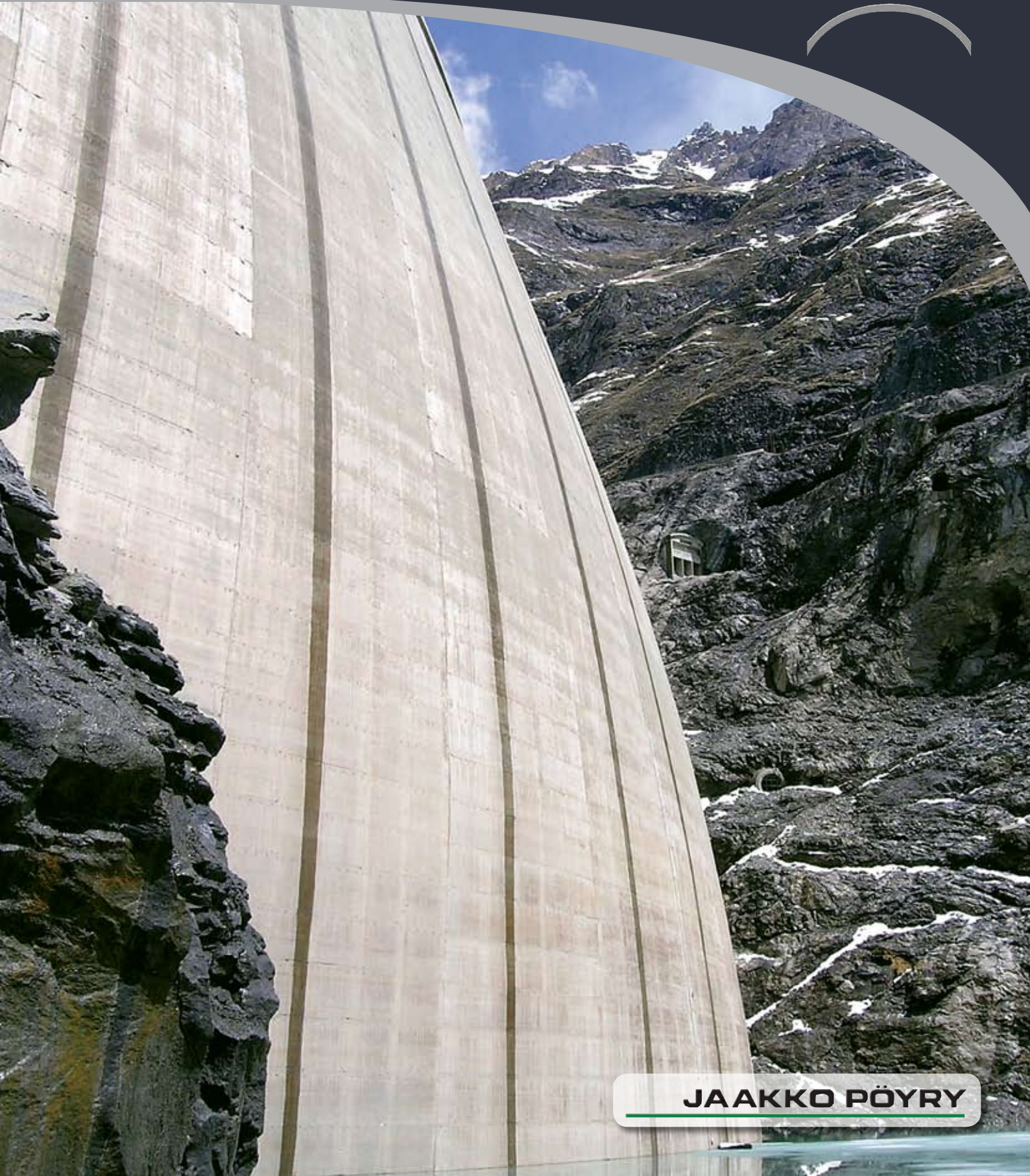


Civil Engineering

Siviele Ingenieurswese

November/December 2005 Vol 13 No 11

SAISI SAICE



JAAKKO PÖYRY



ON THE COVER

The Mauvoisin arch dam on the River Drance in the southern part of Switzerland is, at 252,5 m, the second highest arch dam in the world. The total installed hydro-power capacity is 900 MW. The design and engineering of the dam was done by the Jaakko Pöyry group's energy division, Electrowatt (see article on page 12)



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From All at SAICE

INFORMATION TECHNOLOGY

Communication technologies for civil engineers

In civil engineering projects many people collaborate in a project team. Often this team is spread over several physical locations and maybe even different countries across the world. The need for communication for voice as well as data has become of paramount importance. In this article Peter Webb reviews current communication technologies

THE NEED FOR people to communicate across distance has been in existence for many hundreds of years. Ever since Alexander Graham Bell invented the telephone, the ease with which people could communicate has become easier. What was regarded at the time as 'unnecessary' quickly spread throughout the world, and the telephone has become tightly integrated into everyday life and business.

The problem with the telephone is that rapid deployment of a system is hampered by the fact that cables have to be laid. This process is expensive.

The advent of mobile telephones (cell phones) 25 years ago offered release from the hampering effect of cables. Once sufficient infrastructure backbone had been created, cell phones became available to all who could afford them. In South Africa it was originally believed that there would be a demand ceiling of about two million subscribers, but this has been surpassed two- to threefold and is still rising.

About the same time that mobile phones were starting to proliferate, access to information on the World Wide Web (www) began to become popular. In addition, people were beginning to communicate by electronic mail (e-mail). Sharing information became practically a way of life and has become a necessity during the lifecycle of any civil engineering project.

CURRENT COMMUNICATION METHODS

Some of the communication methods that are widely used are:

- Telephone
- Fax
- E-mail
- The Internet
- Intranet/extranet
- Video/telephone conferencing

Telephone

The word 'telephone' is made up of two Greek words: *tele* meaning remote, and *phone* meaning voice. The telephone is the terminal equipment of the telephone network. It is connected to the telephone exchanges of the network by cables that normally consist of two copper wires. Exchanges contain complex switches that are able to connect one telephone to another.

Fax

A fax machine works by scanning the document to be sent with a laser and encoding this information into digital language via a modem incorporated in the machine. This is then transmitted over the telephone network to the receiving fax machine, which decodes the data and reproduces the documents. The cost of sending a fax depends on the duration of the call and the time of day that the call is made.

E-mail

Electronic mail (e-mail) sends data and messages to other users anywhere in the world. While you could possibly do this with a postal service, e-mail has the following advantages:

- **Speed** Data can be sent in a matter of seconds to practically any destination in the world.
- **Economy** It is much cheaper to send large documents via e-mail than by post. In addition, data can be compressed.
- **Convenience** Transmissions can be sent while you are at your desk.
- **Security** Passwords can be used to restrict unauthorised access.
- The **same message** may be sent to a pre-determined group of people.
- An **electronic address book** can be kept.

- **Data files, pictures, sound and video** may be attached to e-mail messages.

The Internet

The Internet is probably best described as the 'network of networks'. It provides a meeting point for millions of individuals and organisations. It is a collection of interconnected computer networks that span the globe, linked by telecommunication systems. Users can gain access to vast amounts of information on every conceivable topic, as well as e-mail facilities.

Connection to the Internet can be made via a LAN (local area network) at the office or a dial-up service using a modem and a PC. Different computers and systems can link together because they use the same communication protocols to move data around. These are called IP (Internet protocol) and TCP (transmission control protocol).

IP is used to address and deliver data to the correct destination. The data is split into small 'packets' for transmission across the network. Each packet is marked by the IP with its source address and destination address. Transmission of packets is taken care of by computers called routers. Routers ascertain the best route to send the packet to its destination. The packets are sent from router to router until they reach their final destination.

TCP breaks down the data into packets for transmission. Each chunk of information is labelled so that it can be checked at the destination and reassembled in the correct order. If any packets are missing or corrupted in transit, the receiving TCP program sends a request to the source system to re-send the packet. When all packets have arrived, the original file is rebuilt and saved onto the receiver's hard drive.

Intranet

An intranet is a private company-wide web-site that is usually only accessible to authorised members of that organisation. Intranets make the dissemination of information cost-effective. Up-to-the-minute information about important events can be delivered directly to the desktops of every member of the organisation.

A key benefit of an intranet is that all applications have a common front-end: the web browser. This reduces costs, and the support overhead of managing the intranet. All information can be gleaned from just one interface.

Extranet

Some organisations are extending some of the information that is normally stored on their intranet to an extranet. This allows their business partners to have access to selected information. Extranets provide support for communications, collaboration and the use of specific applications between organisations for business-to business information sharing and commerce.

Tele/video conferencing

Conferencing provides participants with the types of communication that they would expect to find in a traditional meeting. Modern communications mean that the people taking part no longer need to be in the same room, or even in the same country. Audio-conferencing links people in different locations into the same telephone conversation. Video-conferencing enables interactive two-way video and audio communications. Data conferencing allows the simultaneous sharing of data, file and applications between two or more remote computers. Conferencing as several advantages:

- Travel costs are reduced.
- Travel time is reduced.
- All participants receive the same information at the same time.
- People can exchange ideas spontaneously and interaction is immediate.

CURRENT COMMUNICATION TECHNOLOGIES

These include:

- Telephone networks
- Wired networks: local area networks (LAN) and wide area networks (WAN)
- Mobile (cellular) phone networks
- Satellite communications

Analogue and digital transmission

Analogue signals vary continually in amplitude and frequency, which tends to lower the quality of the signal transmitted owing to noise addition and loss of strength (attenuation). To overcome these problems, the signal can be amplified. However, by amplifying the signal, not only is the original signal boosted, but the noise as well. The fundamental problem with analogue transmission is that once noise is present,

it cannot be completely removed. For this reason analogue telephone systems are being replaced by digital telephone systems.

Today the preferred method of information transmission is digital transmission. Digital signals do not vary and have only two amplitudes, on or off. The advantage of digital transmission is that we can obtain an exact copy of the input signal at its output, with the result that the signal is much cleaner.

Modems

The telephone system was originally designed for speech, which was transmitted in analogue form. In order to send digital data via a telephone line, it must first be converted to digital form and then converted back to analogue form at the other end of the transmission. This is achieved by pieces of equipment known as modems, which are situated at either end of the line. On high-speed links, modems would not be used because the networks are already designed to accept high-speed digital communications.

Routers, multiplexers and terminal adapters

A terminal adapter is a device that connects your computer to a digital line (ISDN), allowing you to communicate over the Internet, by fax or by phone. You can also install an ISDN card into a PC to gain access to the digital network.

A router is usually used on more sophisticated networks. Routers have the ability to connect different physically and logically organised networks. Routers are capable of calculating the 'optimal route', and are generally more aware of the network because of the more sophisticated processing that can be carried out inside them.

A multiplexer is a device that can send several signals over a single line. The signals are then separated at the other end of the line. Multiplexers are efficient in terms of data compression, error correction and transmission speed.

Bandwidth

Bandwidth is a physical limitation of any communication system, caused by the range of frequencies that can be transmitted and received over a communication link. The lower the bandwidth of the system, the cheaper it is to produce, but the rate at which data can be transmitted is slower.

Traffic on a freeway in rush hour is analogous to bandwidth. If too many vehicles try to travel between two points, a traffic jam ensues and the traffic takes longer to travel between the two points. On a computer network, the traffic would be bytes of data, and computers trying to send the data would receive signals that the network was busy. They would have to wait for a free slot before they could send more data. If lots of

computers are trying to send and receive data at the same time, there will be many clashes and the effective data transfer rate for each computer will be very small. With higher bandwidth the system would cope much better. This is similar to having more lanes on the freeway – more vehicles can travel at the same time.

Utilisation can be expressed in terms of the number of vehicles travelling down the freeway. There comes a point where the cars are bumper to bumper and the speed is extremely slow. Speed drops off significantly at a certain point as more vehicles use the freeway. On an Ethernet network, this point is between 50 % and 70 % utilisation. Above this, data transfer performance drops off rapidly.

It is important to understand the bandwidth limitations of different network connections when using a LAN and a WAN. For example, a connection that has a small bandwidth may be quite sufficient for simple e-mail (no large attachments), but you would need a far higher bandwidth if you wanted to use video-conferencing, as there is a vast increase in the amount of information to be transmitted.

Dial-up networking

Connection is via a public switched telephone network (PSTN) or ISDN (integrated services digital network), by connecting a PC or another device to a network or the Internet using a modem (to PSTN) or a terminal adapter (to ISDN). Another form of connection is with an asymmetric digital subscriber line (ADSL).

PSTN

PSTN is normally a voice-oriented public telephone network that is owned by large commercial operators or government owned, such as Telkom in South Africa. Generally these networks are digital except for the final link from the exchange to the user.

ISDN

ISDN makes that final leg of the network, a digital connection. It is a quick way of sending data via a digital phone line. There are various categories of ISDN, each with varying data transmission rates, such as 64 Kbps (kilobits per second) and 128 Kbps.

In addition to raw transmission speed, ISDN calls can be set up much faster than analogue data calls. An analogue modem can take up to a minute to carry out the 'handshaking' procedure, whereas an ISDN connection, being fully digital, can establish a connection in about a quarter of a second.

ADSL

ADSL is a high-speed data service that turns an ordinary telephone line into a high-speed digital connection, capable of carrying data up to 512 Kbps. It transforms a pair

of twisted copper wires between a local telephone exchange and a user's telephone socket into a high-speed digital line. It is called 'asymmetric' because it moves data more quickly from the exchange to the user than from the user to the exchange. This makes it particularly useful for applications where users expect to receive more data than they transmit (such as the World Wide Web, corporate intranets, and digital audio-visual material).

ADSL works differently from ISDN. It has the potential to send and receive data at faster speeds than ISDN. The ADSL connection is an 'always on' connection, as opposed to dialling in and disconnecting when you are finished. Therefore ADSL is potentially very cost effective for business users who require moderate bandwidth.

In terms of cost, there comes a point where an ADSL connection for an office will become more cost effective than dial-up access. This is because the ADSL facility is normally charged at a fixed cost per month, whereas with dial-up access, costs are directly proportional to the time spent online.

Most ADSL service providers place a limit on the amount of data that can be downloaded in a month. In South Africa this is often 3 GB of data, but you can

arrange a higher limit with your service provider.

