semi-arid region with an annual rainfall of only approximately 500 mm.

REFERENCES
IT IS QUITE REMARKABLE how young and relatively inexperienced engineers arrived in this country in the 19th century and established a successful branch of their profession in a then remote and rather backward part of the world without the benefit of a mentor or role model.

A typical example was John Gamble, who at the age of 31 came to South Africa and set up the foundations for hydrological studies and irrigation engineering in this part of the world.

John Gamble was born in 1842, the son of a naval surgeon, and was a mathematical prodigy. He won a scholarship to Oxford, was a brilliant student, and after taking his degree remained at the university to become a lecturer in mathematics at Lincoln College. During this period he was awarded the Gold Medal for the Johnson Memorial Prize Essay, his subject being “The Laws of Wind”.

But academic life was not for him. Suddenly in 1866 he decided to take articles with the well-known engineer Sir John Hawkshaw. After an initial spell on the construction of the docks at Hull, he became Resident Engineer on the main sewers in Brighton, where he put his mathematical skills to good use in devising a system of survey measurements which ensured that the sinuous tunnels were correctly located.

In 1874 Hawkshaw was appointed by the Brazilian Government to report on the suitability of several harbour sites in that country and Gamble and three assistants set sail for Pernambuco. Shortly after work commenced two of his colleagues took ill and died, while the third was overcome by the heat and had to return home. Gamble continued with one new assistant, who later spoke in glowing terms of his superior’s strength of character and energy in carrying out work in difficult and dangerous circumstances. The survey was completed after nine months of toil under the most trying conditions, and Gamble returned to London to draft his report. Almost immediately he was appointed to the new post of Hydraulic Engineer to the Cape Colony.

At this time almost all the engineers in South Africa were engaged in railway or road work. Despite his lack of similar experience Gamble lost no time in getting to grips with his duties, and he soon impressed his political masters that his plans and requests were practical and worthy of support. He undertook an extended tour of his area of responsibility, and compiled useful situation reports which were acted upon in later years. His reports also led to an Act of Parliament which formed the basis of the future strategy for irrigation in the Colony and led to the eventual creation of the Department of Irrigation.

At Port Elizabeth he made recommendations for a proper water supply, which the municipality acted upon and for a time possessed “the finest waterworks in the colony”. Other towns and villages received his attention, among them King Williamstown, East London, Queenstown, Somerset East, Riversdale and Graaff-Reinet benefited from his expertise and enjoyed adequate water supply for some years.

Gamble prevailed on the Government to set up a rain gauge at each magistracy. As a result some 250 reliable stations were established, and

John Gamble alongside his rainfall instruments on Table Mountain
Gamble was then able to produce the first good rainfall maps for the Colony. This led to the production of the first daily weather reports. He compiled a catalogue of all publications about Southern African climate and also collated a list of all reliable altitude records of the land form.

His practical work led to the construction of several irrigation schemes and dams. One of the first was at Sak River in the driest part of the Karoo where the irrigation scheme was viable for many years. On the other hand he incurred the ire of some colonists by turning down a proposal for a large dam on the Buffels River near Murraysburg, which according to the promoters, would have transformed the district into an agricultural paradise. Presumably if the scheme had been viable it would at some time or other have gone ahead, but as the dam has never been built we can conclude that Gamble knew his hydrology!

Although his job description did not include assistance to the Cape Town Municipality, the government allowed him to become involved in the search for augmentation of the local water supply, and he located the position for the first reservoir on Table Mountain and the Woodhead supply tunnel. When the Molteno reservoir collapsed in 1882, Gamble was appointed to find the cause and remedy.

While in South Africa Gamble met and married Miss Constance Brounger, the daughter of the Colonial Railway Engineer William Brounger, and they produced three daughters. He took a keen interest in the SA Public Library, the Philosophical Society and other scientific and cultural institutions at the Cape, and became an examiner and Council Member of the South African College.

In 1886 the world and the Colony experienced something of a depression, and with short-sighted zeal the government abolished the office of Hydraulic Engineer. Gamble returned to England, and shortly afterwards was appointed to a similar post in Ireland. He immediately set to work on assessing schemes for the Shannon and Barrow rivers, and with Parliamentary approval he produced designs and surveys for the proposed works. Sadly he did not live to see his projects implemented. Ironically, having survived the rigours of foreign climes, he succumbed to typhoid fever in the British Isles and died in November 1889.

It is quite obvious that Gamble, who was affectionately known as “Honest John”, was a personality of some status, both professionally and socially. His opinion was sought on various engineering matters, and he was awarded the Telford Medal and three Telford premiums for papers presented at the ICE. He is described as a person who “combined great mental gifts with a singular sweetness and modesty of character”. As mentor to several engineers he made a considerable impression on the profession and he can rightly be called the father of irrigation and hydrology in South Africa.

Tony Murray

Civil Engineering | October 2008
THOMAS STEWART WAS born in Craigend, Perthshire, Scotland, in 1857 and as a sixteen year-old entered into a pupillage with Mr DH Halkett. After three years, on completion of his time, he was taken into the firm as an assistant engineer. He then worked with the Glasgow Corporation Water Works while he furthered his studies at Glasgow University. Later he joined the staff of Sir John Wolfe Barry before being recruited to South Africa in 1882. He arrived at the Cape on 28 December in the company of another young Scot, James Rawbone.

The two young immigrants were less than charmed by their first impressions of Cape Town, which was windy, dusty and badly drained. As they explored the dimly lit St Georges Street they were annoyed by the stoeps of buildings which projected across the sidewalk and which ended abruptly and steeply at street corners – a definite hazard to unwary pedestrians. Hogmanay was to be a dreary time for the two spirited young Scotsmen. They vowed there and then that, if at all possible, they would return to their homeland on the next ship.

But it wasn’t possible, as they had contracts to honour. Rawbone would make his mark in the Colonial Forestry service, and become the founder of the well-known Rawbone-Viljoen family, the apple-growing pioneers of Elgin. Stewart was employed as assistant to the Hydraulic Engineer of the Colony, John Gamble.

Stewart reported for work on January 1st 1883 and found that the programme for the first day of the year consisted of an official picnic on Table Mountain. The party for this event included well-known politicians such as John X Merriman (a land-surveyor by profession). The Chief Engineer duly read the rain gauges as part of the official duties. There were other practical sides to the visit as Stewart was introduced to some dam sites which Gamble had identified as potential new sources of water for the growing city.

Though the Hydraulic Engineer was not officially responsible for the Cape Town’s water supply, his services were placed at the disposal of the municipality to find out why the Molteno Reservoir had burst the previous year, leaving Cape Town with a severe water shortage. One of young Stewart’s first tasks was to crawl through pipes in order to find some reason for the failure. It was a vivid and uncomfortable introduction to his new job. (Presumably his efforts led to a solution of the problem, since the reconstructed Molteno Reservoir is still in service.)

Soon, however, his duties took him further afield. He was sent to assess the potential of the Olifants River at Clanwilliam for irrigation, and he looked at the possibility of irrigating the Harts River valley with water from the Vaal – both schemes were to be implemented some years later. He worked out schemes for water supply to Barkly West, Cradock, Burgersdorp and Aliwal North, and in doing so he made a favourable impression not only on his boss but also on some of the clients. Gamble was prepared to leave him in charge for a six-month period when he took home leave, and in his chief’s absence he gave some telling evidence to the commission of enquiry into the Sanitary State of Cape Town. It was quite an achievement for a youngster still less than 30 years old. His
contract was extended by six months, at
the end of which he returned to Scotland.

But his initial opinions of South
Africa had been replaced by more favour-
able impressions. Before the end of the
year he was back in South Africa, with an
appointment from Cradock Municipality
to construct the scheme he had designed
a year or two earlier. The supply was
brought from a spring some 10 km away,
and would continue to serve the town for
many years. He spent two years in the
Karoo, and then transferred his interests
to Wynberg, which needed to augment
its water supplies from the Orange Kloof
area of Table Mountain. Having success-
fully built a reservoir near Constantia Nek
and located sites for further reservoirs, he
felt it was time to invite further commis-
sions and in 1892 he set up on his own in
St Georges Chambers, Cape Town, as a
consulting engineer.

Almost immediately he was appointed
to design and arrange for the construction
of the Woodhead Reservoir on the top of
Table Mountain. At the same time he had
been appointed by the tiny Kalk Bay and
Muizenberg Municipality to sort out their
water problems, which were solved by his
design for the Silvermine Reservoir which
was built by a contractor, GS Firth in 1898.

Not all jobs were productive. In 1898
the Colonial Government appointed him
as technical member of the commission
investigating an ambitious irrigation
scheme at Steynsburg. The scheme was
Another dam, to serve Simon’s Town, was also on the cards. This one would eventually be engulfed by the Lewis Gay Dam designed by Ninham Shand in the 1960s, during which time the amazed engineers came across a fascinating piece of machinery, devised by Stewart. The chemical dosing system consisted of a float-actuated bicycle gear, complete with chain and pedals. The alum-dosed water then ran through a long trough containing lumps of limestone. From the trough the water was led into the slow sand filters containing sea sand which had a large proportion of readily soluble seashell in it. The results were phenomenal. Never had a clearer, more sparkling, but still soft and palatable water been produced by this ingenious contrivance, and the Shand men were all grieved to have to see it make way for the essential larger plant of greater capacity.

The Woodhead Reservoir did not solve Cape Town’s water problems, and he gathered the survivors of his previous workforce and began work on the Hely-Hutchinson Reservoir above the Woodhead. The Alexandra, Victoria, and De Villiers Dams, which served Wynberg, were built in the same period – but this time the newly-married young engineer lived at ground level and travelled up the mountain when required.

Another dam, to serve Simon’s Town, was also on the cards. This one would eventually be engulfed by the Lewis Gay Dam designed by Ninham Shand in the 1960s, during which time the amazed engineers came across a fascinating piece of machinery, devised by Stewart. The chemical dosing system consisted of a float-actuated bicycle gear, complete with chain and pedals. The alum-dosed water then ran through a long trough containing lumps of limestone. From the trough the water was led into the slow sand filters containing sea sand which had a large proportion of readily soluble seashell in it. The results were phenomenal. Never had a clearer, more sparkling, but still soft and palatable water been produced by this ingenious contrivance, and the Shand men were all grieved to have to see it make way for the essential larger plant of greater capacity.

The first years of the century became the busiest period in Stewart’s life. Apart from the dams under construction, less well-endowed municipalities such as Rondebosch and Woodstock were looking to locate water sources in the Hottentots-Holland mountains. Stewart tramped the catchments and the valleys and made extensive surveys, and discovered two excellent sites in the Steenbras and Wemmershoek Rivers, which would see development in later years. For the time being, however, the little authorities did not have the financial resources to implement the schemes and nothing could be done until thirst caused the amalgamation of the seven minnows to form the consolidated Cape Town City Council in 1913.

Wynberg, however, was self-sufficient in water because of Stewart’s mountain reservoirs, and could not only afford to thumb its nose at the merger, but to embark on an ambitious sewerage scheme. Cape Town had recently completed a successful scheme based on a sea-outfall, but Wynberg, with no coastline, had to go for a totally new concept for South Africa – a land based treatment works. And who else to design it but their tried and trusted consultant, Tom Stewart!