MOBILE PHONE NETWORKS

Some of the technologies and standards that are used for voice/data transmission across mobile phone networks are listed. But first we need to define some units of data transfer, as this is normally of primary concern to the civil engineer who wishes to use 'mobile' technology.

Data transfer rates

Data transfer rates are normally expressed in Kbps; they can also be expressed in Mbps (megabits per second). There are 8 bits to a byte, so a transfer rate of 100 Kbps is approximately equivalent to 12 KB/sec.

GSM

GSM (global system for mobile communication) is a digital mobile telephone system that is widely used in Europe and across the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephone technologies. GSM digitises and compresses data, then sends it down a channel with two other streams of data, each in its own time slot. It can operate on the 900 MHz or 1800 MHz frequency

band. GSM has become standard for mobile phone networks. Data transfer rates are up to 9 Kbps.

SMS

SMS (short message service) is a standard developed to send text messages (up to 160 characters) via GSM networks.

HSCSD

HSCSD (high speed circuit switched data) enables transfer speeds of up to 28,8 Kbps.

WAP

WAP (wireless application protocol) is a standard to access e-mail and text-based internet via GSM.

GPRS

GPRS (general packet radio system) lets mobile phones send and receive data over an Internet protocol (IP) network, at a similar speed to a standard dial-up phone line. You are able to surf the web, send and receive e-mail and download data. Transmission rates are up to 40 Kbps.

It is an 'always connected' system, sometimes known as '2nd generation'. Users are charged solely for the amount of information that they transfer (not for the time they are connected), and this is measured in

'packets'. Using this system, users can connect to the Internet.

UMTS

UMTS (universal mobile telephone service) – commonly known as '3rd generation' – is similar to GPRS. It is an 'always connected' system, with transmission rates of up to 384 Kbps. '3G' has recently been introduced in South Africa, though it is not yet available on all mobile telephone networks.

WIRELESS COMPUTER NETWORKS

'Wireless' is the cable-free technology that connects machines to one another. Wireless gives you freedom from cables without sacrificing connectivity. It effectively eliminates location and time restrictions, so an 'office' can be virtually anywhere. Devices connect with other wireless devices to provide mobile users with seamless work methods.

Wireless computer network solutions operate over shorter distances, but do offer greater transmission rates than mobile phone networks. Wireless computer networks are often connected to 'wired' networks. Three main connection methods that are used by wireless devices are listed below:

Infrared

With Infrared technology it is possible to

carry information between components via beams of light in the infrared spectrum. Infrared refers to light waves of a lower frequency than human eyes can detect. Infrared is typically used in television remote control systems. It is also used to connect some computers with peripheral devices via a standard called IrDA (infrared data association).

Infrared communications are fairly reliable and are cheap to build. However, there are drawbacks. First, infrared is a 'line of sight' technology. For example, you have to point the remote control at the television to make things happen. The second drawback is that infrared is almost always a 'one to one' technology. You can send data between your desktop and your notebook computer, but not your notebook and your PDA (personal digital assistant) at the same time.

Despite these drawbacks, interference between devices is uncommon. Because infrared transmitters and receivers have to be lined up with one another, you can make sure that a message goes only to the intended recipient, even in a room full of infrared receivers.

Infrared technology has a limited range, up to about 2 m. Transmission speeds are up to 16 Mbps.

Wireless local area network

The wireless local area network (WLAN) has a range of up to 300 m (theoretically) – although an external aerial could extend this range to several kilometres under specific conditions. Transmission rates are up to 11 Mbps (relatively slow), although rates of up to 70 Mbps are being developed. Wireless local area networks are often used to extend the range of traditional wired networks. A typical use would be to provide coverage across a construction site from a site office. Another example would be to link two buildings on a network where it would be costly to lay a network cable from one building to another. 802.11 is a wireless standard that specifies an 'over-the-air' interface using high-frequency radio waves between wireless devices. 'Wi-Fi' (wireless fidelity) is the name for 802.11 wireless network technology that indicates interoperability among 802.11 products. The IT network uses the 802.11a, 802.11b or 802.11g radio frequency rather than wires, and can enable various wireless connections to the Internet. The table below shows a comparison of the WLAN technology standards:

From the table on page 6 we note:

■ **Frequency** 802.11b uses the 2,4 GHz spectrum, which is overcrowded with devices such as cordless phones and microwave

Comparison of wireless LAN (WLAN) technology standards

WLAN technology standard	802.11a	802.11b (currently has largest user base)	802.11g
Maximum data speed	54 Mbps	11 Mbps	54 Mbps
Radio frequency	5 GHz	2.4 GHz	2,4 GHz
Range (approx.)	8 m to 24 m	Over 48 m	32 m to 48 m
Compatibility with other WLAN standards	Not compatible with 802.11b or 802.11g	802.11g	802.11b
Public access	Compatible with 802.11a hotspots. Limited availability	Compatible with 802.11b hotspots. Broadest availability	Compatible with 802.11b and 802.11g hotspots. Common availability
Interference issues	5 GHz cordless phones	Microwave ovens, 2,4 GHz cordless phones, Bluetooth	Microwave ovens, 2,4 GHz cordless phones

ovens. Even Bluetooth devices use the 2,4 GHz spectrum. 802.11a uses the less crowded 5 GHz spectrum. Though this spectrum is less crowded, the signals have a higher absorption rate and this causes them to be easily blocked by walls and objects.

■ **Range** Owing to the higher absorption rate at the 5 GHz spectrum, 802.11a devices have a shorter operating range than 802.11b. Note that the ranges given in the table are only approximate, and actual ranges on-site may vary considerably as range is affected by many factors.

■ **Data rate** 802.11a supports speeds up to

54 Mbps, as does 802.11g, while 802.11b supports speeds up to 11 Mbps. In practice, however, you should estimate on achieving about half the theoretical speeds.

■ **Compatibility** 802.11a is not compatible with the 802.11 protocol, hence 802.11a devices cannot work with existing 802.11b wireless access points. Note that if you wanted to migrate to the newer 802.11g standard, any 802.11b interface cards could access the 'g' network. This is not the case for 802.11a radio cards.

■ **Users** The 802.11a network can accommodate more users because of the increase

in radio frequency channels and increased operating bandwidth.

From a cost aspect, the components for 802.11a devices are more expensive to produce and hence their price is higher than 802.11b devices. Also, the increased number of transmitters required for an 802.11a network will drive up the cost of implementing an 802.11a network.

Wireless local area networks are starting to proliferate worldwide in places such as cafes and restaurants, hotels and airports, giving you accessibility to the information you need. Places of access are often termed 'hot-spots'. Several hotspots are available in South Africa at the main airports and certain hotels and coffee bars.

Recently Telkom (SA) launched 'T-Zone', a solution for the mobile business traveller who needs to have access to the Internet and connect to the office anywhere at any time. It is a 'hotspot' service that makes use of the 802.11b (WiFi) technology and is currently being offered free of charge during the initial trial period. During the trial it is envisaged that 100 T-Zones will be installed nation wide. Users who currently have an ADSL connection will be able to access the T-Zone and achieve potential download speeds of up to 512 Kbps and upload speeds of 256 Kbps.

Bluetooth technology

Why is it called Bluetooth? Harald Bluetooth was king of Denmark in the late tenth century. He united Denmark and part of Norway into a single kingdom. The name indicates how important companies from the Baltic region (Denmark, Sweden, Norway and Finland) are to the communications industry.

Bluetooth is a standard developed by a group of electronics manufacturers that allows any sort of electronic equipment (such as computers, cell phones, keyboards and headphones) to make its own connections without the use of wires or direct action from a user. Bluetooth works on two levels:

- Bluetooth is a radio-frequency standard.
- Products have to agree on when bits are sent, how many are sent at one time, and how the components in a conversation can be sure that the message that was sent is the same as the message that was received.

Bluetooth is intended to overcome the problems that come with infrared and cable synchronising systems. The manufacturers have developed a specification for a very small radio module to be built into a computer, telephone, keyboard, etc. From the user's point of view, there are three important features of Bluetooth:

- It is wireless; you do not have to worry about connecting cables, which makes it easier when you are travelling and designing your office layout.
- It is relatively inexpensive.
- It does not require user interaction for connectivity; Bluetooth does not require you to do anything special to make it work. The devices simply find one another and strike up a conversation.

Bluetooth communicates at a frequency of 2,45 GHz, which has been set aside by international agreement for the use of industrial, scientific and medical devices (ISM).

Although several pieces of hardware could be communicating using Bluetooth technology, they can avoid interfering with one another by sending out very weak signals of less than 1 milliwatt (mW). By comparison, the most powerful cell phones can transmit a signal of 3 watts (W).

Owing to the low output power, Bluetooth technology has a range of approximately 10 m. Normal brick walls, such as in a house, will usually allow the passage of a signal, but reinforced concrete will tend to absorb the signal (largely because of the reinforcing bars).

Transmission speeds are up to 1 Mbps. Handshaking information can take up to 20 % of this capacity. This technology is generally used to replace peripheral cabling. Bluetooth is used for example to connect a PC to a printer; a PC to a digital camera; or a PC to a LAN.

SATELLITE COMMUNICATIONS

While cellular telephony has been adopted

relatively broadly in many countries in Africa, in many remote regions this service is not yet available because it is not currently economically viable. As a result, satellite telephony remains the only option for those who need to work and communicate outside the cellular grid. One advantage of satellite technology is that it is available practically anywhere, and you do not have to rely on cellular grid coverage.

Many commercial satellite systems are in operation over Africa, but only a few specialise in mobile voice connectivity. In addition, these operators still have to obtain permission to deliver a service inside many African countries. While you can obtain some basic data services, line speed is extremely limited, and generally signals can only be received outdoors.

Inmarsat was the first commercial network. It uses four geostationary satellites 36 000 km above the earth to provide a near-complete reception footprint of the world, excluding only the polar extremes. However, the handsets are often bulky and can be as big as a laptop. Next generation Inmarsat satellites are becoming operational and will provide voice and data services at up to 432 Kbps.

Iridium also has global coverage, but uses 66 low earth orbit satellites just 700 km above the earth. Low earth orbit satellites have the advantage that delays in the signal travelling back and forth to outer space are reduced. However, phonecalls have to be handed over from satellite to satellite much more often, because each satellite is overhead for a few minutes, increasing the likelihood of calls being dropped. Data

speed is limited to 10 Kbps.

Thuraya, which started in 2000, uses a single high-altitude satellite to cover Europe, the Middle East, and north and central Africa as far south as Zambia. Data speed is limited to 9,6 Kbps, but handsets are small and light and, like the other two companies, they allow roaming on most African GSM networks.

Pricing and packages differ among service providers, but calls generally cost between US\$1 and US\$1,50 per minute. The hardware costs in the order of US\$1 000 to US\$1 500.

CONCLUSION

The communications industry is accelerating its practical use of technology. The use of cellular telephony in Africa, for both data and voice, is becoming more widespread. The expensive process of laying traditional cables is becoming less of a necessity, and the use of technology to transmit data along existing power cabling is being developed. It is expected that as wireless networks proliferate, computing devices and mobile phones will evolve into a single device.

Mobile computing devices are changing the methods and speed at which tasks are being carried out. Information can now be generated, captured, shared and revised much faster than before. It is important to manage the appropriate use of technology in order to balance cost and performance.

The evolution of technology in the area of mobile communications is progressing rapidly. The rate of adoption will increase as more and more engineers realise the benefits. ■



Looking back

From Enigma to laptop

THE HIGHLIGHT OF my professional career was my audiovisual presentation to the sixteen judges of the International Court of Justice in The Hague. The courtroom was wide to accommodate the bench of judges, but shallow. A huge video projector was hired, but it had to be placed behind the large translucent rear-projection screen. This meant that I could not use a laser pointer, as it did not reflect off the screen. I set the computer pointer to its smallest size and in trace mode so that it left a trace of arrows as I moved the mouse across the screen. With my laptop on a small table by my side, I faced the judges and controlled the whole presentation with my mouse. Fortunately all went well. I was told that this was the first audiovisual presentation to the International Court of Justice.

This application was not even remotely in the minds of the team of scientists at Bletchley Park in the United Kingdom during World War II, less than 60 years previously. The German forces had developed a machine called Enigma by the Allies, which could translate the individual letters of a message pseudo-randomly into other letters. This sequence was transmitted by radio and then decoded in the recipient's machine. The machine settings were changed each day. The Germans were confident that the code could not be broken by an analysis of the messages but they were wrong.

A team of scientists was assembled with the specific purpose of breaking the code. They developed an electronic machine that could analyse the signals at a very high rate. They eventually broke the code. Unknown to the Germans, the Allies could read messages from the German High Command issued to its generals in the field and submarines out to sea. This code-breaking machine was the world's first electronic computer. Its existence was kept a closely guarded secret for many years after the war. As a result, its development is not given its rightful place in the history of the war or the history of the development of electronic computers.

The earliest computer in the public domain was the ENIAC (Electronic Numerical Integrator and Calculator) that started oper-

ations in the USA in 1946. It was physically large, being over 30 m long, weighing about 30 to, and consuming 140 kW of electricity. It was less powerful than today's laptops. The first general purpose electronic digital computer in the UK was EDSAC (Electronic Delay Storage Automatic Calculator), which executed its first program in 1949 at Cambridge University.

IBM was the leader in developing commercial mainframe computers. In 1957 IBM developed the program language Fortran (Formula Translation). As its name indicates, it was capable of the rapid solution of mathematical formulae. Specialist programmers had to be appointed to develop the programs. Communication with the computer was via punched cards produced by teams of typists. Fortran IV became the international standard in 1966 and was widely used in the civil engineering profession from then onwards.

At that time IBM foresaw that one of the main applications of its mainframe computers would be in data storage, retrieval and analysis. They assembled a team of mathematicians to develop computer-based analytical methods. The Department of Water Affairs and Forestry was one of the first users of this equipment in South Africa. It occupied the space of three rooms with the intervening walls removed. Air-conditioning ensured constant temperature of the equipment. Hydrologists were told to use alphabetic characters sparingly for station references, as they occupied more space than numerals. Hydrological data were stored on huge reels of magnetic tape. These were the only visible moving parts as the reels rotated backwards and forwards so that the identified segment of the tape could pass across the recording/reading head. This controlled the rate of the analyses.

Professors Kemeny and Kurz of Dartmouth College developed a simplified version of Fortran called Basic (Beginners All-purpose Symbolic Instruction Code) in the 1960s. The language was easy to learn and made use of instructions resembling basic algebraic formulae by incorporating easily understood words such as LET, GOTO, READ, PRINT, IF, THEN, etc.

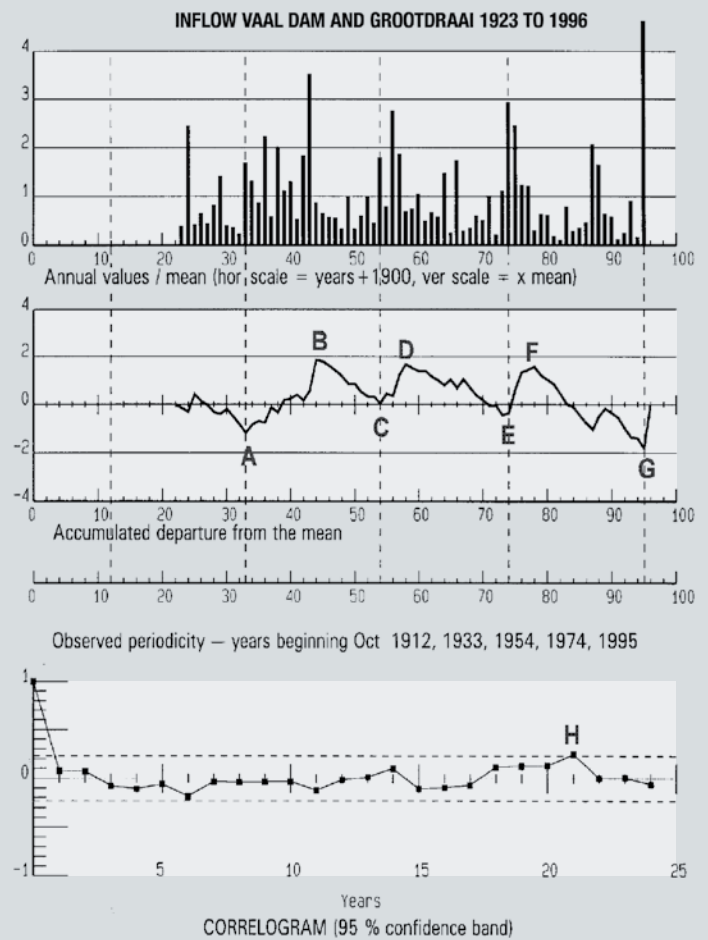
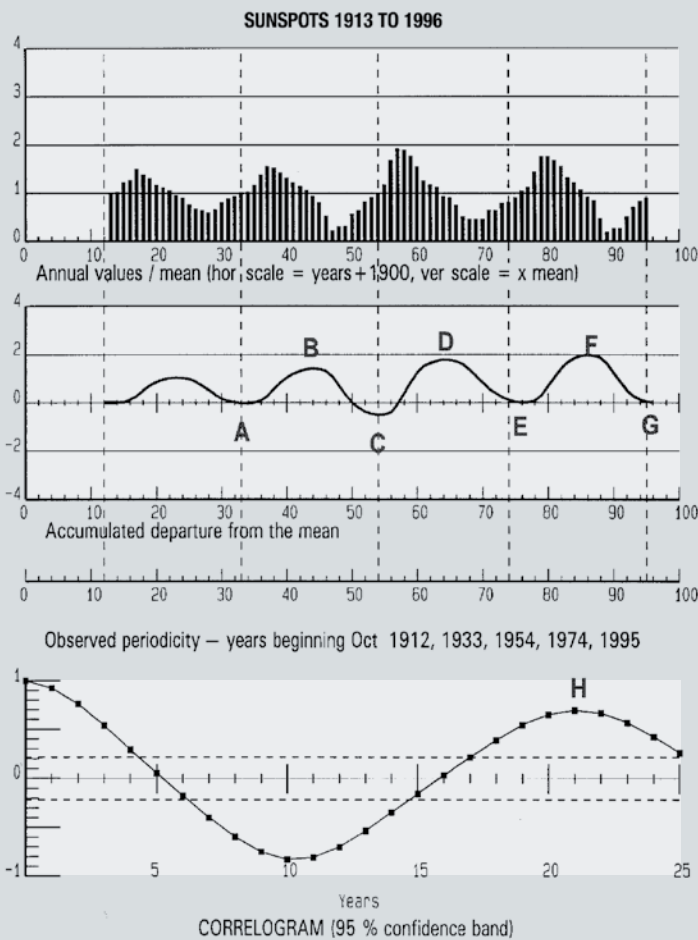
Various improved versions were developed in the following years. It remains the most used computer language. Visual Basic is the latest version in general use. (In passing, note the emphasis on the word 'visual'.)

Advanced technologies subsequently led to the development of minicomputers in the sixties that could operate in the office environment, and desktop microcomputers in the late seventies. These could be used directly by users in their own offices who could write their own programs in Basic. These are the present-day desktop or personal computers (PCs).

COMPUTER LITERACY

My first PC was a Sinclair ZX 81 that I bought in 1982. It was very small and could comfortably rest within my cupped hands. Its storage device was an off-the-shelf portable audio tape recorder. The output was a black-and-white image on the standard television set. My reason for buying a PC had nothing to do with calculations. I was a cine photography fan. Owing to the political situation in South Africa, Kodak closed down its photographic development facilities in South Africa and even prohibited the development of Kodak films from South Africa by its overseas branches. I switched to video photography and foresaw the possibility of using PCs with their TV video outputs as a means for generating titles and other interesting material. The Sinclair with its black-and-white output and limited graphics was not suitable for this purpose. Within months the BBC microcomputer became available in South Africa. I bought one and have become addicted to computer programming in Basic ever since.

The British Broadcasting Corporation (BBC) appreciated the need for developing computer literacy in the United Kingdom, especially in the schools. They financed the development of an altogether new microcomputer and advanced version of Basic to go with it. At that time the emphasis was on computer programming itself, as the availability of commercial programs was still several years away. The programming language had to be easy for children and newcomers to understand, while at the



Computer graphic showing the relationship between sunspot activity and the flows in the Vaal River

same time being capable of advanced applications. BBC user groups were formed. We held monthly meetings where we exchanged ideas and demonstrated our programming skills. There were several monthly magazines and the booksellers had shelves full of publications on computer programming and related subjects.

BBC Basic is still superior to modern computer languages in many respects. These include its simplicity in structure, its very advanced animated graphics, and the ability to generate primitive but understandable voice commands and music in Basic. Low-level, but faster assembler language algorithms, could also be incorporated in the programs. As with the Sinclair, the original version of the BBC microcomputer used audiotapes for data storage, and output to a TV screen. Separate floppy disk drives were later substituted for audiotapes. I soon started using my BBC in my work and for the first time I could brag that I was one step ahead of my own staff who still used the mainframe computer and Fortran, which I could never master.

PATTERN RECOGNITION

As with all my colleagues of the same generation, I was brought up with the use of slide rules, seven-figure log tables and sheets of graph paper. The graph paper varied from simple linear scales to log-linear, log-log, linear-probability and log-probability. The resultant plots were interpreted subjectively. If say, five pairs of

observations were plotted on linear graph paper and plotted on a straight line, we could safely conclude that the relationship was linear within the limits of the observations. If the plotted points varied about the line, our degree of confidence in the relationship was reduced but we could apply factors of safety when using the relationship in practice. We would always extrapolate beyond the limits of the observations with caution. We would boast that this was what engineering was all about. Problems arose when we described these relationships mathematically, as the mathematical equations implied a degree of certainty that was not present in the observations on which the formulation was based.

When we interpreted the graphs, we were applying the most fundamental property of human powers of evaluation – that of pattern recognition. For example, a 12 month old baby can distinguish between its feeding bottle and a can of beer. Mathematicians are unable to describe a feeding bottle in the form of mathematical relationships that an Internet colleague will immediately recognise as a baby's feeding bottle. Based on my engineering experience, when I started using my PC in practice I subconsciously continued to place greater emphasis on computer graphics than the development of mathematical relationships.

When I came to the University of Pretoria at the beginning of 1985, I brought my BBC with me and started using it for

illustrating my lectures, particularly in the field of hydrological statistics that we all have such difficulty in mastering. Fortunately there were large mobile video projectors that I could couple to my BBC. On the computational side I developed a suite of programs under the general title of 'Decision Support Systems' for flood frequency and water resource analyses. I later distributed these with my shortcourse notes.

When I arrived, there were only two PCs in the department. One was still in its box and was allocated to me. Long before I left, there was a PC in every office. More importantly, after decades of use by students, the drawing boards on which students were trained to produce two-dimensional visual images of engineering structures were replaced by rows of PCs.

All this became possible when inexpensive IBM-compatible PCs began to swamp the market. They used the Microsoft disk operating system (DOS) and Intel chips. These chips were inferior, particularly in graphics applications, to the Motorola 6502 chips used in the BBC and Apple operating systems. GW Basic was included for free in the package. It was far inferior to BBC Basic and I had to downgrade my BBC algorithms to GW Basic for applications by my students. I continued to use my BBC for my lectures and research, but I was eventually forced to switch to IBM compatibles.

Another problem was the selection of a suitable program for graphics printouts. These were inevitably crude when using dot-matrix printers, but improved con-

siderably when laserjets became available. Fortunately the Hewlett-Packard Laserjet printers up to and including Series 3 recognised HPGL commands. This was the standard used in civil engineering practice. A few years later Microsoft produced MS Basic Pro 7, the forerunner of Visual Basic and Excel. This had good graphics capability and was ideal for my studies. It has served me well to the present day.

THE FINAL CHALLENGE

It is now more than 20 years since I bought my first PC. Throughout this period I have used computer-generated graphical images on the screen and hard copies for teaching and practical applications. Since the beginning of 2001 I have worked on the most important problem of my career. South Africa's water resources are rapidly approaching the limits of exploitation. There is an urgent need for a reliable and more accurate numerical characterisation of rainfall and river flow time series, as well as the identification of the possible effects of global warming on South Africa's climate and water resources.

My conclusions, based on computer-graphic analyses of a very large hydro-meteorological database, showed that there has been a beneficial increase in

rainfall and that the postulated adverse consequences of global warming on water resources, agriculture and the natural environment were groundless. My conclusions were immediately challenged by a group of climate alarmists and environmentalists. I also encountered problems from a referee in my own profession when I submitted a paper for publication.

Of sunspots and Lord Kelvin

In 1889 R E Hutchins – a forester from Knysna and former official in the British colonial service in India – on the insistence of his colleagues published a book titled *Cycles of drought and good seasons in South Africa*. He demonstrated a predictable linkage between sunspot activity, famines in India, and floods and droughts in South Africa.

In 1892, only three years later, Lord Kelvin, in his presidential address to the Royal Society in London, maintained that the variation in solar activity was too small to account for the famines in India. This was despite a wealth of evidence showing a concurrence in time between sunspot activity and the famines. To this day, climatologists and solar physicists dismiss claims of the influence of solar activity on the earth's climate using Lord Kelvin's

argument, reinforced by their own observations of solar activity and the application of abstract process theory.

Lord Kelvin made the mistake that many scientists continue to make. He was entitled to maintain that variations in solar radiation were too small to account for the linkage between sunspot numbers and famines. He was not entitled to conclude that no linkage existed. This fundamental difference between process theory and observation theory continues to bedevil climate change science. No engineer would ever dream of ignoring evidence of a relationship based on reliable measurements on the grounds that there was no theoretical support for the view that a relationship existed.

The other opposition was from a member of my profession who refereed my paper submitted to a prominent South African scientific journal. The issue was the numerical characterisation of the properties of annual river flow sequences. I produced graphs that clearly showed a periodic behaviour that was synchronous with sunspot activity. The linkage in time was not precise but was undoubtedly present. The periodicity of 21 years was statistically significant at the 95 % level in many rainfall, river flow and flood peak records. The numerical characterisation was based on

simple arithmetic – addition, subtraction, multiplication and division.

The referee insisted that I should have used conventional statistical time series analyses. The editor agreed, and I was forced to withdraw my submission when I refused to follow this route. My referee clearly misunderstood the basics of mathematical-statistical analyses. In statistical analyses you first have to hypothesise something and then you use the analyses to determine whether or not the hypothesis holds with an acceptable degree of confidence. This is not what I was doing. I was searching for hydrologically meaningful numerical characteristics. I knew from the start that, like the mathematical description of a baby's feeding bottle, I would not be able to describe the characteristics using rigid mathematical relationships.

Eventually, after many sleepless nights and days, I was inspired to produce the computer-generated diagram (two print-outs placed side by side) reproduced on page 9. I included this diagram in my two papers published earlier this year. They survived the refereeing process.

The data were not manipulated in any way either before or during the analyses. The left half of the diagram is an analysis of the annual sunspot numbers. The right side

is that of the annual flows in the Vaal River at Vaal Dam. The data in each set were standardised by dividing by the record mean values. The standardised values were plotted in the histograms in the top panels expressed as multiples of the means. In the second panels the mean (1,0) was subtracted from each value. Some of the departures from the mean were negative. These departures were accumulated and plotted one at a time to produce the curve of the accumulated departure from the mean values. It starts and ends with zero values. The third panels are correlograms that show the degree of correlation between observations n years apart. Plots outside the bands show the presence of correlation greater than the 95 % confidence limits.

This computer graphic provides evidence of the following with a high degree of confidence:

- That a relationship exists between annual sunspot numbers and the annual flows in the Vaal River
- That there is a predictable, periodic behaviour of the annual flows in the Vaal River
- That these flows do NOT conform to the view that they can be modelled by assuming random variability about the record mean value

It is obvious that these relationships cannot be described mathematically. How then can some climatologists claim that they can develop global climate mathematical prediction models based on the far more complex atmospheric and oceanic processes?

I have recently completed a 92-page summary of my technical report 'An assessment of the likely consequences of global warming on the climate of South Africa'. Please send me an e-mail if you would like a free copy. I urge everybody to distribute it as widely as possible. This is the only way that I can counter the current wave of climate alarmism based on abstract process theory that ignores the wealth of real-world data. □

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New **time-saving** program

ONE OF THE WORLD'S top engineering firms, Finnish headquartered Jaakko Pöyry Group, are maintaining their lead in engineering software through a new program which is set to save industry millions in engineering man hours.

The program is being introduced to the local engineering consulting arena by Durban-based Jaakko Pöyry Southern Africa (JPSA).

Managing director of Jaakko Pöyry Southern Africa, Derrick Maurice, said that in many instances engineering design drawings for process plants were hopelessly out of date and difficult to retrieve and use effectively.