Despite not having worked in this sphere before, he produced a scheme which the Council preferred to those of the experienced overseas experts, Dunscombe and Pritchard. The treatment works were located in the area between Grassy Park and Prince George Drive (which was still to be built), more or less where the Klip Road cemetery now stands. It was claimed in an engineering publication of the day that there was now “a prospect of the sewage farm being rendered unnecessary; or at any rate will be greatly reduced in size, while sludge, the bete-noir of all precipitation works will cease to exist.” Stewart, the prudent professional, merely reported these claims without undue comment, but the Town Clerk, Mr JB Munnik was more forthcoming: “Under this system there will be no smell or any unpleasantness… It is just like standing on a tank of ordinary water.” In 1903 Wynberg Municipality became the proud owners and operators of the first inland municipal sewage treatment works in South Africa.

The Town Clerk was, however, disappointed in his expectations. The works did smell, and the site proved totally unsatisfactory (and, a hundred years later,
engineers are still looking for a satisfactory way to get rid of sludge!). Wynberg took an option on a piece of State ground between Zeekoevlei and the sea for the purpose of a new disposal site and constructed a new works there. In due course this became the huge Cape Flats Treatment Works.

Stewart’s commissions were not confined to the Cape Peninsula. Outside of Cape Town he designed the Johannesburg Waterworks at Zuurbekom, and provided supply systems for a number of other towns, including Bloemfontein, Oudtshoorn, Worcester and Stellenbosch. In 1912 little Riversdale employed him to sort out problems with the supply scheme designed by his old boss John Gamble some forty years earlier. He designed a new weir on the Vet River, but had a set-to with the local Council, who wanted their local foreman to carry out the construction. Stewart considered him incompetent, held out for his own man, and got his way.

In 1914 he was employed to design a water scheme for Beira.

The amalgamated Cape Town Municipality appointed the extremely capable David Lloyd-Davies to head up its engineering department. He had to give his immediate attention to sorting out the by now desperately urgent water shortage, and after considering various options decided in favour of the Steenbras scheme. Stewart, WA Tait and Lloyd-Davies formed the Board of Engineers responsible for the design of the dam and delivery pipeline, and we can assume that most of the creative work was in Stewart’s hands.

Stewart’s services were much more than mere dam design, and involved hydraulics and hydrology, as well as a decent grasp of finance and economics. And, if we are to judge from his report to Wynberg on the proposed sewerage scheme, his written documents were models of their kind.

In 1932, on the 50th anniversary of his arrival in South Africa, the leading local engineers presented him with an illuminated address to mark the occasion, and to express their admiration for the achievements of “the doyen of the profession in South Africa”. The signatories are a galaxy of the leading practitioners of the time and include Kanthack, George Stewart, Alfred Snape, and a young Ninham Shand, who was just starting out as a consultant. A further unusual honour came Stewart’s way in 1936 when the President of the Institution of Civil Engineers in London wrote to him to express the appreciation of the membership for his long and distinguished connection with the body. He had in fact, while still a student, been awarded the Miller Prize for a paper entitled “The Prevention of Waste in Water”, and later served as the Southern African representative on the ICE Council for two terms. He had become an Associate Member of the Institution in 1883, and a member, at a relatively young age, in 1893.

Stewart served as the second president of the Cape Society of Engineers (now SAICE) at the height of his professional powers in 1904. He was also elected as a Fellow of the Geological Society and served a term as the President of the Royal Society in South Africa.

He died at his home in Kenilworth in October 1942.

Tony Murray
Liviero Civils
– focused and on track

IN TODAY’S PRESSURISED contracting environment, a company boasting both youthful professionalism and experience has distinct advantages. Youthful enthusiasm is more often than not accompanied by high energy levels, a hunger for success and, perhaps most importantly, a flare for innovation. With Liviero Civils (Pty) Ltd this is most certainly the case.

Liviero Civils, part of the Liviero group (which this year celebrates 25 years of active construction in South Africa) was formed in 2005. The young talent at Liviero Civils is not their only advantage. “We have an excellent mix of the ‘mature and wise’ and the ‘energetic and hungry’, and it is this balance that has helped us achieve so much in so little time,” says CEO Richard Saxby. "Planned focus has been an important part of our strategy and a balanced, diversely talented team has been the key to achieving this across a wide spectrum of the market," he says.

Their versatility has facilitated successful growth for the company in all the disciplines of civils, including concrete structures, roads and earthworks, infrastructure, water and sewage works, and heavy industrial foundations.

The MD of Liviero Civils, Stuart Knight, says the company’s primary goal has been to provide a quality customer service and that, to achieve this, discipline has been the key. “We endeavour to achieve excellence in whatever we do. From the signage on our vehicles to the way we plan a multi-million rand contract, and from training our labour force to understanding the details of our clients’ requirements – all these aspects are critical for us. The bottom line is that
Part of the success of Liviero Civils is due to its emphasis on good governance. The company continuously strives to achieve more effective management structures and better integrated management information and control systems, all of which help to make good governance a deeply imbedded aspect of its corporate culture.

we strive to consistently deliver quality work on time.”

The core of their ethos is doing things professionally and competently, and the significant number of repeat orders they are getting from so many of their clients are evidence that this approach works.

Part of the success of Liviero Civils is due to its emphasis on good governance. The company continuously strives to achieve more effective management structures and better integrated management information and control systems, all of which help to make good governance a deeply imbedded aspect of its corporate culture. Good governance is ultimately about being transparent and fair, but a balance must be achieved between fairness and toughness. They find that this is crucial in the civils industry where poor discipline can be dangerous to human life. Where safety is concerned, they do not take chances and they endeavour to stand firm at all times to ensure that the proper
Liviero Civils has contributed to a range of works on the Gautrain rapid-rail link project at Rosebank and Sandton stations.

The Liviero Civils senior management team. Back row, from left to right: Richard Saxby, Chief Executive; Stuart Knight, Managing Director; Charles Wright, Contracts Director. Front row: Directors Moses Maponyane, Rob Schunke, Welekazi Dukuza.

The way in which Liviero deals with safety is, in fact, part of an overall consciousness regarding its health, safety, environment and community (HSEC) issues.

With its roots in a two-generation family concern, Liviero understands the need to play its part in the sustainable development of both its people and the environment in which they work. To support this, the company has its own extensive in-house training programmes and supports various bursaries and scholarships.

BEE is also taken into account and in this regard Liviero is entirely compliant. In October 2007 black-owned Impepho Building and Civils (Pty) Ltd acquired a 30% stake in the Liviero group. The group has focused on broad-based principles in their BEE strategy in order to attain a genuine and sustainable empowerment structure.

Turning to the future, Liviero’s aim is not necessarily to be the largest player, but they do want to continue developing as an exceptional South African company producing high quality work. In this way they aspire to become the civil engineering contractor of choice.

A quick analysis of the company’s fundamentals reveals that they have established a sound basis for expanding in whatever direction they wish. The group as a whole has a turnover of R1.4 billion and its plant and equipment are valued at more than R250 million, making its private assets among the largest of this kind in South Africa. The company is also currently engaged in an expansion programme with the imminent completion of the new Liviero Civils building, which will add another 1 000 m² of office space to its Kyalami headquarters.

“However, this is not growth for the sake of it and it never will be,” says CEO Richard Saxby. “Liviero Civils is growing holistically and at a calculated rate. From a geographical point of view, this growth is focused in Gauteng, North West, Limpopo and Mpumalanga. In time, however, we will develop an extensive national footprint.”

The mission upon which Liviero embarked three years ago, namely to set up a successful South African civil engineering company to challenge the best, appears to be unfolding as planned. They are aware that there is still plenty of work to be done in these challenging times in South Africa, but are as motivated as ever. Liviero’s management team is focused and optimistic – the two most important ingredients for success – and given its sound value foundation and excellent systems, the company will have a great future.

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Concrete deck pour of the concourse level of the Gautrain Rosebank Station.

Liviero Civils has contributed to a range of works on the Gautrain rapid-rail link project at Rosebank and Sandton stations.

The Liviero Civils senior management team. Back row, from left to right: Richard Saxby, Chief Executive; Stuart Knight, Managing Director; Charles Wright, Contracts Director. Front row: Directors Moses Maponyane, Rob Schunke, Welekazi Dukuza.
A moral and ethical dilemma: systems that fail

“19 OUT OF 20 ERP [Enterprise Resource Planning] implementations fail to deliver what was promised” according to a Financial Mail survey published some years ago (McCleod 2003). An article published in Computer Business Review Africa a few years later quoted a Gartner executive as saying that “Most organisations are not making better decisions than they did five years ago” (Technews 2005).

Prof Richard Nolan of Harvard University is reported as saying that “Information Technology is the next corporate disaster waiting to happen” (Alter 2006). The indications are that as many as 70% of corporate business system investments fail to deliver anything material at all when viewed from a commercial and strategic standpoint (Robertson 2004).

For those who are listening attentively there are a significant number of reports of massive IT write-offs by big-name corporations, yet silence and the ‘Delete’ key have become the most effective tools in disposing of failed investments that the world has ever known.

If buildings, bridges, factories or large ships failed at the rate that business information systems fail to function to specification, or fail to function outright, technologically based society in the shape that we know it today would never have reached anything approaching the present level of sophistication.

One can argue that without computers we would not have reached these levels of technological sophistication. However, much of the computer software that has enabled this sophistication has been developed by specialist software engineers operating according to a different set of standards than those that are applied to general commercial software.

Furthermore, much of the core technical functionality that exists in business software is fundamentally unchanged from that which existed two or even three decades ago. The average user of word-processing software today probably uses the same or less functionality than he or she did a decade or more ago. The software may be considerably more functionally obese than it was then, but the basic capturing of text on paper as a more sophisticated replacement for the
The harsh reality is that individuals and corporations who would not think twice about contacting their attorneys if confronted by failure of this magnitude in any other area of business and life generally meekly pay up to replace software that is dysfunctional but is so, at best, through negligence and, at worst, through intentional design while the application software is actually still fully functional.

As a matter of interest, I continue to use the old software because I am so familiar with the function keys that I do not have to think in order to use them and they are faster to use. The inconvenience and time wasted on learning new software is simply not warranted and the content is the same whatever tool I use.

And so we find that old software fails under new versions of the best-marketed operating system, not through a fundamental tendency towards mechanical failure, but through a lack of interest in maintaining consistency of standards which has the interesting effect of making the perpetrators much more profitable than they would otherwise be.

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Returning to the subject of forced obsolescence – there is an interesting legal principle termed ‘the right to maintain and repair’ which originated in the motor industry many years ago and which, as far as I can ascertain, forms the basis of the so-called ‘pirate parts’ industry in the motor trade. The essence of this principle is that when one purchases a product, one has the right to maintain and repair and therefore use that product for as long as one chooses to do so.

The practical implication of this principle is that if a motor manufacturer ceases to manufacture exhaust pipes for your motor car, they axiomatically void their intellectual property rights to the extent that is required for you to have a
One option is for the customer to become a lot tougher, which, incidentally, requires the customer to become a lot more thorough and a lot more realistic about the real cost of doing the job right first time. The other option is for the industry to take voluntary measures to clean up its act.

third party manufacture an exhaust pipe to the original specification or such other specification as you deem appropriate. The principle says nothing about the economic or mechanical practicality of doing this; it simply states that you have the right to do it.

What is also interesting about this principle is that as far as my casual enquiries have revealed, most attorneys know of the principle but it appears that there is only one case on record relating to its application. It would seem that the principle is so intuitively sound that no one has ever seen fit to contest it since it was first adjudicated in the UK’s House of Lords many decades ago in the context of motor vehicle exhaust pipes.

What has this to do with software failure? As far as I can see, a huge amount.