'This makes engineering problem solving extremely difficult, and often the only solution is for the old drawings to be redrawn into modern engineering software programmes at considerable time and expense.

'The need for this unproductive engineering time has now been eliminated thanks to the newly developed procedures and software program.'

The program, developed in the group head office in Helsinki, Finland, is set to save local clients thousands by simplifying

the production of process, mechanical, electrical and instrumentation diagrams.

The new program converts paper or scanned drawings to an 'electrified' CAD program in a fraction of the time taken by conventional scanning or redrawing methods.

Previously old line drawings had to be redrawn in a CAD program before engineers could work on them. The new program allows these old drawings to be scanned and converted into a fully active CAD drawing effecting great savings in time and money.

'This is particularly useful when an old plant or equipment is to be upgraded or rebuilt. The old drawings can be converted into the most up to date CAD program with a minimum number of man hours,' he said.

'Once in this electronic format, modifications for both past and future can be more easily added, providing accurate information for both operation and maintenance of the plant,' said Maurice.

The new converting process translates old line drawings into CAD to scale, with editable text, editable line types including layered information, associative dimensioning and hatching, which allow the

engineer to modify any portion of the drawing as if originally drawn in a CAD program.

'Often executive management does not fully appreciate the difficulties experienced by engineering staff in problem solving due to the poor standard of information and drawings which they have inherited over the years.

'Countless man hours can be saved by updating and modernising the information management system,' said Maurice.

'Even in cases where mechanical drawings don't exist, we can also use the latest 3D scanning technology to model the plant and produce up to date CAD drawings,' he said.

This latest software program is part of a continuous drive by the Jaakko Pöyry Group to stay at the forefront of efficient engineering consulting. Utilising the latest globally networked engineering tools, Jaakko Pöyry Southern Africa has utilised these expert engineering systems, which optimise engineering efficiencies, particularly in large, fast-track projects. As these systems are developed largely in-house, they are unique to the local Jaakko Pöyry engineering office.



introduced

The value of 26 years of local experience coupled to the incomparable resources of the Jaakko Pöyry Group worldwide in its field of professional service, puts JPSA in a unique position as the application will be of great benefit to JPSA's traditional client base, the forest industry, but will also be of great help to all other large industries.

Jaakko Pöyry Southern Africa, with its impressive track record of projects, ranging in size from small modifications to multiple billion rand projects and over a decade of consulting to the local paper and pulp industry, has firmly established itself as the leading consultant to the industry in Africa and worldwide. The Jaakko Pöyry Group is represented in North, Central and South America, Australia, New Zealand, the Far East, the Middle East and over twenty offices in Europe.

The group's focus is on creating added value for clients through operating efficiency, the latest know-how sourced through the group's information network system, an intimate knowledge of the client's needs and the market requirements, and long-term client relationships.

Besides the forestry industry, from its local headquarters in Westville, KwaZulu-

Natal, JPSA also serves the Jaakko Pöyry Group in the fields of energy and infrastructure throughout the continent. This helps to keep the local staff complement at an optimum.

According to Derrick Maurice, one of the major advantages of maintaining a skilled local office was that it afforded JPSA the ability to gear up quickly in response to clients' fluctuating needs.

'Our local reputation coupled with the opportunity for many of our staff members to gain international experience through our group's worldwide client base has enabled JPSA to attract top quality staff.

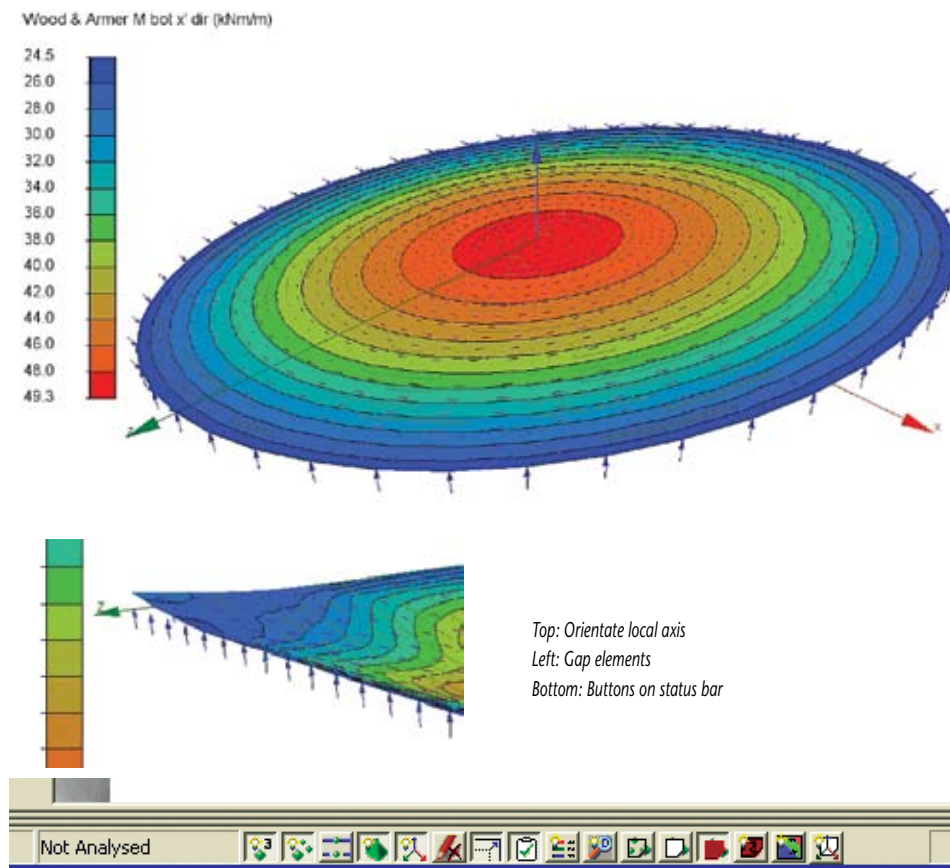
'Our group has management and staff with international experience capable of leading and training younger engineers,' said Maurice.

'The group world-wide, including the local company has a very low staff turnover, and this enables us to build highly experienced teams which besides offering clients top level service and expertise also creates continuity in multi-phase projects.

'This system of resource development is very cost effective for both Jaakko Pöyry Southern Africa and its clients,' he concluded. ■

Previously old line drawings had to be redrawn in a CAD program before engineers could work on them. The new program allows these old drawings to be scanned and converted into a fully active CAD drawing effecting great savings in time and money. This is particularly useful when an old plant or equipment is to be upgraded or rebuilt. The old drawings can be converted into the most up to date CAD program with a minimum number of man hours. Once in this electronic format, modifications for both past and future can be more easily added, providing accurate information for both operation and maintenance of the plant. The new converting process translates old line drawings into CAD to scale, with editable text, editable line types including layered information, associative dimensioning and hatching, which allow the engineer to modify any portion of the drawing as if originally drawn in a CAD program

Prokon steps up to the plate with release 2.2



'OUR BETA TESTERS are very happy with the enhancements in our new release,' says Louis Viljoen, a director of Prokon Software Consultants.

'We only make use of qualified structural engineers for the coding of our programs and our support desk. This provides a platform whereby the products are designed by engineers for engineers. The support desk allows our clients to speak to experienced engineers and/or the programmer. This is an advantage that is not afforded to the client by most software developers. We leverage this to our and our clients' advantage by getting valuable feedback and suggestions from our clients. The applicable suggestions are then collated and processed into new features or products. The cycle from support desk to programmer is also very fast.'

Louis points out that the addition of features is not the only initiative at Prokon.

'We have noticed that more clients need trained personnel. The boom in the development market and the shortage of engineers has placed a great deal of pressure on consultants to produce work at an alarming rate. Our clients do not have the

resources to train their personnel in-house anymore. We developed a set of training courses which have been refined over the past few years, and have grown with our products. They are also presented by qualified structural engineers only.'

Some courses have been presented on site, but Louis stresses that on site courses are more expensive, and the attendees don't have the advantage of speaking directly to the programmers.

'In certain cases the attendees have very specific or advanced questions. When the course is presented at our new training centre, access to the programmer is just a few metres away, in most cases.'

Sessions are run frequently but booking is essential. Feedback has been excellent and the series of courses is constantly being expanded.

'After attending courses we have noticed a marked improvement in the usage of our software. This includes speed of input and post processing of the design. In many cases the users then have a better understanding of the underlying technology enabling them to better model a structure with elements and layouts that will produce

good results,' says Louis.

Many users are also modelling larger structures on the Frame analysis tool.

'It seems that users are using faster machines that enable them to analyse larger structures on Frame. This has prompted them to request several enhancements in the module to further enhance ease of use with large models.'

The elements in the model can be associated with a group. If no group is specified, the elements are automatically placed in Group 0.

'This may not sound like a great enhancement, but it has been hailed as a large improvement by our beta testers. There is no limit to the number of groups. One or more groups may be switched on at any time. This may be done during input or output. During the input phase it speeds up redraws and removes "clutter" from the screen. During output the extents and contour value intervals for the output are computed from the visible groups only. We have had many cases where users have made use of clip planes to view only part of a structure in the output, only to have a slab with two or three contours drawn on it due to much higher and much lower values elsewhere in the structure. Groups solve that problem.

'Another enhancement for large frames is the option to save the full set of output data with the input. This enables users who have analysed a frame to open a file and directly use the design links, view output contours or values, or to add output views to the calcsheets. The file may take a few more seconds to load into Frame, but a great deal of time may be saved by not re-analysing. For smaller files we recommend leaving this option off, as analysis may be faster than loading all the data off a disk.

'On the graphic and modelling side, we have added buttons on the status bar representing all the options on the Graphics Options Dialog. These can now be toggled with the push of a button. Examples of this are toggling the node numbers on/off or viewing shells transparently or shaded.'

Several new functions and enhancements have been added to the modeller. One that is of note is the mirror function. Elements may be marked and then mirrored about the working plane. 'This has also been hailed as a wonderful tool during the modelling process.'

'When users modelled shell elements in the XZ plane they had no control over the local axis being used for shell stress

output or concrete reinforcing orientation. With out of plane elements, rigid rules were applied to these orientations. This has now been changed and the user can orientate the local axis in three ways: firstly by specifying an orientation node, secondly by aligning the local axis with one of the global axes, or thirdly by indicating two nodes as an axis.

'An example of the first case may be a circular reservoir roof. Orientate all the shells to the central node, and all rebar will be placed radially for one axis and axisymmetrically for the other axis. In other cases where skewed slabs are modelled, it is easy to align the local axis with a global X,Y or Z axis.'

Two new elements have been added to Frame. The first, a 'Gap element', may be added as a spring element or a support. The gap element has a linear orientation and a fixed direction. It can only sustain force in that direction, and when force reversal takes place, the element disappears and the elements connected to it are free to move.

An example of this could be a rectangular slab resting freely on four walls. As load is applied the corners of the slab lift. If the slab is not restrained in the corners, the supports may all be modelled as Gap elements. After an analysis only the supports

in compression will show, and the corners will have an upward displacement.'

The second element is a catenary element. This enables one to model true cable elements. These may be joined to other catenaries or other elements.

In Prose the Bending and Torsional properties have been combined into one page and placed in a grid, from which values can be copied or exported to .xls files.

SANS 10162:2005 is now supported in Prokon's design modules (Strut & Com) and is being added to their connection design modules.

'Another exciting addition to the Prokon suite is ProdoX. This product easily controls and documents the flow of design and construction documentation between parties in the professional team and on site. We have designed the product to work for any user. Whether documents are printed and couriered or issued electronically via e-mail or uploaded to a website, the product can easily and quickly keep track of these processes. What sets it apart from most other products in the same field, is that it also keeps track of received documents. All these documents can be placed and named in a structured fashion to retain a complete

record of all documents sent and received on a project or even a phase of a project. The reporting tool gives the project manager the ability to view progress reports in a single view.

'This product has been developed keeping in mind the difference in workflow and application of resources in different offices. We do not wish to dictate how an office should be run or even how to document its projects. This product provides the user with a wide range of options to set up the system for optimum use. The user will, however, realise that the optimum usage lies in all involved parties using the system.'

This product will be launched with Prokon 2.2. 'Please contact us if you wish to arrange for standalone installs with your partners in any project,' says Louis.

There has been much talk in the market about the release of Revit™ Structure by Autodesk in the USA. Revit™ Building is being used by architects in South Africa with much success. Prokon is involved in the development process with Autodesk, and Revit™ Structure should be released in South Africa in 2007.

► Should you have any more questions, please contact Prokon



Driving better and faster roads



'We developed the Roads module to design any kind of road imaginable, from urban and rural roads to freeways, airports, railways and even dams' – Vincent

A SUBSTANTIAL PERCENTAGE of South Africa's roads have been designed using the Civil Designer Roads module. This comprehensive road design package forms one of nine standalone modules that combine to

form an integrated data gathering, drawing, surface modelling and design system for designers of civil engineering infrastructure. According to Vincent Bester, CEO of Knowledge Base, the heart of the program's success lies in its ability to integrate seamlessly in a visual design environment with seamless interaction between the design tools.

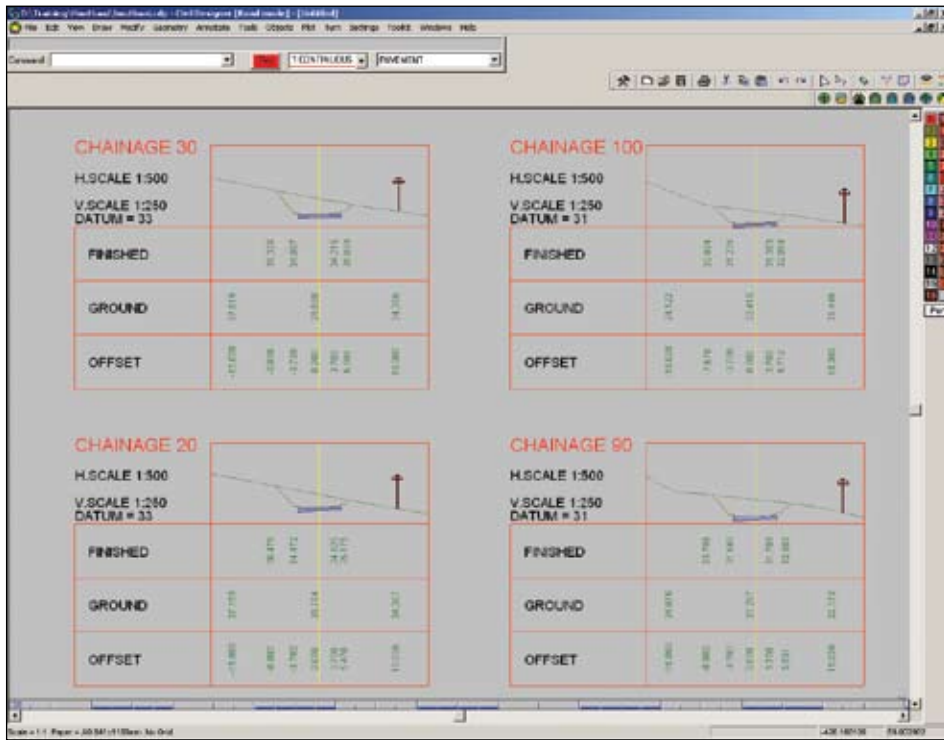
'We developed the Roads module to design any kind of road imaginable, from urban and rural roads to freeways, airports, railways and even dams. With the steady increase in South Africa's infrastructure development, the Civil Designer module has been put to the full test and there is constant development in order to keep abreast of current industry trends. We are also gearing up for some exciting infrastructure plans for the 2010 Soccer World Cup,' says Vincent.

The growing demand for this locally produced software has resulted in the soon to be released 6.4 Roads version. The new version has about 50 enhancements and there is an increase in functionality that will benefit both road designers and transportation engineers. Amongst the many enhancements, the most noticeable are:

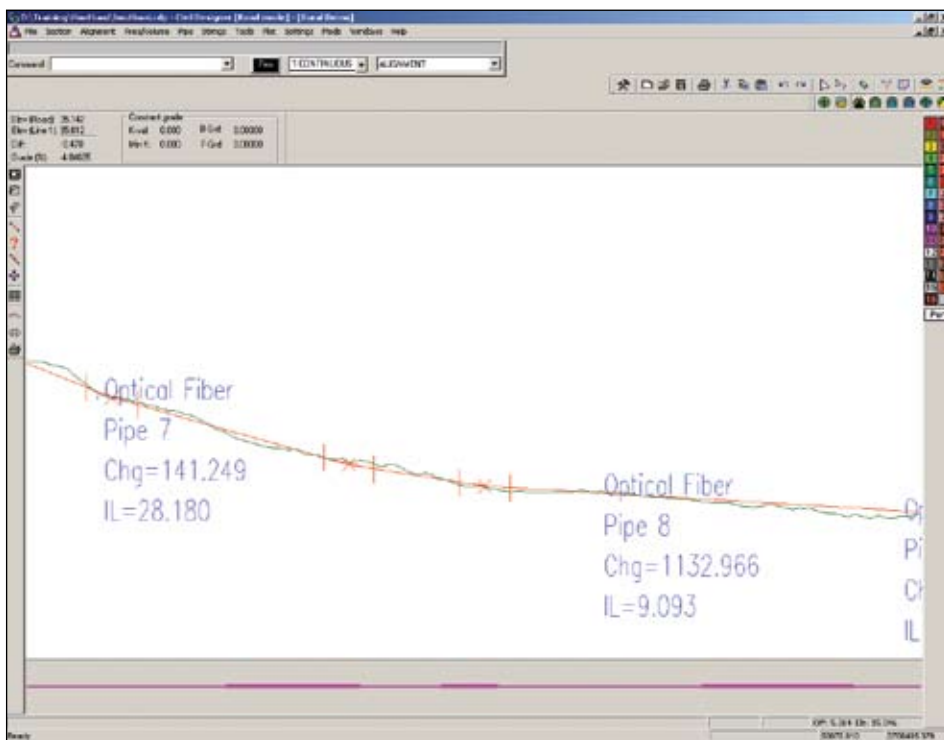
■ A revised design criteria that will warn the user when transition curves are needed on a Horizontal alignment. The

program will also suggest transition curve lengths.

- The new release will allow the user to have a choice to model Vertical curves as parabolas or circular curves.
 - A Translate Road feature has been added to the Translate Cross section function. This will allow the user to accurately translate his design cross sections to a DTM surface without having to manually alter the DTM model at template changes afterwards.
 - The module has special surveyed features such as fence lines that can be extracted from the DTM onto cross sections by specifying a filter. These features can then automatically be indicated onto cross section drawings with the use of user-defined CAD symbols.
 - A Pipe database function has been added to 6.4. This will allow the user to specify any additional services, or culverts that cross the road. The program will then indicate wherever these pipes are crossing toe road alignment, together with pipes from the Sewer, Storm and Water Modules, on Long Section plots and in the Vertical Alignment Editor.
- Another powerful feature that has received special attention in the Roads module is the newly developed Strings application for Platform design. 'The Strings tool has been enhanced to facilitate easier design. It



▶ Left: Cross section
▶ Bottom: Vertical alignment



works in a similar way to a 3D polyline in that it consists of a sequence of 3D points called vertices. It also differs from polylines in that multiple strings have an effect on each other in a hierarchical manner and it is this hierarchical structure that defines the String's dynamic nature.'

According to Vincent, a String is not a CAD entity, nor is it a sequence of DTM points. It is a separate object stored in a separate file but it can be created from CAD entities or a series of DTM points. In addition, a String can either form a closed figure or an open route.

The hierarchical nature of Strings is quite unique. A newly created or isolated

String is known as a platform or master string. Once this string has been created, you can attach a second string called the child string which in turn can have its own children. The relationship of the platform string to the child string is usually described as the platform being a parent to the child.

In practice, a change to one string means that all its children will automatically be updated with the change. In this way, when the corner of a terrace is changed, all subsequent bank points will automatically be moved and recalculated. Similarly, if the elevation of a single vertex is changed, all the vertices in the child strings that are connected to the modified

vertex will be updated. A project may contain up to 64 platform strings and each will have their own set of children.

'We enjoy the String's functionality because it can be used to design complicated terraces. Strings are ideal for designing parking areas, curved dam walls, berms and channels with complicated benching. The hierarchical nature of Strings means that a designer can change his design by simply moving a corner of the terrace, grading a string or surface, or moving the entire terrace without having to re-generate all the affected strings. The affected strings and toe points will then automatically be re-calculated,' explains Bester.

Although the newly created Strings tool has increased in functionality, it remains user friendly and quick to use. The user can create Strings using any of the following methods:

- By indicating the position of the vertices graphically
- By converting a CAD polyline into a string
- By converting a connected series of DTM points to a string
- By creating a child string and specifying a specific relationship between an existing string (parent string) and the new child string

Once created, Strings can be modified from both the plan and long section views as follows:

- Vertices and complete string can be edited, deleted or moved.
- Strings can be graded to a specified grade, or tapered.
- Vertical and horizontal curves can be introduced to a string.
- A surface formed by a closed string can be graded to a specified grade.

'We have created the Strings tool to be both dynamic and versatile in its operation. Once the String has been created according to the users requirements, a triangulated DTM surface can be created from a series of strings by simply running the String to DTM function. All the regular DTM functionality can now be used in Civil Designer to calculate quantities, create a contour plan and generate a 3D view,' notes Vincent.

'We are excited about the new developments in the 6.4 Roads version because the module is intended as a resource to Consultants when completing demanding infrastructure projects within tight deadlines. The next few months will be dedicated to testing the system fully, but we are pleased with the progress to date,' says Vincent in closing.

▶ Knowledge Base Software

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WESTERN CAPE

Civil engineering happenings around Cape

► *Left: Berg River Dam, 24 November 2005. The stage is set for the diversion of the river into the diversion conduit. On completion, the dam will be the highest concrete-faced rock-fill dam in South Africa. It will be 70 m high and 990 m long and will have a surface area of more than 500 ha. Water impoundment will begin in June 2007 and water delivery will start towards the end of that year*

► *Below: Construction of the intake tower in progress*

FOR SOME YEARS civil engineering practitioners in the Western Cape have been feeling the pinch, as funding and contracts have been slow to materialise. The main reason has been slow delivery by municipal and provincial government, where engineering departments have lost numbers of competent professionals, and political interference has frustrated project management. The degree of professionalism shown by our municipal colleagues has been exceptional considering the lack of competent staff, threats of job security, and a generally demotivating environment, and it is a wonder that any major projects have seen the light of day. However, some work has been released and will provide business for some fortunate firms. Smaller, less glamorous contracts which do not bring political kudos, but would provide bread and butter work for the great majority of firms, are still in short supply.

WATER, WATER ANYWHERE?

Favourable winter rains have reduced the spectre of a really serious water shortage in the immediate future, but in the longer term some innovative solutions will be required to cope with huge increases in population in the past decade, improvements in living standards, and the consequent rising demand.



in and Town

The degree of professionalism shown by our municipal colleagues has been exceptional, and it is a wonder that any major projects have seen the light of day. However, some work has been released and will provide business for some fortunate firms. Smaller, less glamorous contracts which do not bring political kudos, but would provide bread and butter work for the great majority of firms, are still in short supply

Progress on the Berg River project

Cape Town's water problems will be alleviated, for a few years at least, by the

► *Awaiting the diversion process. They were among the last people to see the Berg River following its ancient course*



construction of the Berg River Dam (as the Skuifraam project is now known). Construction is well under way and on schedule.

An interesting feature is the intake tower and overflow structure, which has

been designed to increase output in wet weather to simulate flood conditions downstream and thus conform to environmental requirements.

The value of the contract estimated at R675 million. TCTA act as the client; design is in the hands of Berg River Consultants, a consortium of Knight Piésold, Goba and Ninham Shand, and the contractors are a joint venture of Grinaker-LTA, Group Five, WBHO and WCEC.

The contract for the complementary Drakenstein balancing dam and delivery system has recently been let.

New water reconciliation study gets under way

The Western Cape Water System Analysis, released in 1992, demonstrated clearly that the water resources of Greater Cape

N2 GATEWAY LAUNCH

The Executive Mayor of Cape Town, Nomaindia Mfeketo, recently revealed details of the city's proposed Integrated Human Settlements plan, which combines current and future major housing projects spread across the city area and spanning the next ten years.

The plan will transform the city and reduce the current backlog of 260 000 units. Some of the projects are already under construction and 64 % of the city's capital budget has been earmarked for its settlements plan in the next financial year starting on 1 July.

'The N2 Gateway project is an

important element and trail blazer for national housing initiatives. City residents can rest assured that it is not the only housing opportunity. It is part of an overall strategy to consolidate people's needs, housing opportunities and, importantly, all the community facilities that bind people together,' said Mayor Mfeketo.

The city's plan is tackling the housing backlog in a number of ways: by building new houses, upgrading informal settlements (where they are), converting hostels into family units, making land available to private developers, by expecting

developers to make a contribution to the city's social housing needs and by actively seeking donor or private sector funding for housing development.

The mayor listed the six principles of the settlements plan as a policy of housing for all, a holistic, sustainable human settlement approach for community building and dignified living, a fair and inclusive process for allocating housing opportunities from a single housing database, creating integrated communities rather than those separated by physical boundaries and mindsets, shifting focus to providing housing closer to opportunities and a greater range of housing choice for the range of lower-income families

with different needs and financial means.

As a primary component of the City's Integrated Development Plan, the settlements plan includes all the other infrastructure and facilities such as roads, transport, electricity, water, refuse removal, community facilities, schools, shops and recreation areas. The plan also aims to integrate informal settlements into existing areas to truly form one city.

In line with its new settlements plan, the city is creating an integrated city housing database. It will contain details of those in need of housing, including where they currently live, preference for rental or ownership, size of family, ability to pay and other pertinent information.

Town and its hinterland would be severely strained by the end of the century. Indeed, this proved to be the case, and the delays in building the Skuifraam Dam exacerbated the situation to the extent that severe water restrictions had to be put in place after the dry winter of 2004.

A new reconciliation study has been launched to coordinate recent research, and to develop new strategies to provide the Western Cape with sufficient water for its future needs. The process has been developed, and includes a series of working spells punctuated by meetings with the public for feedback. The comprehensive recommendations for strategies to reconcile demand with available supplies are due to be published in December 2006.

On the supply side, new dams and diversions will be considered as well as more adventurous proposals such as a supply from the Congo River, and that old pipe dream, the towing of icebergs. The politically favoured desalination process, which is beginning to take on some signs of economic feasibility, will obviously be carefully researched.

The demand component will also be studied, and the effects of agricultural con-

sumption, water re-use, and the removal of invasive plants, as well as renewed attention to urban water demand management can be expected to receive attention.

Coupled with the study will be the design of a process to establish a catchment management agency for the Berg River. The regulation of the catchment will obviously become even more sensitive when flows in the river are affected by the Berg River project, and the move will be welcomed.

The lead consultants for the study are Ninham Shand and UWP Consulting.

Clanwilliam Dam to be raised

Overflowing in early August but not at this stage an option for supplementing the Greater Cape Town supply, the dam at Clanwilliam is nevertheless likely to be raised. Extensive environmental impact studies are under way, conducted by Ninham Shand in association with ASCH Consultants and Jakoet and Associates.

A NEW APPROACH TO CAPE TOWN Informal settlements on the N2 to be transformed

The road into the city from Cape Town International Airport, flanked by miles of

informal settlements, is scarcely an inspiring sight for the visitor. Successful individual efforts have been made to upgrade specific areas, such as HHO Africa's innovative scheme for New Rest Township, but the overall impression is still one of squalor, poverty and suffering. In an effort to remove the eyesores, and more importantly to improve the living conditions of the shack dwellers, the City Council has embarked on an ambitious scheme known as the Gateway project. Three major consortiums have been formed to design and deliver.

Major sewer project

A new major sewer will be built along the Kuils River valley, at a cost of some R200 million, to serve the Gateway housing projects in this vicinity. The work will include extensions to the Zandvliet treatment works. Consulting engineers are Liebenberg and Stander.

Infrastructure for the Soccer World Cup

Further impetus has been given to upgrading local infrastructure by the requirements for hosting the 2010 FIFA Soccer World Cup. Priority projects will include upgrading of the rail system (both rolling

CAPE TOWN GETS SA'S FIRST INNER-CITY WINERY

The developers of the R1 billion Mandela Rhodes Place (MRP) in Cape Town's CBD have selected and finalised negotiations with an internationally renowned winemaker for the city's first fully fledged inner-city winery.