Essentially, the right to maintain and repair says that if a software developer ceases to support a version of its software that you have legally purchased, then you are entirely within your rights to have a third party maintain and repair that software for as long as you consider it appropriate and are willing to pay what it costs to procure this maintenance. Since the precedent appears to indicate clearly that in such a case intellectual property rights are void to the extent necessary to maintain and repair the software, it seems that you are entirely entitled to demand the source code for no more than the reasonable cost of making a copy for your use. The only real question would appear to be whether anyone has the will and legal resources to consider taking the necessary measures to establish a precedent in the software business.

Turning to the high level of failure and suboptimal outcomes of business information system implementation, we find ourselves faced with another interesting phenomenon. One of the reasons why “19 out of 20” implementations do not deliver what was promised (that is fail to deliver) is that much of what is promised is in the realms of human ability or even in the realms of the superhuman. We are promised that software will do things that only people can do and in many cases that not even people can do. IT marketing hype propagates beliefs in the most remarkable outcomes and creates the impression that companies that implement the software concerned will achieve levels of efficiency and effectiveness that can be achieved with no other software.

The harsh reality is that computer systems, like guns, are value inert. A gun held by someone you consider to be good and pointed at someone you consider to be bad is ‘good’, whereas a gun that is pointed at you is ‘bad’. Computer software is much the same: well-designed and well-implemented software used by well-trained and well-motivated staff is ‘good’, otherwise it is bad (it fails).

This problem is compounded by the names we use. Careful inspection of the software commonly referred to as Enterprise Resource Planning (ERP) software will reveal that in most organisations where software with this label is deployed, the software being applied in practice comprises basically the same modules as were employed in ‘Accounting Systems’ in the late 1980s and ‘Management Information Systems’ in the 1990s. There has been an exponential increase in the functionality of such software and, accordingly, there has been an exponential increase in the complexity and cost associated with implementing this software. Nevertheless, orders still get placed, suppliers get paid, products get sold and paid for, and all these transactions end up with one leg in the General Ledger.

In all cases the name of the product, supplier, customer, staff member, etc. comprises the identical pattern of binary 0s and 1s that has applied for decades to the words in question in electronic form and the numerical values of the data have also been expressed in exactly the same way for decades. So, in practical terms, there is a limit to how much more value one can add to the data. One is therefore faced with a huge conundrum as to the basis on which one can justify the real cost of trashing systems that are five, ten or even 15 or 20 years old and that are getting the job done.

Yes, one may well find ways of extracting value by adding new modules and new functionalities that work with the existing data. And in most cases one can almost certainly release substantial value by improving the quality and the classification of the data, and reimplementing the existing software. However, telling customers with five-year-old software that they have to replace it on
the grounds of obsolescence requires careful consideration.

Then there is the question of reducing the ‘head count’ which is frequently used to justify large system investments. The problem is that frequently this head count reduction does not materialise and, in fact, an increase in the head count and a reduction in overall efficiency is experienced. Added to this there is the moral dilemma of the ethics of eliminating jobs in a nation where unemployment is severe and job creation is supposedly a priority.

So where does this leave us? By now you may well be thinking that I am opposed to all things that relate to computers and that what I am advocating constitutes a threat to all that any worthy computer geek holds dear. No, far from it.

I have devoted most of my career to the application of computers in business. In fact, I have spent the last 19 years seeking to find ways of achieving high levels of reliability and sustainability in the design and implementation of business computer systems. This is something that I refer to as ‘an engineering approach’ – an approach that aspires to have the same level of success as we take for granted from engineering structures.

You may recall the bridge failure in the US last year which made headlines around the world within minutes of its occurrence. Why did it make headlines? Because the failure of bridges is so extremely infrequent.

And why is that? Because engineers do not design bridges to stand up - they design them NOT to fall down. What is the difference?

There is a fundamental difference in the mindset required to design a bridge NOT to fall down as opposed to simply designing a bridge. The first step in this change in attitude is to recognise that the tendency to ‘fall down’ is the natural state of things generally and of bridges in particular, just as failure is the natural state of business software investments.

So, the first thing we need to do in order to achieve software success is to prevent the epidemic level of software failure; to achieve this objective we first need to acknowledge that failure is indeed epidemic and then we must CHOOSE to work consciously and actively to PREVENT failure.

This requires that we understand all the factors that cause failure and work to eliminate them from our projects. And this is not a mystical or magical endeavour – the factors that cause failure are mundane and mostly quite easy to recognise. They are (Robertson 2004):

1. Information technology mythology (30%)
2. Lack of executive custody and inappropriate policies (20%)
3. Lack of strategic alignment (15%)
4. Lack of an engineering approach (12%)
5. Poor data engineering (10%)
6. People / soft issues (8%)
7. Technology issues (5%)

What you will notice is that only 5% of what causes failure relates to technology, 95% relates to factors that have to do with things that people do and think, and 30% relates to the tendency to ascribe human and superhuman attributes to ‘binary adding machines’ which only approximate human ability to the extent that human beings are able to interpret and anticipate applications that simulate what human beings are able to do.

To return to the position that I am advocating. Not only am I advocating preventing failure, but I am also advocating preventing failure in a manner that delivers high and sustainable strategic value, that is value that facilitates and supports the success of the organisation.

If we look at the real cost of failed projects coupled with the high ongoing cost of suboptimal projects (those projects that failed to deliver on a real, valid and valuable business case that delivers lasting economic benefit), I submit that the real cost of the few projects that succeed is far higher than is recognised and that, accordingly, we should recognise the real cost of success AND the high value of truly successful investments and then act appropriately.

Once we are clear on the real cost and real value of real success, we can decide either to stabilise and expand our existing systems or to invest in new systems. Once we are clear on the real cost of a new system, we may well be willing to invest heavily in our existing systems. Once we do this in concert with a robust requirement for vendors to honour the principle of our ‘right to maintain and repair’ our systems for as long as we desire, we may well acquire a very different perspective on the way we operate our business system investments – be it our office automation software or our accounting systems or extended accounting systems (ERP systems).

The essential prerequisite for this approach is a change in attitude on the part of the client and the IT practitioner. I would like to see such a change originate from the profession, but in practice it will probably be a combination of change from both sides. In its simplest and harshest form, this change might look like a meeting that I facilitated on behalf of a client some years ago after they had been informed that the supplier was going to discontinue support for their version (let us call it xx) of the software and that they should accordingly prepare to spend a considerable sum of money and incur considerable business disruption in upgrading to a new version which, it appeared, there was no strong business case to recommend.

The conversation went something like this:

Supplier: “We are discontinuing support for version xx from the end of next year so we need to start making plans for you to upgrade.”

Client: “We do not want to upgrade. We want the source code for version xx and a five-year support contract for version xxx renewable for five years.”

Supplier: “Sorry, perhaps we did not make ourselves clear, we are DISCONTINUING version xx.”

Client: “There is a legal principle called ‘the right to maintain and repair’ and in terms of this we want the source code and a renewable support contract. And we are willing to take this to court.”

Supplier: “In that case we will have to speak to our principals.”

A few weeks later the supplier returned with a quote to supply the source code and a draft five-year support contract renewable for five years. We did not particularly like the dollar amounts for either item, but they were a lot more attractive than the real cost of scrapping the current version and provided a basis for negotiation.

I would prefer there to have been NO NEED for the conversation in the first place and for the supplier to have automatically offered to continue supporting version xx on an ongoing and open-ended basis.

Your response to this suggestion may be that it is ‘impractical’ and unreasonable to expect vendors to maintain support for ‘obsolete’ versions at numerous sites indefinitely, to which I suggest that the obvious reply is that this is done for buildings, oil refineries and numerous
other large and expensive systems of greater tangible complexity and greater overall cost than business computer systems. Moreover, if we considered the true cost of trashing thousands of person hours of work spent in implementing new systems every few years, we might find that the economics would in fact favour the approach that I am advocating here very considerably.

Taking this full circle back to where this discussion started (with the unacceptably high level of software failure), I suggest that we now find that there is a perfectly sound economic basis to do the job properly.

In actual fact, in broad terms we know how to do the job properly. The biggest problem is that too many people lie about the real cost of doing the job because of sales targets and short-term budgets, and because there is no awareness of the real cost of failure.

One option is for the customer to become a lot tougher, which, incidentally, requires the customer to become a lot more thorough and a lot more realistic about the real cost of doing the job right first time. The other option is for the industry to take voluntary measures to clean up its act.

I recently encountered an outstanding example of the tougher customer approach. The customer spent a year compiling a set of 300 reference documents, together with a tightly structured contract, and appointed the attorney who drafted the contract as part of the project team. The project came in on time and under budget and met all business expectations. In fact, it came in so far under budget that the company paid material cash bonuses to all the staff involved with the project!

Surely it is time for all those who practise in the field of the art and science of business information systems (and who aspire to complete projects on time and on budget, and that meet customer expectations, and who are willing to bite the bullet of being honest about the real costs and are willing to take a stand with regard to dealing with integrity and in the best long-term interests of the customer) to join forces to establish a peer-moderated professional body that will eventually seek statutory powers to license and moderate the practice of professional information technology practitioners in the various major fields of IT endeavour?

REFERENCES

McLeod, D 2003 The IT industry, time for a re-boot. Financial Mail, Johannesburg, 28 March.


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Coaching in Construction

Coaching is a profession that is still in the process of forming in South Africa and it needs to be shaped to suit local requirements. The development, growth and effective use of coaching will be achieved in a partnership between clients and coaches, who create the market together. In the construction industry, executive and performance coaching appears to have been used more widely, and to greater effect, in the US and Europe. The author feels it is time for the industry to engage in an inquiry into the role, problems and possibilities of coaching in the construction industry in South Africa.

THE INTERNATIONAL COACH

Federation (ICF) defines coaching as “partnering with clients in a thought-provoking and creative process that inspires them to maximise their personal and professional potential”. Coaches are trained to listen, to observe and to customise their approach to the needs of individual clients. The job of the coach is to provide support to enhance the skills, resources and creativity that the client already possesses.

One particular construction company reported an experience of coaching where a coachee was deemed, by people in the company, to have “become dependent” on their coach. This coach subsequently put forward management consultancy proposals and, over time, became involved in various aspects of the coachee’s work, even acting on behalf of his coachee in certain interactions.

This story highlights three things about coaching across all sectors in South Africa:

- The boundaries are blurred between consultant and coach, meaning the role of a coach is not immediately apparent to clients
- There is a huge variation in the quality of coaching on offer
- Too many coaches are operating in unethical ways

QUALITY OF COACHING AND ETHICS

As a growing profession we can try to control the quality of coaching and unethical behaviour. The professional bodies of coaching aim to deal with issues of ethics through an ethical code of conduct and a complaints procedure. The local body is COMENSA (Coaches and Mentors of South Africa), who have recently established their own procedures. The International Coach Federation (ICF) also has a code of ethics and a well-established complaints procedure, although it is not locally administered. The profession can encourage the reporting of unethical behaviour and invite coachees and client organisations to make valid and specific complaints about unethical behaviour. A willingness to identify and unmask unethical behaviour is vital to the development of the profession.

Certain coaching agencies promise to solve the problem of poor quality in coaching by promoting a scientific method of coach matching that will avoid the “risk of making an uninformed buying decision… relying on luck and instinct.”
The metaphor employed in the article is one of keeping the “cowboys out of the corral”.

DESIGNING AND COMMISSIONING AN APPROPRIATE COACHING INTERVENTION

Codes of ethics, complaints procedures and the professional management of coaching interventions by coaching organisations or individuals are all important aspects of an effective profession. However, relying solely on these measures ignores the importance of a major precept of coaching which is that clients must be in a position to evaluate their own needs.