Jean Vincent Ridon of Signal Hill Wines and his team of winemakers have won the bid to be the CBD's first working winery that forms part of the unique retail and lifestyle component of the mixed-use Mandela Rhodes Place.

Japie Hugo, Eurocape's head of business development, says: 'The winery is the first of many operator announcements which will be made in the coming months. The winery will act as a catalyst for the myriad of lifestyle opportunities offered within Mandela Rhodes Place, providing residents and visitors with a wide variety of entertainment and leisure options.'

'By bringing city dwellers, quality retail and lifestyle elements back to the city, Eurocape aims to show the strength of their commitment to reviving Cape Town's Old Town.'

Old Town encompasses the historical and cultural heart of the city and includes attractions like the Company Gardens, Parliament, the South African Library, Supreme Court, St Georges Cathedral and a variety of museums and art galleries.

Ridon, a French winemaker, started producing wines in South Africa in 1997 and he will relocate Signal Hill from its current premises in time for the 2006 harvest. The winery will see the full production process taking place on site which will include de-stemming, crushing, fermentation, barrelling, bottling and packaging.

In addition to guests being able to witness the full winemaking process, the winery will incorporate wine tastings and wine sales to the public, and will offer light meals in a sophisticatedly relaxed bistro. The winery will also produce Tutuka wines on-site. Tutuka is the only fully black empowered operation in the wine industry and is produced by Ridon's associate winemaker, the Burgundy-trained Laurence Buthelezi.



Mandela Rhodes Place is firmly regarded as a catalyst in inner-city rejuvenation and is one of the largest mixed-use developments in Cape Town since the 1970s. The development, set for completion at the end of 2006, successfully merges residential and retail components. Mandela Rhodes Place comprises 180 luxurious apartments and, in addition to the first city winery, a range of restaurants, bars, food halls and delicatessens.

These will be complemented by a state of the art rooftop wellness centre and clinic, offices, gymnasium and in-house parking. The development will also boast a

glazed tower, sensitively divided and constructed between the existing historic facades. A luxury five-star hotel will also be developed as part of Mandela Rhodes Place.

Through the development of Mandela Rhodes Place – which comprises well over 100 000 m² of new buildings and refurbished mixed-use property in the heart of the city – Eurocape aims to achieve the city's vision of providing residents and visitors with a host of entertainment and round-the-clock leisure activities and creating a lifestyle experience alongside that of the most advanced cities in the world.

stock and selected stations), the Klipfontein Corridor bus transport scheme, the central city transport distribution system and a city wide multi-modal ticketing system. Infrastructure improvements are also planned at Cape Town International Airport (both air and land side) together with various road improvements between the city and the airport.

The N2 highway itself is being improved by the addition of an extra lane between Vanguard Drive and Borchers Quarry Road, undertaken by BKS. A similar project, in the hands of VKE, is under way on the N1 between Sable Road and Karl Bremer Interchange.

EPWP PROJECT FOR THE OVERBERG

HHO Africa have designed a new major road from Gansbaai to Bredasdorp. Access into this area has been difficult in the past, but the cool sea breezes are said to be ideal for growing pinot noir and sauvignon blanc with – and new wineries require better infrastructure. An improved tourist route to the vicinity of Cape Agulhas will also attract visitors. The contract is an interesting one, as it is designed to offer significant empowerment opportunities to isolated communities like Elim, and the work will form part of the provincial roads department's Expanded Public Works Programme.

COMMERCIAL DEVELOPMENTS

Century City

Apart from the Ratanga Junction theme park, which has not come up to commercial expectations and is battling to survive, this huge business and residential complex continues to grow successfully. HHO Africa are involved in the development of a number of new high density residential, commercial and office blocks which will be integrated into the system of waterways and canals that are part of this prestigious scheme.

Somerset West

If the success of Century City has surprised the prophets of doom, the continued growth of the Heartland Properties development around the N2 at Somerset West is really amazing. HHO and Arcus Gibb are involved in the next phase, which is to develop a high density up-market waterfront type precinct around the Paardevlei waterbody.

A touch of Hollywood

The much vaunted Cape film industry will at last get a proper home when a 200 ha site is developed as a film studio. Located adjacent to the N2/Stellenbosch Interchange, this complex will include support facilities such as a hotel, residential accommodation and various external film set-up areas. HHO and Orrie Welby-Solomon are the civil consultants.

Central Cape Town continues to experi-



The Athmania system will form part of the Beni Haroun water transfer scheme in Algeria



Murray's Bay Harbour, Robben Island, is the entry point to this famous island

ence an office/retail/residential upgrading investment cycle which is most encouraging when one considers the declining investment market in the central city area of a few years ago. New foreign investment is aimed at providing more residential and hotel accommodation, and several of the city's venerable old buildings, such as the famous Old Mutual icon have been converted into luxury apartments.

Meanwhile the Waterfront continues to expand, and new luxury hotels and apartments fronting on to an extended yacht basin are under construction. Craig Sutherland Consulting Engineers are deeply involved on the structural side.

OFFSHORE IMPETUS

Local consultants have been successful in making lucrative connections north of the border and further afield.

Jeffares and Green have had a fascinating landfill project in Qatar, where the existing waste disposal site interfered with planned extensions to the airport for the capital, Doha. A new properly engineered landfill facility was built in the desert sands, and six million cubic metres of existing waste had to be moved to the new site.

The firm has also been active with landfill projects in Freetown, Sierra Leone and Ireland, where an existing site was capped



Construction in progress: Al-Ezzel Power Station, Bahrain

to allow housing development above it.

Ninham Shand has made successful forays into Algeria. Together with a Tunisian firm they have done the design and documentation for a bulk water scheme for the environs of the ancient town of Constantine, and are about to go to tender for a job worth an estimated US\$ 500 million. They are also responsible for a water scheme valued at \$60 million, to serve the towns of Chlef and Tenes, west of Algiers. In Bahrain they are involved with Murray and Roberts Engineering Solutions in the design of the cooling water system for Al-Ezzel Power Station.

African have got interesting projects in Oman – a proposed \$200 million resort – and in Bahrain, where they are the lead consultants for a waterfront-type development including full civil services and two 50-storey buildings.

Generally the Middle East involves studies for eventual turnkey projects, and requires careful tendering for work priced in dollars, so with unpredictable exchange rates and other volatile factors, local engineers have to be up to speed in international business practice as well as technical excellence if they are to be successful.

Local consultants have become involved in many waterfront projects on the African coast. Entech are particularly busy, with potential projects ranging through Namibia to Gabon, Cameroon, Nigeria and Côte d'Ivoire. On the East Coast they are involved as independent consultant at Djibouti for the African Development Bank, consultant for Salama Bay development in Dar es Salaam, and in Mozambique. They are also looking at waterfronts in Greece (Thessaloniki and Aegina). Closer to home they were involved in the reconstruction of Robben Island Harbour.

WASTE DISPOSAL

The West Coast area north of Milnerton is one of the most rapidly growing parts of the region, and the wastewater disposal facility at Potsdam is under pressure. The facility has always been controversial as it discharges into the Rietvlei conservation area, and the small works built for a small population some forty years ago has been extended at various times.

The present upgrade is in the hands of Ninham Shand, Stewart Scott, Africon

and ASCH. A new regional works is being contemplated further up the Diep River, to serve the Durbanville area and, possibly, to accommodate further growth in the West Coast area.

Meanwhile the major Cape Town solid waste disposal site at Vissershok is reaching saturation. Efforts to extend the current site are limited by urban growth and by environmental concerns in the environs of the historic Battle of Blaauwberg site. Any future site will be further afield.

Entech has been responsible for the initial technical studies to identify potential sites for the establishment of refuse transfer stations at Helderberg, Oostenberg and Tygerberg, as well as the upgrading work at the Athlone transfer station.

WHO WILL DRIVE THE BUS?

Clogged roads and gridlocked intersections proliferate, but the grand talk of improved public transport, sophisticated inner-city systems, free-flowing corridors and the elimination of traffic pollution still seems to be little more than exhaust fumes.

An exception has been the UCT transport project, where students have happily taken to the extended system of attractive and convenient midi-buses which ferry them to the campus. Ninham Shand has devised the system. (See article on page 25.)

Will this be the way to go? Hopefully the taxi industry and the controlling political elements will take note. ■

WESTERN CAPE GAS DEVELOPMENT PROJECT

The Petroleum Oil and Gas Corporation of South Africa (Pty) Ltd (PetroSA) has been mandated by the South African government to facilitate the development of the natural gas industry in the Western Cape, including feedstock and infrastructure requirements. In responding to the mandate, PetroSA has set itself the objective of enabling the establishment of the full value chain for the supply of commercially viable and competitively priced natural gas to regional markets in the Western Cape.

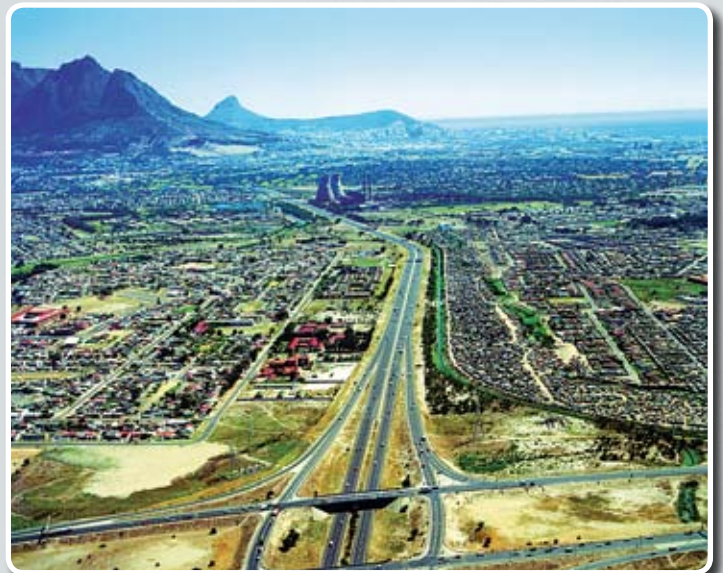
After a detailed consideration of a range of alternative gas supply options, PetroSA identified the most viable option as the importation of liquefied natural gas (LNG) from markets in the Middle East and West Africa. The import volume required to underpin the infrastructure development is 500 mmscfd (million standard cubic per day),

which would be supplied to markets in Saldanha Bay, Cape Town and Mossel Bay.

PetroSA is undertaking a joint project evaluation with Eskom and the National Ports Authority. At present the project comprises the following key components:

- A re-gasification facility, possibly in Saldanha Bay, which would require various modifications to the Port of Saldanha
- A combined cycle gas turbine power station along the Cape West Coast
- Pipelines to industrial users in Saldanha Bay and Cape Town and to the PetroSA Gas-to-Liquid plant in Mossel Bay

An association of leading consultants led by Ninham Shand has been appointed by PetroSA to provide a range of environmental services for this project, starting with a strategic evaluation. The strategic evaluation,



► It is envisaged that gas would be imported via the Port of Saldanha to supply the Western Cape gas development project

undertaken at the recommendation of the Department of Environmental Affairs and Tourism, sets out to interrogate the essential question of 'How this gas project contributes to sustainable development in the Western Cape?' The purpose of the strategic evaluation is to consider

the triple-bottom-line sustainability of the project and its various alternatives. Furthermore, it aims to provide a focus for the subsequent environmental impact assessment processes that will be a legal requirement for each of the key pieces of infrastructure.



The University of Cape Town's 'Jammie Shuttle'



THE UNIVERSITY OF CAPE TOWN'S picturesque and historical main campus, situated on the eastern slopes of Table Mountain, is split into three, rising from the Lower Campus (along Main Road Rondebosch), through Middle Campus (below the M3) up to Upper Campus (which backs directly onto Table Mountain). Along Main Road north-south are the suburbs of Observatory, Mowbray, Rosebank, Rondebosch, Newlands and Claremont. A large proportion of the UCT community live in residences located within these suburbs.

But the university and its activities are not limited to the main campus. There are also campuses at Groote Schuur Hospital (the Health Sciences Faculty), at Valkenberg Hospital in Observatory, at Hiddingh Hall near the CBD of Cape Town, and at health stations in the informal settlements around the Western Cape, as far west as Atlantis.

Two decades ago, the UCT recognised that its growing campus could not accommodate the spiralling growth in parking demand. The university wished to discourage vehicles on campus and to encourage and restore geographical unity through pedestrian precincts through its green lawns and landmark architecture which houses, academic, cultural and sporting activities. The closure of University Avenue to through traffic represents one of the earlier actions in this regard, but certainly not the last.

In terms of its charter, UCT is committed to delivering a safe, reli-

able and efficient transport to some 24 000 students and staff in the fulfilment of their university activities. Historically, this element of the charter has been served by a miscellany of transport service providers ranging from City Tramways Ltd to private contractors in a variety of vehicle types including double-decker buses and nine-passenger minibus-type vehicles.

The 'Jammie Shuttle' idea was introduced in 1992 to supplement the public transport service provided at that time by Golden Arrow Bus Services (previously City Tramways).

In 2002, Ninham Shand Cape Town was appointed by the university to undertake certain infrastructure improvements to the existing transportation system. As new national and provincial public transport legislation began to impact on UCT, the Ninham Shand brief was amended, first to bring the system then operating in line with the legal requirements and subsequently to include the design of a comprehensive system that closely fitted with the new legislation and relevant transport policy, and that would meaningfully contribute to improved access control.

Ninham Shand, in consultation with the university, developed the concept of the new Students and Staff Transport System (SSTS) – which transformed the service provided from an ad hoc minibus taxi type operation into an organised, controlled, highly efficient,

► PROJECT TEAM

Ninham Shand – Brenda Sudano (project manager), Dijon Niehaus, Hopolang Ntoi; Robby Robertson and Dr Wayne Duff Riddell (specialist consultants)

University of Cape Town – John Critien and Geoff de Wet (UCT Properties and Services); Roland September and Chubasco Hunter (UCT Traffic and Transport)



scheduled system of the highest standards.

SSTS vehicles and staff appearances, operational performance and staff behaviour, both on and off vehicles, were all considered to be important features of the new system – which is unique in South Africa.