In defining coaching, the ICF asserts that coaches regard their clients as being naturally creative and resourceful. This should mean that coaches believe that their coachees have the skills and imagination to inquire for themselves into what coaching is and to trust in their ability to choose an appropriate coach. If you follow this approach you will not need to be rescued from “cowboys”. Clients need to inform themselves thoroughly before appointing a coach, as they would with other aspects of their business.

Obviously, unethical behaviour cannot and should not be condoned, but a poor experience with one coach can be a great excuse. It could be seen as proof that coaching does not work and could therefore be used as an excuse not to challenge the cultural and professional norms that expect us to ‘be tough’. However, the sustainability of these norms may soon be brought into question, particularly in the context of the current pressure on contracting and civil engineering professionals, the looming step change in coaching and the development of South Africa as a whole.

SECTOR PRESSURE

The construction sector in South Africa continues its almost breakneck expansion. Between 2006 and 2007 the top four construction companies increased their turnover by an average of 45% and staff by an average of 40%. Planned spending on infrastructure for the 2010 FIFA World Cup, freeway projects, Transnet and Eskom development is huge. Indeed, contracts for Eskom dwarf the order books of even the largest contractors. The skills shortage is set to become even more critical and there is a great deal at stake here for South Africa, the profession and the industry.

When I was running my own construction business, I found the biggest pressure on me was the shortage of skilled site managers. As a small business owner, and the only fully skilled individual in my business, I did not have the time to develop my site managers in the way I would have liked. The stress of operating in this way resulted in my cholesterol reaching an unacceptable high level. As Allyson Lawless states in the introduction to Numbers and Needs, Addressing Imbalances in the Civil Engineering Profession (2005), “it is only possible to develop capacity if there is sufficient capacity to develop this capacity”. There is a danger that with such a rapidly growing order book and a continuing shortage of skills, too much pressure will be placed on the shoulders of those who do possess the skills. Concrete is very strong under compression but we have all seen how dramatic and sudden failure is in a testing lab.

THE PRACTICAL ROLE OF COACHING IN CONSTRUCTION

As with all industries, middle-level managers are the heart of the operational vitality of our industry. However, much of the coaching in all industries and sectors is aimed at senior executive level. Allyson Lawless (2005) describes coaching as a “luxury” for junior engineers. She also places emphasis on ‘knowledge coaches’ and mentoring. In my opinion, coaching designed with and for site managers is going to be key to supporting and developing the capacity of that vital resource. Coaching will enable site managers to reflect on their experience and unlock the tacit knowledge they have gained over years of experience. I believe that they are too valuable not to be receiving coaching so that they can become ‘models’ for the industry and use their own coaching skills to pass on their knowledge to their juniors.

The December 2007 issue of the Construction Management and Economics Journal features an article on research into site managers’ actual experience of coaching. The authors conclude that coaching “is not some kind of ‘add-on’ service to comfort managers, but an important strategic human resource management practice whose role and function deserve further attention.” The article also states that the coaching literature remains largely preoccupied with presenting and introducing coaching, rather than giving empirical examples of coaching experience. Perhaps the industry should create a forum to discuss the practical use of coaching to finally achieve the promise of training and skills development.

CONCLUSION

Allyson Lawless explains that “many organisations complain that their staff are always on training, but have not developed the necessary competence.” Mentoring that focuses on the ‘right’ skills training for those on a junior level will not necessarily produce a different outcome. In fact, there is some evidence that this may be counter-productive.

Coaching aims to develop the personal communication skills and raise the emotional intelligence (EQ) of coachees. This enables them to pass on competence and tacit knowledge. A study spanning 44 Fortune 500 companies determined that people with higher EQs achieved twice the sales volume of their colleagues. In the IT industry, it has been found that software developers who test in the top 10% of EQ levels write their programs three times faster. On the other hand, research at Loughborough University in the UK showed that the EQ of participants on their Construction Engineering Management programme actually reduced during the course!

Allyson Lawless asks us to “consider a creative name that captures the imagination and achieves buy-in for coach—protégé relationships to blossom.” Perhaps we should rename this role and process ‘competence coaching’.

I became a civil engineer to help society and I imagine some readers may have chosen this profession for the same reason. With this in mind, I ask you to join me in an inquiry into how we want coaching to operate in this industry so that we can directly serve the needs of South Africans in a more powerful and fulfilling way.

USEFUL WEBSITES

COMENSA www.comensa.org.za
ICF www.coachfederation.org
CTI www.thecoaches.com and www.thecoaches.co.za

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Shortly after World War II, in view of a universal shortage of vegetable oils, the British Government of the day decided to institute a scheme to produce groundnuts (peanuts) on a massive scale in colonial East and Central Africa. The decision was based on recommendations made by an official three-man mission, members of which were no strangers to Africa: a former Director of Agriculture of Tanganyika Territory, the Head of the Plantations Department of the United Africa Company and a senior official from the Colonial Office. Their plan envisaged the establishment of 107 mechanised farming units of 30 000 acres each in unoccupied bush country, of which about 75% of the total would lie in Tanganyika Territory (now Tanzania).

The total cost of the dry-land (i.e. non-irrigated) scheme, scheduled for completion of the development phase in five years, was estimated at that time (60 years ago) at £23 million, plus a few extra million pounds for permanent conventional infrastructure. The largest anticipated capital costs lay in clearing of the bush and forests, and preparing the soils for mechanised agriculture, and the first development areas were planned to be located in Tanganyika. The tone of the report was generally optimistic in regard to both development costs and future revenues, and administration of the Groundnut Scheme was allocated to the Ministry of Food, acting through a body called the Overseas Food Corporation (OFC).

Some four or five years after the start of operations, however, the original forecasts of clearing costs, crop production and potential revenue had all failed to meet their targets, and the British government took what must have been an embarrassing decision to close the Scheme down. Although the events are well in the past, the object of this article is to record a brief history in an attempt to explain the failure and possibly also to provide a guide for agricultural mega-projects of the future. Comment will tend to focus, however, on the pioneering and development aspects. In any event, it will become evident that crop production never really had a full opportunity to prove or disprove itself.

History

Operations commenced as planned in the late 1940s in three provinces of Tanganyika Territory, with the major effort concentrated in the Central Province near the village of Kongwa, probably selected because of its access to road and rail. Nevertheless, the most optimistic forecasts from the start had been centred on a proposed development area in Tanganyika’s Southern Province, situated near the town of Nachingwea, about 160 km east of the port town of Lindi, but connected to it only by a low-standard gravel road. Fairly early on therefore, the OFC arranged not only to improve the harbour at Lindi but to build a new railway and an all-welded surface pipeline from the coast to Nachingwea, in order to cater for the intensive mechanised clearing and agricultural operations that were to come. Furthermore and in all the regions, conventional housing, infrastructure services, hospitals and schools were established to cater for the fast-growing influx of expatriate and local staff.

Within two years, contractors had cleared about 100 000 acres at Kongwa,
somewhat fewer than forecast and at an appreciably higher cost; but a reasonably solid block on which to start crop production. The required sequence of mechanised agricultural operations then commenced, but at the time it was not realised to what extent the fleets of rubber-tyred agricultural tractors were gradually compacting the sandy loam soil. When the time eventually arrived for harvesting, disaster struck: the harvesting equipment could manage to extract only a proportion of the full crop from the plants buried in the compacted soil, leaving a significant percentage of the crop in the ground, unable to be harvested. The tremendous and expensive previous efforts of clearing the bush, preparing the soil, planting and cultivating had therefore been seriously frustrated.

The original mistaken decision to start full-scale operations before carrying out adequate soil surveys and some sort of a pilot project was only then brought home in somewhat tragic fashion, and a great deal of rethinking and possibly recrimination must therefore have taken place both in London and in Kongwa. Entirely new ideas did the rounds in any event – amongst others, switching the project from groundnuts to sunflowers or transforming the Kongwa area into a cattle ranch. One positive decision that did arise from the rethinking was the immediate appointment of a team to conduct a long-overdue survey of the potential of the Nachingwea area in Southern Province – at that time still the great hope for eventual success.

A survey team, termed ‘Forward Reconnaissance’, was appointed from among the professionals already on the Scheme: soil conservation and agricultural officers, engineers, surveyors, draughtsmen – all under the leadership of a former Chief Geologist of Tanganyika Territory – and started field work almost immediately. The techniques used in conducting the survey are of technical interest only and might by today’s standards be described as somewhat archaic. In any event, using both standard and ‘bush’ techniques, and aided by the availability of specially flown aerial photos, the final maps and report covering topography, vegetation and soils of the entire allocated Nachingwea area were handed over after about six months. Even before that time, however, a depressing fact had become evident. The Southern Province area could not provide sufficiently extensive unfragmented blocks of acceptable land that would accommodate efficient and economic mechanised crop production, and could therefore not become the much-anticipated El Dorado that would save the Scheme.

As an inevitable result, and probably also in view of the setback at Kongwa and its inflated clearing costs, a high-level mission from the UK recommended that the Scheme be closed down.

Some 50 years later the Tanzanian Embassy in Pretoria reported that only vestiges of the Scheme remained visible. Kongwa has indeed become a cattle-raising centre. Cotton and maize are grown in the cleared areas of the Western and Southern Provinces respectively, the railway to Nachingwea lies disused and the fuel pipeline has disappeared, having been dismantled and sold for scrap. The well-intentioned and imaginative post-war dream of colonial transformation had come to an unfortunate and dismal end.

Discussion

Armed with hindsight, it is not difficult to pinpoint the essential reason for failure of the Scheme. The OFC had made a headlong start with full-scale operations in a remote and undeveloped region of Africa without the benefit of a pilot project or at least detailed preliminary investigations and technical surveys. Such preliminaries were apparently ruled out by the report’s emphasis on urgency.

Civil engineering was essentially responsible for bush clearing, but also for the Scheme’s other conventional functions; the latter having been conducted conventionally and without drama. The proposed railway line and pipeline in the Southern Province were completed...
The report appears to have planned originally for clearing to be carried out in the main by the OFC itself, and for contractors to be engaged for an initial limited period only – simply to get the clearing operation going. In any event, during that immediate post-war period no contractor in Africa, nor possibly anywhere else in the world for that matter, could have mustered an establishment of heavy plant and equipment sufficient to carry out bush clearing at the planned rate.

After the start of full clearing operations, however, a different system emerged: the OFC would still procure and own the clearing equipment (essentially heavy crawler tractor/dozers), but would appoint contractors in each development area to man and operate the machines. Furthermore, the OFC would establish a Heavy Repair Section (HRS) to carry out major repairs, while the contractors would be responsible for production, field maintenance and light frontline repairs. Payment would be made monthly on the basis of areas of work completed under different categories – felling the bush, windrowing and creation of contour banks, heavy ripping androoting, heavy ploughing – before final handover to the agricultural units.

The OFC had already set about procuring the equipment some time earlier (a major task in itself), essentially from redundant US Army stock in the Far East. The size and scope of the procurement and clearing programmes can be judged from the fact that when clearing reached full production at Kongwa, the contractor (Paulings, a famous name in African railway construction) was operating 150 of the OFC's Caterpillar D8 tractor/dozers, together with all the usual ancillary transport and minor plant.

The parties entered into clearing contracts which, again with hindsight, were heavily weighted in favour of the contracting companies. Contractors had been relieved not only of the financial obligation of acquiring enormous fleets of heavy equipment, but also of the more onerous obligation to carry out major repairs to large fleets of second-hand plant in the remote African hinterland. Furthermore, the contractors were handed an additional incentive by means of a bonus clause for beating agreed production rates, so that compared to normal civil engineering practice, their contractual risk became minimal. As could have been foreseen, with the contractor relieved of the heavy repair function, fierce disputes ensued in Kongwa between the OFC's HRS and Paulings in regard to alleged abuse of machines. (A cynical witticism did the rounds, based on Winston Churchill's war cry "Give us the tools and we'll finish the job"; which became "Give them the job and they'll finish the tools").