Ninham Shand had responsibility for all the traffic, transportation and road infrastructure planning associated with the contract, the aims of which included:

- Minimising private car usage on campus

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- Improving linkages with the Metropolitan public transport system at lower user cost
- Transporting of students and staff between all UCT facilities and residences and parts of the campus
- The prompt and reliable transfer between lectures on different parts of the campus
- The safety of students and staff, especially during off-peak periods when students access campus academic facilities
- Accommodating special academic, sport and social trips undertaken as part of UCT activities

Among the operational design activities carried out by Ninham Shand as part of the planning and implementation phases were:

- Forecasting of traffic flows and impacts arising from alternative conceptual plans
- Assessment of the traffic impact of such a major development on the surrounding areas
- Detailed design of the system including vehicle selection and specification, routing and scheduling and the detailed operational costing of the system
- Detailed design and construction supervision of the necessary roads, paving and landscaping (requiring close professional interaction with UCT landscape architecture and street furniture), relocation of traffic signals and pedestrian crossings to allow for safe pedestrian crossing of roads with high traffic flows with minimum disruption
- Evaluation and specification of an electronic vehicle monitoring and boarding control system so as to ensure operator adherence to specified performance measures and to control illicit use of the 'free' service provided to students and staff
- Evaluation of tenders and the practical implementation of the new contract
- Negotiations with provincial and metropolitan authorities, transport operators, including local minibus taxi associations

In respect of the detailed specifications, these included planning for sight and hearing impaired passengers on the core SSTS service, and the special provision of a dedicated service for wheelchair passengers, with a suitably modified vehicle.

At the end of 2004 UCT awarded the contract for the provision and operation of the new SSTS to Sibanye (Pty) Ltd, a 100 % BEE company. The initial value of the operator's five-year contract is in the order of R45 million, covering vehicles, core service mileage, suretyship, infrastructure, human resource development, social investment and transformation. Unscheduled services, such as ad hoc field, social and sporting trips, are additional to this.

Initially, in January 2005, a temporary vehicle fleet was used, allowing the permanent bus fleet to be manufactured in Brazil, and assembled in South Africa. The permanent fleet which started operations in the second semester of 2005, consists of 22 buses: 18 with a functional capacity of approximately 45 passengers, two standby vehicles with 30-passenger capacity and 2 with approximately 90-passenger-capacity. On board vehicle monitoring and access control systems were retrofitted in each vehicle for UCT data gathering and management of the system.

In July 2005, the Wheelchair Passenger Transport Service contract, utilising one specifically modified, dedicated vehicle, was awarded to iKapa Tours (Pty) Ltd, and commenced operations almost immediately.

The success of the UCT project will only be truly measurable some months after the permanent bus fleet has been in operation. Passenger numbers have escalated considerably since the surveys undertaken on the previous system – this due to the reliable, safe and 'cashless' nature of the service. The project is currently settling in, with passenger numbers altering daily as students and staff learn how the new system operates; this requires regular adjustment to the finer operational detail, while operator and driver training is ongoing.

The University of Cape Town's Students and Staff Transport system is a milestone in the transformation of public transport in South Africa in that it aims to deliver a 'quality' service targeting car users and reducing the cost of transport for less fortunate students and staff. ■

BOLTRIGHT PROGRAM RELEASED

HI-FORCE HYDRAULICS, a leading global player in the bolt torque and tensioning business, has recently announced the launch of its new computer software program designed for easy calculation of the required torque and/or tension values for a wide range of bolted joints.

Entitled 'BoltRight', the program is designed to run under the Microsoft Windows XP operating system (or compatible systems such as Windows 2000, ME, NT or 98).

Currently the program allows the user to work in metric or imperial bolt sizes and includes all of the standard ANSI/ASME, API and ISO class flanges. Ongoing development of the program will see additional joint designs, for example clamps and special non-standard bolted joint arrangements, added to the program.

The Hi-Force BoltRight program will automatically calculate the required torque value (in Nm or lbf.ft) or the bolt tensioning value (in kN) from the joint information entered into the program by the user. The program will consider all of the key elements within the joint including flange class and size, operating temperature, bolt material and size, gasket material and type, thread lubricant (for bolt torquing) and the applicable friction coefficient, and the load loss factor (LLF) when using hydraulic stud bolt tensioners.

The BoltRight program also allows the user to generate a bolt torque or bolt tensioning procedure, dependent on the method of tightening selected, and to print or store this traceable procedure in the PC. The procedure can also include critical joint information such as location, joint tag reference, details of organisation and person carrying out the bolt tightening work as well as any other key information. A Hi-Force recommended bolt tightening procedure using Hi-Force bolt tightening tools will also be included in the report.

An additional link in the program also enables the user to request BoltRight to recommend the most suitable Hi-Force bolting tools to carry out the bolt tightening. Hi-Force manufactures

and supplies a comprehensive range of hydraulic torque wrenches and stud bolt tensioners and with a simple click of a button, the user is also able to view full details of these products whilst using the BoltRight program.

An easy to follow installation procedure, user guide and help file is included in the program which is available either on CD format or by direct download from the www.hi-force.com website using an authorised password.

HOLCIM AWARDS COMPETITION GOES GLOBAL

FOLLOWING FIVE regional competitions, 15 award-winning projects will now compete in the first global Holcim Awards competition for sustainable construction projects. The global phase of the competition showcases the best entries from more than 1 500 submissions from 118 countries, and encourages innovative, future-oriented and tangible approaches within the building and construction industry.

The competition was created by the Swiss-based Holcim Foundation for Sustainable Construction in collaboration with five of the world's leading technical universities: Swiss Federal Institute of Technology (ETH Zurich), Switzerland; Massachusetts Institute of Technology (MIT), Boston, USA; Tongji University (TJU), Shanghai, China; the University of São Paulo (USP), Brazil; and the University of the Witwatersrand (Wits), Johannesburg, South Africa.

As part of the three-year competition cycle with prize money totaling US\$2 million, all projects that received the gold, silver or bronze award in the five regional competitions automatically qualify for the global Holcim Awards. The global Holcim Awards winners will be announced in Bangkok in April 2006.

The challenge of assessing the innovative, future-oriented and tangible sustainable construction projects from around the globe will be

performed by a jury of 15 independent, internationally renowned representatives from science, business and society.

Head of the jury, and dean of the MIT School of Architecture, Adèle Naudé Santos, said the selection of the global awards would be based on further information submitted by each participant using the target issues for sustainable construction that the Holcim Foundation defined in collaboration with its partner universities. 'The target issues provide a strong framework for assessing diverse projects – beyond a focus on architecture or the use of specific building materials, the competition is about the broad picture of sustainable construction,' she said. The criteria range from environmental and aesthetic quality to high ethical and economic standards.

The 15 global awards finalists are the three top projects selected by the juries in each of the regions: Europe, Asia Pacific, North America, Africa Middle East and Latin America. At five regional awards ceremonies in September and October in Geneva, Beijing, Boston, Johannesburg and Rio de Janeiro a total of 31 Acknowledgement and Encouragement prizes were awarded in addition to gold, silver and bronze awards, confirming the rapidly growing interest in sustainable construction around the globe.

The objective of the Holcim Foundation in cooperation with its partner universities is to establish the Holcim Awards as an international platform for professionals and specialists of all generations to promote interdisciplinary dialog, bring forward new ideas and examine potential solutions.

PAPERS CALLED FOR 'YOUNG CONCRETE' CONFERENCE

PAPERS ARE NOW BEING CALLED for the 3rd Young Concrete Engineers', Practitioners' and Technologists Conference to be presented by the University of Pretoria next year in collaboration

PARTICIPANTS IN THE GLOBAL HOLCIM AWARDS COMPETITION (BY COUNTRY)

- ▶ **Argentina:** 'Verde Sobre Gris – Cubiertas Verdes' Buenos Aires. A conceptual project for a public policy to promote roof gardens (green roofs) on existing houses in the city of Buenos Aires on a large scale
- ▶ **Brazil:** 'Escola Mínima-Energia' Rio de Janeiro. An implementation of minimal energy design in a school

building including natural ventilation, natural lighting with protection of direct sun radiation and a roof garden

- ▶ **Canada:** 'Material Reduction: Efficient Fabric-Formed Concrete'. Project presents a technique using flexible fabrics instead of conventional rigid molds for the production of concrete elements

- ▶ **Canada:** 'Greening the Infrastructure at Benny Farm', Montréal. Urban, landscape and architectural project for the sustainable construction and renovation of 187 housing units on four adjacent properties in Montréal
- ▶ **China:** 'Design for a Clan Settlement's Regeneration', Hangzhou. Project provides a model for the adaptation and revitalisation of an existing urban sector without large-scale demolition or replacement

- ▶ **Germany:** 'Main Station', Stuttgart. The project places the railway station underground to recover land to create a new urban area, combining structural and landscape aspects.
- ▶ **Italy:** 'Waterpower – Renewal Strategy for the Mulini Valley', near Amalfi. The project uses water as the central theme with the historic preservation of a number of heritage buildings and maintaining aesthetic balance between existing and new structures

with the Concrete Society of Southern Africa, the Cement & Concrete Institute and the National Research Foundation.

The conference will take place in the auditorium of the C&CI School of Concrete Technology, Midrand, on 11 May next year. Aimed at delegates under the age of 35, it is the third conference of its kind: the first was held at the C&CI in 1997 and the second at UCT in 1999.

The objective is to draw together local young engineers, practitioners and technologists working in concrete engineering and technology to expose them to current research and new developments in southern Africa, while exchanging ideas and establishing a network for research and development.

For a paper to be accepted for the conference, the author has to be under 35 on 11 May next year or, if older than 35 on that date, he or she has to be registered for a higher degree at a tertiary education institution in South Africa. Papers can be presented on case studies, R&D projects interesting or innovative concrete applications, or concrete research needs. Draft papers have to be submitted by 26 January 2006.

For further information, contact the Concrete Society of Southern Africa on e-mail c.s.s.a@mweb.co.za or telephone 012-809-1824.

NEW C&CI DATABASE FOR CONCRETE QUALIFICATIONS

THE CEMENT & CONCRETE Institute's School of Concrete Technology's new database of concrete unit standards and qualifications (accessible from www.cnci.org.za) will facilitate greater industry input to assess the levels of qualification now available – and needed in future – to create South Africa's concrete infrastructure, Dr Rod Rankine, Education and Training Manager of C&CI, said in Midrand at the launch of the database.

He said: 'Unit standards are the building blocks that make up qualifications. They define the scope, learning level and minimum out-

comes required before a learner can be declared 'competent'. Without meaningful contribution from employers - who will recruit personnel with unit standard qualifications - the unit standards become nebulous documents that hinder rather than promote progress.

'Historically, the Standards Generating Bodies (SGBs) have provided a forum for industry players to define their specific requirements for qualifications and the unit standard derivatives. Unfortunately, in our industry, such participation has been disappointing. Construction companies do not appear to have appreciated the importance of investing time and effort in this process,' explained Rankine.

He said that the problem had been compounded by the fact that, until now, it had been virtually impossible to establish what concrete unit standards and qualifications existed because there had been no rigorous process for listing new documents and tracking the progress of proposals and revisions. The new C&CI database had now overcome these difficulties by collating everything and making it accessible online.

In compiling the database, C&CI had discovered several inaccuracies in the existing SAQA database, Rankine said. 'As part of our new online database, C&CI wants to review and evaluate concrete unit standards. We need to identify the gaps and overlaps, and initiate new standards and review learning materials and teaching methods for NQF compliance. But this will be impossible without input from industry,' he stated.

Rankine said there were, for example, no listed unit standards for concrete industrial floors or concrete roads. There were also no unit standards for concreting in hot and cold weather, nor mix designs for special applications, such as low-density concrete.

Rankine and consultant Wim van Steenderen have now listed 171 cement- or concrete-related unit standards of which 134 had been registered with SAQA and 37 are in draft form.

Anyone with Internet access can search the new online database using either key words, unit standard ID numbers, or titles. The website also provides clear instructions for users who wish to recommend changes or develop new unit standards and qualifications. There is even a facility for visitors to provide feedback and suggestions.

The database also contains links to databases of concrete unit standards and qualifications in

New Zealand, Australia, the United Kingdom and Ireland. Rankine emphasised that it would be foolish – and a waste of resources – to reinvent the wheel by writing new South African unit standards without checking whether other countries had already done the same. Those standards could serve as a point of departure and, if necessary, be modified to suit local conditions.

He said the courses offered by the School of Concrete Technology need to take cognisance of the evolving needs of the industry. South Africa currently faced a desperate civil engineering and construction skills crisis. 'Unless we provide more relevant education to meet this demand, our nation will have no option but to import skills from places like Asia. This would be a great shame when 40 % of our fellow South Africans currently need jobs.

'We believe that our efforts to make these unit standards and qualifications more accessible to industry, will enable us to provide education that is appropriate and relevant to the needs of our nation.'

SA CONSULTANCY BECOMES MAJOR PLAYER IN AFRICA

THE BOOMING CELLULAR telephone industry in Africa has opened up lucrative new markets for a Pretoria-based ITC company.

Exponent – one of the largest electronic payment facilitators in South Africa – has successfully entered markets in Malawi, Gabon, Tanzania, the Democratic Republic of Congo (DRC), Congo, Uganda, Zambia, Kenya, Niger, Sierra Leone and Burkina Faso.

Exponent CEO Marius Pels said while doing business in the rest of Africa was not for the faint-hearted, the rewards were enormous.

'We have been installing a point of sale application that has been integrated into post and prepaid billing applications in towns and cities across the continent and we have done very nicely for ourselves.

- ▶ **Japan:** 'Air Suit – Housing Renovation', Hiroshima. Urban housing renovation through the creation of an 'air suit' which acts as a new skin/envelope to improve economic and ecological performance
- ▶ **Morocco:** 'Équipements Socio-économiques dans un Douar de Montagne', Tamtarga. A community empowerment facility located in a mountain village in Morocco using local materials and construction technology
- ▶ **Philippines:** 'Concrete Substrates

- for Accelerated Coral Restoration'. Pre-cast concrete elements used to assist the regeneration of the marine environment using incremental infrastructure.
- ▶ **South Africa:** 'Caravan Site Upgrade', Nieuwoudtville. Eco-systemic driven design for upgrading an existing caravan site within an ecologically sensitive zone
- ▶ **South Africa:** 'Tsoga Environmental Centre and Local Sustainability Catalyst', Cape Town. Project aims to catalyse sustainable

- livelihoods by serving as a demonstration of environmentally sound construction practices
- ▶ **Spain:** 'Metropol Parasol', Seville. Revitalisation of a historic town square by combining cultural and commercial requirements in an integrated public space
- ▶ **USA:** "'New Sustainable California Academy of Sciences', San Francisco. The project integrates concerns about sustainability and architectural design in the construction of a major public building

- ▶ **Venezuela:** 'Proyecto Integral Habitación Física San Rafael-Unido', Caracas. Urban improvement project including social aspects of a large shanty town in Caracas, Venezuela

▶ **Holcim Foundation for Sustainable Construction**
Hagenholzstrasse 85, CH-8050
Zurich/Switzerland
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www.holcimfoundation.org

'There is no question that it takes a certain amount of pioneering spirit to deal with local conditions but once one understands these social, cultural and economic differences, the payback is enormous.'