Relief at achieving a reasonable rate of clearing was, however, tempered when financial accounts revealed that the agreed contractual arrangement had created a startling increase of close to 400%. In fairness, this substantial increase was not created entirely because of the poor contractual arrangements: the report's estimate had obviously been completely unrealistic.

The tremendous increase in clearing costs did not seem to deter the OFC in the early years, and whatever high-level discussions took place at headquarters in Kongwa and London, there were no immediate changes in the basic plan, or cutbacks in development expenditure, until the later crop failure. The OFC might have accepted the extra expenditure by virtue of their belief in the eventual success of the Scheme and the benefits that would accrue in the course of time. The directors might have been comforted by the fact that overspending on major projects (the Suez and Panama Canals, for example) is not an unusual phenomenon. Overruns on building and civil engineering projects, however, usually produce durable and safe structures and services which eventually justify their existence. It was the crop failure at Kongwa and the subsequent pessimistic report of the Forward
Reconnaissance team that finally must have brought about closure.

Rereading the report of the three-man commission confirms that their investigations into the costs of clearing had been somewhat cursory. They did indeed consult East Africa’s largest supplier of heavy equipment, as well as a prominent Tanganyika pioneer, famous for his farming developments not far from Kongwa itself, but there is no evidence of their having sought advice elsewhere. Consulting engineers or civil engineering contractors in Africa (or even from further afield) could perhaps have given a more realistic assessment. In the report’s defence, however, it is also likely that data on costs were simply not available anywhere at that time, in terms of the scale and rate of clearing that was being proposed.

In further defence of the report, it might also be argued that the success of fairly recent wartime projects like PLUTO (Pipe Line Under The Ocean) and Mulberry Harbour had given political officials a more realistic picture about costs and the writing of contracts. In fact, considering the high proportion of the civil engineering cost in the original budget, the British Government might have been well advised to appoint a fourth commissioner in the form of an experienced civil engineer with colonial experience, especially when such expertise was readily available within the UK professional establishment.

An unfortunate further consequence of failure of the Scheme was that it probably prevented other potential colonial or developing world projects, possibly less difficult and more viable ones, from being attempted or even planned. The ‘groundnut scheme’ became a byword for rejection of new ideas. The need to modernise African agriculture and industry has, however, not disappeared, and lessons learnt from the Scheme’s collapse should act as a warning, although not a complete barrier, to planners of all manners of development in the future.

4. SOILS ENGINEERING MAP: LATE 1950s

The innovation effort described here, the Soils Engineering Map (SEM), is a product of research carried out during the 1950s at the National Institute of Road Research (NIRR) of South Africa’s CSIR. At the time the research was being initiated, South Africa was already in the throes of its infrastructure surge, with new roads and freeways comprising a high proportion of the total effort. Much of the work was therefore taking place in rural or developing areas, and the NIRR realised that serious cost savings could be achieved by locating local sources of supply for concrete aggregates, and suitable soils and gravels for upper-layer roadworks. The method was in fact designed not only to be applicable to civil engineering, but was also available as a tool for general evaluation of terrain – town and regional planning and possibly also agricultural planning.

The conventional method of locating such materials at that time was physical exploration of the areas traversing the line and vicinity of the proposed road. The investigating team would sample and test soils and potential borrow pits on and near the proposed centre line, search for likely sources of concrete sand and stone perhaps a little further afield, and possibly also investigate possible sources of water supply. In the larger country towns, the prospecting team could also call on the advice of knowledgeable local citizens and officials. Although this somewhat slow and labour-intensive method generally produced reasonable results, its success obviously depended on the experience and expertise of the team, and the possibility of missing potentially useful deposits was ever present.

SEM brought forward a different approach. Terrain was studied in detail first in the office – making use not only of the standard ordnance maps, geological maps, air photos and photogrammetric techniques then current – but later also, of course, field surveys. From their accumulated data the NIRR was then able to produce a map (SEM) which indeed resembled a geological map, but which showed topography, surface geology (including boundaries of differing soil types), location of suitable gravel sources, rock outcrops and possible sources of water supply. Furthermore, the map covered not only a narrow strip flanking the proposed road reserve, but also a broad swath of territory on either side of its proposed centre line. The SEM therefore afforded design engineers and contractors greatly improved opportunities for inspecting and locating material suitable for the various phases of construction, not necessarily adjacent to the centre line, but within reasonable and economical range of it. They would also obtain a far better picture of the nature of the terrain and environment in which construction was scheduled to take place.

The NIRR first published its findings in a paper submitted to SAICE at about the same time as the first contracts using SEM came into operation. Furthermore, a subsequent presentation by the NIRR in Pretoria, which included both theory and field experience, was received without adverse comment and apparently quite enthusiastically. The NIRR must therefore have had good reason to believe that the profession and industry would accept SEM and use it in the future on a reasonable scale.

The method was first introduced into the road-building industry during the early 1960s on contracts in the north-western Cape Province (now the Northern Cape), a developing region that was then being further opened up for agriculture, cattle raising and mining.
Consultants and contractors engaged on those and subsequent contracts used SEM with varying degrees of enthusiasm, the doubters generally avowing that suitable materials were plentiful enough and that SEM was an unnecessary luxury. Thereafter, only a few devotees in the private sector (contractors and consultants) continued to make use of SEM. However, the established system generally remained dominant, and in fact still seems to be dominant today.

In 1975, about 15 years after the launch, a symposium was held under the auspices of SAICE to discuss SEM’s progress and practical applications. Papers were presented on road construction experience, town and regional planning, land-use planning and the use of SEM in solving environmental problems. It was obvious, however, irrespective of unanimous acceptance at the symposium itself and of practical examples of the advantages SEM had brought to the various disciplines, that the method was being used on a rather limited scale by a few devotees only.

Moreover, the South African Railways authority never saw fit to test the merits of SEM, despite building a number of major long-distance lines through difficult terrain during the latter half of the 20th century. At present the system seems to be substantially unknown to the new generation of planners, consulting engineers and contractors. (It might have grown in recent times, however, into GIS, which has similar capabilities, or possibly Google Earth.)

Discussion and comment

Comparison of the aims and modus operandi of the Tanganyika Groundnut Scheme with those of the completely different SEM project is a far-fetched exercise, but it does present both a paradox and a parallel. In the former instance, an ambitious and extremely costly agricultural project in tropical Africa – under-researched and under-surveyed – failed catastrophically and had to be abandoned. In the latter instance, a competent R&D programme, which was carried out at government expense and which promised proven and advantageous applications in
the fields of construction and land-use planning, failed to raise sufficient interest or enthusiasm in the minds of most potential users. Like the Groundnut Scheme, SEM has also faded into obscurity, although not quite so dramatically and certainly not so deservedly.

The Groundnut Scheme is now an incident that serves only as a warning to super-optimists of the future. SEM is, however, worthy of resuscitation and it might therefore be useful to consider and debate the reasons for its failure to gain general acceptance:

- The NIRR failed to make efforts to monitor the progress of SEM in practice. Waiting for feedback from employers, consultants and contractors was being a little too hopeful and optimistic. The Institute should have appointed a ‘product champion’, in the manner of private enterprise, to promote the adoption of SEM and to check and report on progress and problems. In that connection, a statement from Prof Tony Ridley’s Brunel Memorial Lecture (1999) is relevant:
  “... in academic life the ‘reward system’ is such that the publication of good quality work in good quality journals becomes an end in itself. I have no problem with this, but, if we are to advance technology, we must have mechanisms which go further.”

- The NIRR paid insufficient attention in its presentations to the matter of comparative costs, i.e. SEM versus the standard method. Extra SEM costs would have included, amongst others, expert geological and photogrammetric interpretation, the production and printing of the maps (usually in colour) and, in some cases, the need for commissioning photography for areas not covered by aerial photos. Such costs, which in any event did not eliminate the need for field investigations, might have discouraged both employers and consultants from using the system, particularly in well-known terrain. It is possible, of course, that the extra cost of SEM could have played a part in the lack lustre reception of the idea, and consultants might have displayed more enthusiasm if fees had been enhanced for using it. The NIRR could have made it clear to potential users that SEM was probably an unnecessary luxury in areas or districts with well-developed road networks, where sources of acceptable material were already known and where standard methods would suffice.

- The major employing authorities, essentially the Provincial and National Roads Departments, showed little interest and seemed to leave the choice to their appointed consultants. They apparently did not instruct designers or materials engineers in the consulting firms to use SEM in appropriate circumstances, or agree to increase fees to cover its use.
Contractors, like consultants, varied in their approach. Some complained about the apparent complexity of SEM, and it is indeed possible that the researchers, more often than not engineering geologists by profession, overdid the geological detail. Contractors at that time tended to avoid the risks that might arise through the use of alternative materials, and to play safe by abiding by what was laid down in the contract. The era of encouraging or proposing alternative designs to increase competitiveness had not yet reached South Africa’s road-building fraternity. Nevertheless, the experience of a contracting company that enjoyed success with SEM is set down for the record:

On a road contract of 60 km in the Northern Cape, the documents specified that crusher-run basecourse material was to be produced either from designated solid dolerite deposits, or from dolerite boulders – the latter source abounding on surface in the adjacent Vaal River valley. Neither of the two alternatives appealed to the contractor, who was not excited by the obligation to open and develop a series of rock quarries along the length of the road, nor was he keen to collect by hand and then transport to the crushing plant great quantities of suitable boulders.

The contractor thereupon commissioned an investigation by one of the authors of SEM, an engineering geologist. His SEM in fact succeeded in identifying, in blocks of land close to the road, a series of large deposits of chert gravels, which eventually proved of sufficient quality to meet basecourse specifications, and where preliminary operations comprised only the screening-out of excess fine material before the balance was passed to the crushers. Drilling and blasting proved to be quite unnecessary, and the in situ material proved able to be excavated by conventional equipment. Quite clearly, elimination of the specified expensive preliminary stages – boulder collection or the opening up of rock quarries – worked to the contractor’s financial benefit.

From a strictly professional or ethical point of view, the contracting company should probably have published its rather happy experience. In the competitive construction world, however, that sort of public-spirited action would have been classed as rather unusual, and the contractor felt under no obligation to keep the profession or his competitors informed. In fact, wherever or whenever it was thought necessary to locate better sources of material on new contracts, the same company continued to commission SEM. Outcomes were never again quite as spectacular as the original effort, but were always worth the expense.

At present, almost half a century later, advances in satellite photography and photogrammetry might render the production of SEM more accurate, faster and possibly less costly. A good case for revival of the technique could therefore be made in view of the present resurgence of the construction industry in South Africa. The possibility of the technique being made available to the many development projects being initiated all over the African continent should also not be forgotten.
Permeable Interlocking concrete paving (PICP) is taking root in South Africa. After its introduction last year, the eighth and largest PICP project to date has recently been completed.

In this instance, PICP was used to pave a 13 000 m² car park on the west campus of the University of the Witwatersrand. The parking ground, which abuts one of Johannesburg's major thoroughfares (Empire Road) is split into two: a lower section comprising approximately 6 000 m² and an upper section covering some 7 000 m².

Designed by Arup, the car park was paved with PICP to provide on-site storm water infiltration and attenuation to avoid contributing additional run-off to the Empire Road storm water system. Emanuell Prinsloo, Director of the Property and Infrastructure Management Division of Wits, says the university opted for this technology owing to its environmental and storm water management attributes.

The Director of the Concrete Manufacturers Association (CMA), John Cairns, says that apart from preventing flooding, PICP offers environmental benefits such as filtering out pollutants and storing water for re-use, and notes that all these conditions apply in the case of the Wits project. “The threat of flooding on Empire Road will be curtailed and the water that infiltrates beneath the paved surface will replenish the underground water table,” he says.

The PICP project at Wits consisted of six material strata. Starting with the bottom layer and rising sequentially to the top, the strata are: 150 mm of recompacted in situ soil; Typar geotextile membrane manufactured by DuPont and supplied locally by DV Building; 250 mm of 37 mm quarried stone; 100 mm of 24 mm quarried stone; Inbitex membrane supplied by Concor Technicrete; 50 mm of 6,7 mm stone; and finally, 60 mm of rectangular paving blocks rated at 30 MPa which were supplied by Concor Technicrete.

The Typar membrane prevents soil from mixing with the first layer of stone and, likewise, the Inbitex membrane performs the same function. Approximately 90% of pollutants will be trapped in the upper 50 mm stone layer, and some of this runoff will water trees planted in tree rings in the car park.
There are essentially three types of PICP: full infiltration where everything goes into the soil; partial infiltration where some of the water is stored for re-use; and zero infiltration where all the water is stored for re-use. Apart from the pipes that feed the trees in the rings, the first option applies in the case of the Wits project.

The paving blocks were laid in a herringbone pattern, which, according to Concor Technicrete’s product manager Taco Voogt, is the simplest and most effective pattern for the heavy traffic conditions of a car park. Based on a European design, the pavers include vertical slots (3 mm deep and 40 mm wide) at either end through which the water infiltrates into the subbase.

Before commencement of the project, six ‘soakaway’ tests were conducted to ascertain the capacity of the soil to accept rain water. The tests established that the soil had a more-than-sufficient absorption capacity, with the lowest absorption result being 79 mm/h. When newly laid, the pavement’s absorption rate will be approximately 4 500 ℓ/m²/h.

Voogt says this rate will stabilise at 20% of the original rate after 15 years, or roughly 900 ℓ/m²/h. In other words, 0,9 m³ of water will still be absorbed into the pavement in an hour, i.e. 900 mm/h.

Weko Civils was the main contractor and as such was responsible for the earthworks and the laying of the subbase layers. The paving contractor was Mondo Meccano, a contractor member of the Concrete Manufacturers Association (CMA).
I grew up and matriculated in Queenstown (Ntabethemba, Eastern Cape). Throughout my childhood I dreamed of one day being involved in engineering, so after school I moved to Johannesburg to study civil engineering at the Germiston College, and thereafter I started studying towards the National Diploma in Civil Engineering at the Walter Sisulu University (East London Campus).

For the first half of my experiential training, I worked at the Johannesburg Roads Agency (JRA) where I was involved in municipal services such as roads and storm water development and maintenance. In the end I spent 18 months with the JRA before I moved to the private sector company Jeffares & Green Consulting Engineers, who took me on permanently and who are now assisting me financially to complete my studies at the Tshwane University of Technology.


I am involved in the Geometric Design section where I specialise in the design of roads, pavements and water services.

Membership of SAICE also keeps me up to date with the latest developments in the profession, and I enjoy being an ‘ambassador’ of this Institution.

My dream is busy coming true. I grew up in an area where the standard of infrastructure and engineering services is very poor. That is the main reason why I opted for a career in civil engineering – so that I could become a specialist who could contribute to the improvement of such situations. It is my aim to plough back into my community all the skills and knowledge that I am now acquiring, and I am looking forward to that. Part of my dream is also to one day become a registered professional technologist leading my own consulting engineering firm.
EARLY MORNING ARRIVALS at the busy Bateman office in Boksburg will often encounter Vladimir and Judith Bortnik at their desks at 5:30 in the morning. Vladimir is a senior civil engineer and Judith is a drawing checker, working in the area of mineral beneficiation. Their extraordinary background starts with their being born on the same day in the same city – 2 July 1936 in Leningrad in the Soviet Union (today St Petersburg in Russia).

Vladimir was born to Jewish parents, Jacob and Anna Bortnik. Jacob had been an orphan from Odessa in Ukraine and had progressed from school to the Politechnik Institute and thereafter to the Military Academy. At the time, entry into such prestigious institutes was considered a great privilege for a Jew, especially one from a disadvantaged background. He was even awarded a car for private use at the Academy. Jacob died in December 1941, early in the World War II, just outside Moscow in command of a tank brigade.

Judith was also born to Jewish parents, Isak and Rachel Rivkerman. Isak was a chemical engineer working for a rubber factory and served in the Russian Army’s Chemical Division during World War II. He survived, but lost all his brothers: three in battle and one of starvation in Leningrad.

Vladimir and Judith both enrolled for study at the Leningrad Institute of Railway Engineers in 1954. Vladimir recalls that he had to write five exams and obtain 23 points to gain entry to this Institute, but that the Russian candidates were only required to obtain 15 points. Although Vladimir and Judith had been in the same class, they first took notice of each other when they failed the same exam: “Resistance of Materials”.

Vladimir had been standing outside the lecturer’s office one morning staring at the ‘make-up’ test schedule when Judith arrived. They discovered that the new exam date was set for 2 July 1958 – their birthday! Since that afternoon they have been inseparable and were married on 22 January 1959.

Vladimir started his career at two of the consulting engineering firms in Leningrad, Giprosantekhprom and Giproruda. The former specialised in the design of factories for sanitary ware, whereas the latter undertook design for the iron ore industry. Judith worked at Gipronikel in Leningrad, a consulting firm for the nickel industry which had more than 5 000 staff members. They worked on projects throughout the USSR, including the challenging environment of Siberia.

After moving to Israel in 1974, they both worked as structural engineers at consulting engineering firms in Haifa until 1984. Their experience ranged from commercial to industrial projects in Iran, Nigeria and South America.

Vladimir and Judith moved to South Africa early in 1984. They both joined Iscor in Pretoria towards the end of 1989 and worked there until June 2000 – he as a senior structural engineer and she as a specialist designer and senior draughtsperson. Both consider their time at Iscor to be the...
highlight of their career. Vladimir was able to apply his particular skills and expertise to new and existing mineral-processing plants and materials-handling structures. He took extreme pride in ensuring that optimally engineered solutions were presented and enjoyed troubleshooting in dealing with corrosion, vibrations and high-temperature environments.

Vladimir first joined Bateman in 2001 and has been responsible for the design of steel and concrete structures on projects ranging from the Maandagshoek Platinum Concentrator to the Aflease Uranium Project, a hydrometallurgical plant. Judith also started working as a drawing checker at Bateman in 2001, where she has become known for her meticulous attention to detail.

Colleagues have often remarked that they are impressed by Vladimir’s work ethic, meticulous calculations and attention to detail. One engineer recalls Vladimir asking for assistance in understanding Limit States design a few years ago. He stated that “the manner in which he approached what could only have been a paradigm shift from what he was educated in (and taking account of his age) is simply remarkable”. Another colleague pointed out that Vladimir had even acquainted himself (through self-study) with dynamic analysis on the Strand 7 finite element software within the past few months.

Judith’s attention to detail also impresses her colleagues. She has made many an engineer realise that his calculations were not as comprehensive and detailed as he may have thought. Her insistence on understanding the full picture and presenting all details clearly has certainly ‘saved’ many a design.

The staff of the Cement & Concrete Institute (C&CI) said goodbye to a friend, colleague and leader – and expert in many spheres of concrete technology – when, at the end of August this year, Dr Graham Grieve retired from C&CI after 26 years’ service.

After graduating as a civil engineer in 1970 from the University of Cape Town, Graham worked for the Department Kustoderzoek, Rijkswaterstaat, in the Netherlands for a year before returning to South Africa to take up a post at the Coastal Research Unit of the CSIR in Stellenbosch.

In 1974 he started work as resident engineer on a road and bridge contract, and then moved to Pretoria in 1978 to join BS Bergman and Partners with responsibility for materials testing and the design of road projects.

He completed his BSc (Eng) (Hons) at Pretoria University in 1981 and a year later he accepted a full-time research post at the university, working towards his MEng degree, which he received in 1984.

He joined C&CI (then Portland Cement Institute) in February 1982 as Director of Laboratory Services, becoming Deputy Executive Director in 1987 and Executive Director in 1990.

In 1991 the University of the Witwatersrand awarded him a PhD for his research on the practical use of fly ash in concrete. This work also brought him full membership of the Institute of Concrete Technologists in the UK.

Still at the helm as Managing Director, he steered the PCI through its transition into a marketing organisation, along with its name change to C&CI in 1996.

“Graham’s practical approach and in-depth knowledge – coupled with his analytical mind – ensured that his contribution on many levels to the cement and concrete industry was vast and highly valued. His departure will leave a gap that will not be easy to fill. He commanded respect from all those whose paths he crossed in many diverse business environments. The number of farewell lunches, dinners and functions arranged by academics, peers, colleagues and staff attest to the fact that everyone wanted to say goodbye to him in their own special way,” said John Sheath, marketing manager of C&CI.

At a special farewell function in Midrand at the end of August, C&CI Chairman Hylton Macdonald paid tribute to Graham’s notable contribution to the growth of the Institute.

Many people retire with the intention of taking life easy, but Graham intends enrolling for a second PhD, this time in ornithology, and he and his wife, Kate, will be starting a new life on the KZN South Coast.
IN BRIEF

SBA CONSTRUCTS WASTEWATER TREATMENT WORKS AT BALLITO

A POSITIVE RECORD of Decision was given to Siza Water Company by the Department of Agriculture & Environmental Affairs at the end of 2007 for the construction of the new Sheffield wastewater treatment works, north of Ballito.

SBA (Stemele Bosch Africa), which focuses specifically on infrastructure projects and provides multi-disciplinary consulting engineering and project management services, is actively involved in the civil, mechanical and electrical components, and the instrumentation for this project.

Phase 1 of the project will handle 6.0 Ml/d of sewage. However, certain structures, as well as a modular layout, have been designed to handle the ultimate flow of 18 Ml/d. “Construction of the treatment works comes as a great relief for the developers in the Ballito North area, where this was a prerequisite for further development to take place,” says Morrell Rosseau, a director of SBA, part of the B & A Group.

The civil contract is valued at R23.4 million, with estimated costs for the mechanical and electrical components expected to amount to a further R3.6 million.

The works, which has been designed to treat effluent to achieve a quality above the normal DWAF general standard, is scheduled to be operational by December 2008.

STATE-OF-THE-ART SOLAR WATER HEATER LAUNCHED

ESKOM ADVISES THAT THE energy needed for water heating amounts to between 30% and 50% of the electricity consumed by an average household. One option is to install a solar water heater which can reduce electricity consumption for water heating by at least 70%, depending on the system selected.

As far as protecting the environment is concerned, a 150 liter solar water heater unit will replace the need for about 4.5 kWh/day of electricity, which can save an estimated two tons of carbon emissions per household per year. If just 10% of South African households used solar water heating, the reduction in carbon dioxide emissions could add up to tens of thousands of tons of emissions. The mining industry in particular is focused on reducing energy consumption by 10% and solar heating systems are part of their power-reduction strategies.

In line with all this, Sky Power has launched an enhanced version of its home and industrial solar water heating system. It is an evacuated tube-based system, significantly more efficient than other, older technology, flat-plate systems.

“Evacuated tubes are approximately 80% efficient compared with about 40% for flat-plate collectors. Flat-plate collectors suffer performance degradation in cold ambient conditions, whereas evacuated tubes are unaffected by such conditions and can operate down to minus 20°C,” says Sky Power MD Barry Cribb.

Microprocessor-driven control units give the user complete control of the system parameters. The unit will display water temperatures at the bottom and top of the geyser, as well as the manifold temperature. It also controls the pump to ensure that optimum benefit is derived from the sun’s power. User-definable time periods can be set by which heating can be supplemented electrically if the target temperature has not been reached. This ensures that hot water is always available in the case of no sunshine.

The thermal performance of the Sky Power product has been measured by the SABS. The system has also passed all SANS 1307 tests conducted by the SABS, allowing it to be classified as hail-resistant.

INFO

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INFO

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Chlorine contact tank floor slab

Inlet works with de-gritter in the foreground

Sky Power’s tube-based solar water heater system
NEW SENSUS BULK WATER METER

SENSUS METERING SYSTEMS has unveiled a new bulk water meter which delivers higher levels of accuracy over a wider flow range. Incorporating an innovative floating rotor hub, the next-generation MeiStream Series is the first Woltman meter capable of achieving a Class C accuracy standard.

The new MeiStream Series replaces three former meter types, thanks to bearings and hydraulics of a radically new design. The base version of MeiStream combines the features of the standard WP-meter and WS-meters. It has been optimised for medium and high flow rates, but also covers the minimum flow rate of WS-meters.

Sensus Metering Systems MD Basil Bold says, “Standard bulk water meters have specific advantages and disadvantages and can lead to solutions based on compromise. However, with the latest MeiStream, water utilities and municipalities can now choose a meter that delivers an optimum solution for every application.”

The MeiStream Plus has been optimised for very low flow rates. Its measuring inserts slip perfectly into the bodies of Sensus WP-Dynamic meters, enabling customers to upgrade easily to gain the benefits of MeiStream accuracy and durability. This is a key advantage of the meter for water suppliers. Furthermore, the body length of the MeiStream allows it to be fitted into all existing installation sites of WS, WP and single-jet meters. Both versions are also pre-equipped for upgrading to automatic meter-reading (AMR) systems.

The ball-shaped rotor hub is positioned in the water stream and floats between the bearings in response to flow. The specific weight of the rotor is near zero in water and thus supports the no-friction principle, known as ‘three-dimensional rotor balancing’.

The main advantage of this ‘balancing act’ is that the rotor works without wear at very high flow rates but also starts to turn at very low flow rates. Water suppliers using the new MeiStream will benefit from extended accuracy over a longer period, as well as high wear resistance. The net effect is higher revenues as a result of the ability to measure very low flow rates.

INFO
Sensus Metering Systems
011 466 1680
HARNESSING THE WIND WITH VOITH WinDrive TECHNOLOGY

WIND ENERGY IS GAINING importance across the globe as an alternative generator of electricity both on and off shore. Voith Turbo Wind GmbH & Co KG’s dynamic mechatronic system, WinDrive, is an innovative and cost-effective solution for wind energy.

Established in January 2007 and with its headquarters in Heidenheim/Brenz, Voith Turbo Wind focuses on the development, design and marketing of WinDrive technology. In addition, the company is active in the development and implementation of concepts in the field of other renewable energy sources, such as wave energy and hydroelectric power.

The need to generate multi-megawatt power with wind turbines presented the technological challenge of finding reliable, efficient wind turbines to satisfy all power grid criteria in compliance with power plant standards. The current concepts using frequency converter technology, usually coupled with mechanical gear drives, do not meet all the necessary requirements.

WinDrive employs proven, time-tested power plant technologies for wind turbines, allowing wind farms to generate electricity that is equal in quality to that generated by conventional power plants. Obviously, the system also offers a sustainable solution to replacing the world’s rapidly diminishing fossil fuels, thus playing a role in reducing the impact of carbon dioxide emissions on the atmosphere. Increasing raw material costs are another factor that will force the global move towards renewable energy sources and in Voith Turbo’s opinion this will undoubtedly result in a massive demand for this technology in the next 20 years.

Martin Darrington, the Director (Industry) of Voith Turbo South Africa, explains: “Voith Turbo’s innovative, technologically advanced, continuously developing mechatronic system, WinDrive, does not require the use of frequency converter technology in wind turbines, which considerably reduces downtime and substantially increases reliability.” The introduction of WinDrive also means that wind turbines are becoming more readily available and operating and maintenance costs have been drastically reduced. WinDrive’s increase in size is less than proportional to its output power, translating into considerable weight savings in the nacelles and thus the sizes of the associated towers and foundations for multi-megawatt systems.

The company believes that the uniqueness of the WinDrive concept and its associated benefits place it in a class of its own in the alternative energy industry. “WinDrive is the first and only technology that employs the time-proven system components used in conventional fossil fuel power plants and thus represents a significant contribution to solving the primary challenge associated with future developments – the stability of the power grid.”

The system’s time-tested synchronous generators cope smoothly with various requirements such as reactive power (VAr) compensation or grid stabilisation in the event of a short circuit. By eliminating the frequency converter and step-up transformers, the complexity of the wind turbines is reduced significantly, decreasing the probability of failure and downtime, and increasing reliability by more than 30%.

WinDrive is designed for variable-speed operation and the wind rotor can be operated at different speeds, i.e. the aerodynamic optimum for the rotor. Synchronous generators permit operation at the medium voltage level, without the need for additional components, and wind farm efficiency is increased significantly.

WinDrive’s response times are in the millisecond range, which considerably lowers the load in the drive-train under dynamic load conditions. A direct result of this lower load is a longer service life for the electricity-conducting assemblies.

The mechatronic system is a single component and, since it is approximately 2 m long by 1.5 m in diameter, shipping and transportation pose no major challenges. Installation is easily done on site by local technicians who simply need to follow the easy-to-understand interfaces with the drive-train and generator.

WinDrive technology can be installed and operated at diverse locations and wind turbines have already demonstrated the suitability of their components for both on-shore and off shore operation. WinDrive performs efficiently at altitudes of up to more than 4 000 m above sea level and connection to weak energy grids is easily handled. In addition, WinDrive can be employed to increase efficiency in hydroelectric power stations where water-powered turbines operate at variable speeds. A pilot project currently under way in Germany will be completed in 2008.

The initial financial outlay is moderate because, by incorporating WinDrive technology, the maximum operating loads in the drive-train are reduced. In large systems this translates into material savings of up to 20% for the tower and foundation (steel and cement), while hundreds of tons of material can be saved on each wind turbine.

The unique know-how of Voith Turbo Wind GmbH & Co KG is protected by a basic patent and four subpatent applications filed and granted worldwide (PCT WO 2004/088132).

SINGAPORE’S FIRST INTERNATIONAL WATER WEEK A HUGE SUCCESS

THE SINGAPORE INTERNATIONAL Water Week is a new global platform for water solutions. It brings together policy-makers, industry leaders, experts and practitioners to address challenges, showcase technologies, discover opportunities and celebrate achievements in the water world.

The theme of the inaugural Water Week, held from 23 to 27 June 2008 in Singapore, was Sustainable Water Solutions for Cities and the event attracted some 8 500 delegates and trade visitors. The annual event features the Water Leaders Summit, Water Convention, Water Expo, Business Forums and the Water Festival, as well as the presentation of the Lee Kuan Yew Water Prize for innovative contributions in solving the world’s water problems. The first winner of this prestigious international award was Dr Andrew Benedek, a Canadian researcher and successful technopreneur, who pioneered the development of low-pressure membranes which made it possible to derive drinking water from even
highly polluted sources, and at a lower cost. Dr Benedek delivered the Singapore Water Lecture at the Convention.

During the Water Week governments, water utilities and water companies signed 27 agreements totalling more than US$270 million. In addition, a water fund was launched to attract US$320 million in investments in Asian water projects. This global event for the water industry also saw governments and international organisations announcing significant initiatives to prioritise water investments and research.

Also profiled during the Water Week was a water reclamation project, called NEWater, pioneered by Singapore and introduced in 2003. In the NEWater project water is treated and purified with state-of-the-art membrane technologies involving microfiltration, reverse osmosis and ultraviolet disinfection. The result is an ultra-clean product that has been vetted by more than 30,000 scientific tests, surpassing even the World Health Organization’s standards for drinking water.

NEWater recently received an award as ‘Environmental Contribution of the Year’ at the Global Water Awards 2008. This prestigious award bears testimony to NEWater’s success as a viable and sustainable source of water. At present, there are four NEWater plants, which meet 15% of Singapore’s water needs. There are plans to further boost production to 30% by building a fifth plant.

In a speech on 25 June at the Water Leaders Summit, Professor Tommy Koh, Singapore’s Ambassador-at-Large and the Chairman of the Asia-Pacific Water Forum Governing Council, said: “Water is essential for life. There are over 1 billion people in the world, 700 million in Asia alone, who do not have access to safe drinking water. The time has come for us to recognise people’s access to safe drinking water and to sustainable sanitation as a human right.”

Summing up the conclusions of the Water Leaders Summit, Professor Koh said that participants had shared a common vision to “make our cities sustainable, vibrant and liveable. Cities should strive for a number of common goals, among them safe drinking water, sustainable sanitation, clean air, a good living environment and the efficient use of natural resources, including water and energy…”

The proceedings of the Water Leaders Summit were presented at the World Water Week in Stockholm in August and will also be available at the World Water Forum in Turkey in March 2009.

NEW URBAN DEVELOPMENTS ON THE NORTH COAST

THE SEATON DELAVAL ESTATE IS South Africa’s most exclusive equestrian real estate investment on the KwaZulu-Natal North Coast. This high-profile project complements the modern Natal-style architecture and offers expansive freehold plots of approximately 10,000 m² each. The venture, which started in October 2006, accommodates 31 erven in the Equestrian Estate, strategically built on different levels to ensure maximum privacy, as well as approximately 500 high-end residential sites with both inland and sea views and eight cluster home sites allowing for 400 units.

The estate boasts world-class facilities for equestrian enthusiasts and includes Olympic standard dressage and show-jumping arenas, two international-standard polo fields, polo cross fields and 12 stable barns providing sufficient accommodation for 120 resident horses. According to UWP Consulting Engineering Technologist Jean-Paul van der Linde, the multi-disciplinary project proved to be a challenge.
from the very beginning because the client, Amber Mountain, had very specific design requirements. This prominent estate demanded a high standard of quality finishes with unmistakable exclusivity. Everything from roads and sewer design to water infrastructure design had unique features. The project also made provision for a landscaping team to ensure that the grounds were in perfect condition, as well as an irrigation specialist to maintain vegetation.

Jean-Paul is an avid user of Civil Designer and has used the locally developed infrastructure design software with great success on all his projects. Civil Designer was used to design various dams throughout the estate for recreational and irrational use, and was instrumental in delivering the final design result. They are also quite fortunate to have a reciprocal arrangement in place to receive the recycled grey water from the new waste water treatment works being constructed to service the burgeoning population in the area. This recycled water will be pumped from the treatment works into the irrigation storage dams on the estate and will be sufficient to accommodate the entire irrigation needs of the development.

An interesting aspect of the project was the roads design which had unique specifications. The roads within the estate had to conform to the client’s requirement for concrete brick paving. A special kerb therefore had to be designed to complement the look and to add to the estate’s overall aesthetic appeal. Civil Designer was used during the earthwork volume calculations which had to be closely monitored. The project resulted in the movement of approximately 250 000 cubic metres of earth for the construction of the polo fields.

A second urban development project about which Jean-Paul is equally enthusiastic is the Woodmead development initiative. The Woodmead Estate consists of approximately 350 ha of land at Shakaskraal just inland of Salt Rock on the KwaZulu-Natal North Coast and is considered to be the largest South African middle-income housing development of its kind. It is situated between the existing townships of Nkobongo in the south and Etete in the north, while the eastern boundary is defined by the P2 provincial road between Shakaskraal and KwaDukuza.

The Woodmead Estate consists of approximately 3 500 residential sites, which include cluster developments and individual erven ranging in size from 400 m² to 600 m², a commercial centre, a business/light industrial zone, and educational and institutional sites. The civil works alone are expected to cost around R140 million and will include the construction of bulk water and sanitation services, as well as roads and storm water reticulation. Approximately 40 km of roads will be constructed, varying from bus routes and collector roads to access courts. The current provincial road will also be widened to accommodate four lanes throughout the length of the site, with various pedestrian walkways provided. About 50 km of sewer, 40 km of water and 30 km of storm water piping for services will be installed once all the construction phases have been completed.

The residential development, which will commence in November 2008, is aimed at middle-income individuals and is expected to enjoy a rapid take-up as there is currently an acute shortage of such residential land for sale on the North Coast. According to Jean-Paul, UWP Consulting Engineers are actively engaged in a variety of urban and rural development projects. It is therefore encouraging to see high-profile projects such as the Seaton Delaval Equestrian Estate and the Woodmead development initiative enjoying top priority with consulting engineers.
SAICE History and Heritage Panel

THE SAICE HISTORY and Heritage Panel was formed some two years ago in response to a clear call to promote this activity in the Institution. In the past various members have collected bits of information about South African engineering history, but the efforts were uncoordinated, unrecognised and usually unpublished. Probably the greatest impetus to put things on a sounder footing came from Graham Ross’s hugely successful book, *The Romance of Cape Mountain Passes*, which seized the imagination of the general public when it was published in 2003 and has been reprinted several times. Not only did it record the great deeds of pioneer engineers, but it increased awareness and raised the profile of the profession generally. Clearly H&H was not merely an excuse for a trip into nostalgia, but a vibrant tool for promoting SAICE and the civil engineer.

Our major sister institutions have already recognised the fact. The London ICE has a very active section known as PHEW (Panel for Historic Engineering Works) which meets regularly at venues around the United Kingdom, publishes its own newsletter, and in particular promotes the identification, recognition and preservation of worthy historic engineering projects. At ASCE the H&H group runs the “Historic Engineering Landmarks” awards – SAICE has fortunately become part of this initiative by gaining such recognition for the Woodhead Dam (see main feature elsewhere in this magazine).

The SAICE H&H Panel has begun operating in the following areas:

- Assembling a database of researchers, writers and other interested persons – who may or may not be engineers or SAICE Members – who are active in the field of Southern African engineering history.
- Assembling a database of books, articles, research documents and visual presentations about Southern African engineering history which can assist researchers (and avoid duplication of effort). This will lead to a small collection of such works (including unpublished monographs) in a library at SAICE House.
- Assembling a database of historic engineering works which are worthy of recognition and preservation, and recording their history. Eventually it is hoped that we can institute a system of National Landmark Awards, similar to the ASCE initiative, as well of course as gaining further ASCE awards.
- Recording biographies of prominent engineers and their achievements. The “Past Masters” series in the magazine is the start of this initiative, and has been well received; we trust it will continue for an extended period. Panel members have also contributed to the recently published “ICE Biographical Dictionary of Engineers who practised between 1820 and 1880” (and are looking forward with some trepidation to participating in the next volume).
- Arranging for talks and lectures to local cultural organisations such as historical societies, Probus clubs and “Universities of the Third Age”, which are always on the lookout for interesting speakers. The Western Cape has been particularly active in this area, and has among other activities contributed two series of very well received lectures to the UCT Summer School.

Ultimately of course, the Panel looks to SAICE to contribute modest amounts of funding towards the promotion of research, publication of documents and the celebration of awards – we feel that such expenditure will be well spent.

Although the Panel has been pleasantly surprised by the number of people who are actively involved in historical engineering research, we still need members who are prepared to spend a little time in assisting with our efforts. We would like representatives in each of the major regions to keep the panel aware of opportunities and initiatives in their area. Deadlines are fairly relaxed, so this is an ideal hobby for the busy and the not-so-busy! If you have carried out any historical research, however informal, or know of somebody so occupied, or would otherwise like to devote a little time to this very rewarding pastime, contact the current chairman of the H&H Panel, Tony Murray (asmurray@iafrica.com) or Marie Ashpole, the administrative officer at SAICE National Office (mashpole@saice.org.za).
Nail-biting FUN!

The BKS-SAICE International Bridge Building Competition 2008 started off with the ‘Amazing Mystery Ghost Bus Tour’ after registration on the evening of 28 August. The learners were returned safely to the venue, St Alban’s College in Pretoria, to prepare for the gruelling Bridge Building the following day.

On the morning of 29 August the learners were given a motivational briefing by Don Duffield, a teacher at St Albans, and then set off to build their bridges. The 18 teams, including a team from Namibia and Zimbabwe, completed their masterpieces by 15:30. They then left their bridges to dry, and returned later that evening to test their work.

The atmosphere was exhilarating as bridge after bridge was loaded with weights, and tested to destruction. Our heartiest congratulations go to St Johns College from Zimbabwe whose bridge scored the highest for the second consecutive year. (Please refer to score sheet on next page for detailed results.)

Thank you to our sponsors, without whose input this competition could never have taken place, the participating teams, SAICE branches and supporters, and to all teachers and parents who share an interest in the competition. We hope to see you all again next year!

For more information and downloads, visit our website: http://www.civils.org.za/EventsAwards/BridgeBuildingCompetition/tabid/122/Default.aspx
Or contact Zina Girald at SAICE National Office: +27 (0)11 805 5947 or zgirald@saice.org.za
### Nail-biting FUN!

1. **Winner:** St John’s College, Zimbabwe  
   From left to right: Kabelo Serutle (BKS), Nick Salthouse, Joe Norton, Luke du Toit, Robin Powles (teacher)

2. **First runner up:** Bellville Technical High School  
   From left to right: Christopher Pio, Marius Norman, Pierre Roux

3. **Second runner up:** Domino Servite High School  
   From left to right: Kabelo Serutle (BKS), Gabriel Khwela, Mxolisi Mthembu, Cornelius Grobler

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<th>(1) School</th>
<th>(2) Aesthetics</th>
<th>(3) Mass of bridge (g)</th>
<th>(4) Load carried (kg)</th>
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Nail-biting FUN!
Nail-biting FUN!
SAICE 2008/9 essay topics for professional registration

THE CURRENT PROCESS of registration with the Engineering Council of South Africa (ECSA) was implemented in January 1998. The ECSA “Discipline-Specific Guidelines for Civil Engineering” of February 2003, Clause 6.5, indicate that two essays will have to be written by candidates:

1. The first essay will be on one of two technical subjects set by the reviewers in the context of the training report and the interview.
2. The second essay will be on one of two topics selected by the interviewers from a list published in advance by SAICE.

Guidance notes for the assessment of essays are set out in the Guidelines for Professional Registration of Civil Engineers, available from SAICE: dhermanus@saice.org.za.

The topics for the second essay for 2008/9 are listed below, and have been approved by the ECSA Professional Advisory Committee on Civil Engineering:

1. Referring to your own experience, discuss the way in which the resources required for either a design project or a construction contract should be organized and managed in order to ensure that technical objectives are met and that work is completed on time and within budget.
2. Discuss the most significant influences, attitudes and strategic issues relevant to the total project cycle, i.e. planning, design, construction and maintenance.
3. In projects for developing countries emphasis is often placed on the need for transfer of technology. How can this best be achieved in practice?
4. Discuss the importance of environmental regulations on the design, documentation and construction of civil engineering projects. Use your own experiences to illustrate your argument.
5. Although failures may be a disaster for the individuals concerned, many have led to advances in theory, design and construction methods. Discuss how failures should be dealt with so as to ensure the maximum benefit to society and the engineering community.
6. Discuss the opportunities and threats inherent in industrial and infrastructure projects which impact on local communities and the role civil engineers can play in delivering value to society through their involvement in such projects. Use your own experience where appropriate.
7. Describe the planning necessary for and the difficulties inherent in (and how they can be overcome) the construction of a major civil engineering works, with particular reference to quality control and quality assurance. Use your own experience where appropriate.
8. Describe how you have implemented health and safety legislation on the projects you have worked on, and detail what opportunities you think there are for improving health and safety performance.
9. Discuss the principle of whole life asset management with specific respect to municipal infrastructure, using a single service to illustrate your argument.
10. Risk is inherent in most civil engineering work. Discuss the ways in which such risks can affect the employer and the contractor, and how they can influence the form of contract and the contract price.
11. “The estimation of costs of schemes and their budgetary control is one of the key functions of the engineer.” Discuss how engineers should be trained to fulfil this function in design and construction.
12. Identify the areas in which disagreement between a Resident Engineer’s staff and the Contractor’s staff may develop. How can good relations be achieved between these parties? Illustrate where possible from your own experience.
13. Describe the authority of the Engineer to delegate decisions to the Engineer’s Representative...
under the General Conditions of Contract (GCC) 2004. In what circumstances could an Engineer vary the level of delegation during the construction period?

14. Discuss how the application of ethics in civil engineering projects or contracts should be regulated in order to ensure that the negative impact of corruption and similar practices are eliminated or at least minimised.

15. Discuss the role that the civil engineering profession has to play with respect to poverty alleviation.

16. Discuss the future of transport in South Africa in the context of higher fuel prices, global warming and environmental factors. Consider both rural and urban situations.

17. Discuss the impact the Environmental Conservation Act has on the planning, design and construction of a civil engineering project.

Call for Reviewers

SAICE has been conducting Professional Reviews on behalf of ECSA for a number of years. Recently a few of our reviewers retired, however, and SAICE now urgently needs to recruit more reviewers to assist with the reviewing process. The SAICE Education and Training Panel therefore requests members who are interested to contact Dawn Hermanus for an application form. Dawn’s contact details are as follows:

E: dhermanus@saice.org.za
T: 011 805 5947/8
F: 011 805 5971
## SAICE Training Calendar 2009

Contact SAICE on telephone 011 805–5947/8

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PLEASE NOTE THAT COURSE DATES ARE SUBJECT TO CHANGE
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KBY = Kimberley // SCD = Secunda // RUS = Rustenburg // PLK = Polokwane // NEL = Nelspruit // GEO = George // RCB = Richards Bay
THE UNIVERSITY of Stellenbosch recently re-established its student chapter with the goal of getting students involved in SAICE activities.

The committee is planning a minimum of two talks per term at the university. The first talk was held on 9 May when Tobie Louw from Africon addressed the students on what the modern civil engineer should be like. It was also an opportunity for Africon to market their company under students and to recruit students for bursaries. Companies wishing to address civil engineering students at the University of Stellenbosch should contact the chairman of the student chapter, Pierre van der Spuy, at 14512661@sun.ac.za or at 083 572 8393.

The student chapter hopes to persuade speakers who address members of the Western Cape Branch at meetings in Cape Town to also present their talks in Stellenbosch. As this will be advertised in the SAICE newsletter, the committee hopes to attract working members who reside in Stellenbosch, Paarl, Somerset West, Strand and Gordons Bay who have to travel far to attend Branch talks in Cape Town.

The committee has also arranged for ten students from Stellenbosch and ten students from UCT to attend Fischer Fixing Systems’ Engineer’s Seminar during September at Canal Walk. Forthcoming attractions include talks on women in engineering, civil engineering and the law, as well as a talk on the Construction Charter.