Pels said the main reason why his company had succeeded where so many other South African players in the African market had failed was because it did not try and impose a South African solution on an African problem.

'In South Africa specialised cellular shops are plentiful and airtime is readily available from supermarkets and other vendors.

'In many parts of especially rural Africa, these concepts don't exist and we might have to install a point of sale airtime terminal at the local equivalent of a spaza shop. By embracing these differences rather than trying to fight them, we have established an admirable track record for ourselves across the continent.'

Working in collaboration with one of the largest cellular providers in Africa, Celtel, Exponent has helped extend the reach of the Celtel footprint across the continent.

'While vast areas of the continent remain largely undeveloped, certain countries like Nigeria are a lot more sophisticated than many South African business people give them credit for. While there are still a number of infrastructural problems such as poor roads and an erratic power supply, the other reality is that many of the people we do business with have degrees from Oxford, Cambridge, Harvard and MIT and are extremely savvy.'

Pels said economic colonialism was alive and well in Africa with South African entrepreneurs often attempting to impose Johannesburg-based business solutions on the African business community.

'We have developed a good understanding of

the African environment. Because of that we are able to provide airtime sales solutions wherever the need exists be it in the deep rural reaches of the Congo or in urban Tanzania,' Pels said.

The close relations between President Thabo Mbeki and many African leaders has played an important role in the influx of South African corporates entering the African market and had created a more secure environment for private enterprise in the country.

'Every time we board an aircraft for some deep rural destination in central, East or West Africa, we are very aware that we are leaving first world medicine and health care service behind. We are also very aware that armed hostilities in certain parts of the continent have not been fully resolved,' Pels said.

Other issues that affect doing business in Africa is the fact that good hotels generally are extremely expensive. Support services for appliances such as laptop computers and overhead projectors are often difficult to come by.

'Make sure that you carry any spare parts that you might need with you. Don't depend on the local infrastructure to meet your sophisticated first world needs,' Pels said.

An important part of doing business in Africa was to have a local partner who knew local trading conditions and who was familiar with local red tape.

Marius Pels

Exponent

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CONCRETE PIPES CHOSEN FOR LEEUWKOP RELIEF OUTFALL SEWER

CONCRETE WAS THE pipe material of choice in the construction of the Leeukop Relief Outfall Sewer (Leros), a 4,5 km sewer pipeline which was built to relieve the over-burdened Northern Outfall Sewer.

Completed in April for approximately R52 million, the project is notable in that several construction techniques were employed, including traditional pipe trenching, pipe jacking, tunneling, and the erection of a bridge spanning approximately 240 m across the Jukskei River.

The pipeline consists mainly of buried concrete pipe 1,5 m in diameter, apart from a 600 m D-shaped tunnel, and the bridge which supports twin 1,5 m diameter concrete pipes.

The project was commissioned and designed by Johannesburg Water, and consulting engineering concern, Goba (formerly Goba Moahloli Keeve Steyn), was appointed to project manage the installation and supervise construction. The concrete pipes were supplied by CMA member Southern Pipeline Contractors.

Three main sewer lines serve the northern suburbs of Johannesburg: the Delta Line, which cuts through Delta Park and follows the Braamfontein Spruit; the Cydna Line, which roughly follows the M1 highway; and the Bruma Line, which serves the northeastern nodes such as Edenvale, Alexandria and Kelvin close to the N3.

Leros was designed to tap into the Bruma outfall sewer at Barbeque Downs and divert the primary flow of 3 m³ per second away from the Northern Outfall Sewer into the Diepsloot Tunnel. The latter runs from Paulshof and Sunninghill through Lonehill, linking up with the large sewer pipe bridge near Dainfern.

► This 240 m bridge, designed by Arup, was built to support the Leeukop Relief Outfall Sewer (Leros) concrete pipeline over the Jukskei River. The bridge carries twin 1,5 m diameter pipes for maintenance purposes. The pipes rest on concrete saddles which lie on reinforced concrete decking slabs covered with a screed. These are supported by concrete piers and a steel superstructure, the latter comprising tubular steel lattice work



LEROS is situated above the northern outfall sewer which it crosses before descending into the Diepsloot tunnel. Much of it runs through the Leeuwkop Prison grounds, with a gravity induced flow rate with a fall of 1:500.

Located close to the convergence of the R55 and the Jukskei River, Barbeque Downs is approximately one kilometre south of the Kyalami race track. From Barbeque Downs the pipeline threads its way under a small stream before entering the tunnel. Some 600 m long, it passes under some high ground, before terminating approximately 40 m inside the Leeuwkop prison grounds.

Designed as an open channel flow system, the completed tunnel profile has a 'D' section, 1,5 m wide and 1,5 m high. Under design flow conditions it will run 80 % capacity, but can accommodate higher flows when running full.

Construction of the tunnel commenced with the sinking of two temporary access shafts at each end, both approximately 7 m deep. The tunnel was excavated from two headings using drill and blast methods, followed by a cast in-situ concrete lining 250 mm thick. The tunnel excavation was predominantly in Halfway House granites, although two diabase dykes were crossed, the latter being some 25 m wide. Ground cover over the tunnel was generally low, the maximum being 20 m.

Rock quality varied from highly to reasonably weathered. It was heavily jointed in places, making tunneling problematic at times. Rock support varied from a light pattern of 1,5 m long rockbolts to steel arches with lagging plates in highly jointed areas, the latter covering some 200 m of the tunnel.

Beyond the tunnel, trenched pipeline using the 1,5 m diameter concrete pipe was resumed. The pipes were buried underground with bedding material and sealed at the joints with rubber O rings. Pipe bedding was carefully selected and placed to ensure that no differential settlement would occur. Both the bedding and backfill material were compacted to provide a consistent base and surround for the pipes. The backfill comprised local material from borrow pits as well as some imported material.

The pipeline was directed under one of the prison's tarred roads and a pipe jack system was used to insert concrete pipes under the road. Thereafter cut and cover pipeline construction was resumed to extend the line to the banks of the Jukskei River.

A bridge, designed by Arup, comprised eight spans of approximately 30 m each was constructed to support the pipeline over the river. The bridge itself was constructed with concrete piers and a steel superstructure comprising tubular steel lattice work. This supported reinforced concrete decking slabs covered with a screed and concrete saddles to support the pipeline. The bridge carries two 1,5 m diameter pipes to enable one pipe to be shut down for maintenance while the other remains operational. Heat reflective paint was used on the bridge piping so as to minimize thermal movement.

Normal trenching resumed from the bridge to the Diepsloot Tunnel.

The main contractor on the project was the Cerimele Phenduka Civil Joint Venture. The sub-contractors employed on various elements of the project included: Bomar Construction for the tunneling work; Esor for the pipe jacking; Tass Engineering for the manufacture of the bridge steelwork super-structure; and Bishop Construction, who was responsible for the concrete work on the bridge piers and the pipeline transition structures, the Bruma take-off structure and the Diepsloot drop structures.

CMA director John Cairns says there are several factors why concrete is still the best material for outfall sewer applications.

'As a recent independent survey conducted by LHA Management Consultants has shown, concrete is a highly effective piping material. Unlike flexible plastic piping which is a conduit only and requires a support structure to be built around it, concrete piping offers both a conduit and its own rigid structure,' said Cairns.

KAYTECH'S GRASSFENCE ROOTS OUT EROSION PROBLEMS

PRODUCTS FROM the Kaytech stable have again played a major role in combating erosion in the Umhlanga Rocks area in KwaZulu-Natal. The first occasion was when BCP Engineers of Westville developed the Geo Step, a unique erosion inhibitor which was successfully used to rehabilitate a massive canyon caused by heavy rains as well as vegetation loss below the Gateway complex. In this instance, Kaytech's bidim A4 was used and more than 5 000 m² of the product were installed to construct a series of Geo Steps.

Now, Kaytech has again come to the rescue, this time at Izinga Ridge, a prestigious new residential development also in Umhlanga Rocks. Phase One of this development straddles a watershed which borders the existing residential area to the east and cultivated sugarcane fields to the west. This phase – which comprises some 11 ha – was completed in November 2004.

Comments Mark Weedon of consultants Goba (Pty) Ltd: 'Before construction started, we discovered that there was extensive erosion in the two natural watercourses on the western side of the development. The erosive nature of the insitu Berea Red sandy material, together with the steepness of the terrain and the slope of the watercourse (it averages 1:9), resulted in erosion continuing unabated. With the development contributing to the stormwater run-off in these watercourses, the watercourses needed to be rehabilitated and some form of erosion protection needed to be implemented.'

After backfilling the eroded watercourses with 'clayey' material, a short-term solution was sought that would be cost-effective. The solution



The start of the Izinga Ridge erosion control project in November 2004



This photograph taken in April 2005 vividly illustrates how well the Kaytech product has performed in only five months

would also not be limiting in the planning and design of future phases, yet effective in mitigating erosion of the watercourses.

Once the future phases have commenced, which is imminent, the formalised stormwater system will be extended down the watercourses and run-off will be safely discharged into the existing stream.

Moreland Developments, the developers of Izinga Ridge, in conjunction with consultants Goba (Pty) Ltd, chose GrassFence, a new generation erosion control geotextile from Kaytech, as the preferred product which met all the requirements stipulated by the consultants. The product is aesthetically pleasing and is reinforced with a scrim to prevent excessive bulging of the GrassFence under the loading of the trapped sediment.

'The product was selected as a temporary measure to help prevent erosion, allow the rows of Vetiver grass – used in together with the product – to take root as well as allow the existing grasses and vegetation to re-establish,' says Greg Veerasamy of Moreland Developments. Immediately below the culvert outlet the product was laid horizontally (as GrassRoots) to protect the invert of the in situ channel. Down the rest of the valley depending on the slope, GrassFence was staked vertically at intervals of between five and seven metres, parallel to the contours. Placed vertically, the product traps any transported sediment and retards the velocity of the run-off.

It is an economical solution as coverage of the whole area is achieved by the spacing of the product, that is, although sold at a linear metre rate, the effective coverage in square metres is taken as the linear metre cost divided by the spacing centres. From the storms experienced since installation where flows have been in the order of 0,5 m³/s, GrassFence has to date performed exceptionally well in preventing significant erosion from occurring.

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Text Mike Deeks
SAICE president, 2005

President's Report

I FEEL PRIVILEGED to have served as president of SAICE during what has been a watershed year for the Institution in many respects – having seen the adoption of a new constitution and by-laws (instituted by my predecessor, Ron Watermeyer), SAICE's move to our own building, a radical increase in our annual budget (now close to R10 million), and the realisation of the research report and publication of *Numbers and Needs*, so successfully carried out by Past President Allyson Lawless, to mention just a few.

SAICE has enjoyed a year of increased relevance and recognition of its role against the backdrop of industry developments such as the imminent and long-awaited boom in construction activity in infrastructure and other capital projects, the now acknowledged impending acute shortage of civil engineering skills, and the erosion of technical skills and politicisation of appointments within local authorities.

SAICE STRUCTURES Branches

During the year, it was realised that the Wits Branch had reached the stage where it was no longer viable and the decision was taken to close the branch, with all responsibilities in respect of services to members reverting to National Office. This is not expected to have a significantly negative impact on the services enjoyed by members in this region, but is based on a realisation that many of these typical branch services are already available to its members through the locally domiciled divisions as well as National Office.

Divisions

A decision has been taken in principle to create two new divisions – the International Division, which will supersede and replace the current SAICE/ICE Joint Committee, and the Project Management Division, which will hopefully enjoy the support of the members of the PDM Panel as well as members of SAICE who are registered professional project and construction managers.

Section 21 Company

SAICE's Section 21 Company has held its first meeting but has yet to become fully operational and effectively resourced for the projects it intends to undertake.

National Office

It has been identified that National Office staff continue to work far in excess of normal capacity and the issue of effective resourcing, including transformation imperatives, versus what services need to be provided to members are being addressed by a small task team already identified for the purpose.

PRESIDENTIAL VISITS

Presidential visits began only in June, later than is the norm, as Executive Director Dawie Botha was overseas on long leave in late April and May, which tended to compress the visits into a shorter period. Fifteen branch visits have been undertaken.

My wife, Michèle, accompanied me on visits to four of the branches, an experience which she thoroughly enjoyed, and would have participated in more but for our younger daughter's matric exam timetable. I wish to express our gratitude for the warm hospitality of our host branch committee members and their spouses, and to Dawie and Ria Botha for their excellent company on our visits.

The opportunity presented was used not only for pleasurable social interaction with the committee and members, but also for presentations on specific issues of topical interest such as CPD, identification of work, SACPCMP, skills availability and general industry prospects. Where the opportunity presented itself, a presentation was also made on the theme of my presidential address, 'Safety in Numbers for Construction'.

Protocol contacts with local politicians and decision makers and also less formally with SAICE's members were not always as effective as one would have hoped; preplanning and communication ahead of these visits should be given greater attention in future.

CONTACTS WITH TERTIARY EDUCATION INSTITUTIONS

During presidential visits and on other occasions, five addresses were delivered to students and staff of universities and universities of technology.

PROFESSIONAL MATTERS

Engineering Council of South Africa

During the year our usual high level of contacts with ECSA continued. I have taken leave of absence this year from my duties on the PAC (Civils), but still undertook a few interviews of applicants. I also participated on a panel of presidents convened to make representation to the Minister on members to serve on Council of ECSA.

The Minister's appointment of members to serve on the 50-person new Council from 24 November includes 28 % SAICE members, including four past presidents and our president elect, Sam Amod. SAICE's unique role is recognised by ECSA as the largest of its 'voluntary associations'.

South African Council for Project and Construction Management Professions

SAICE is recognised by SACPCMP as a 'voluntary association' and in that capacity Executive Director Dawie Botha and I served during this year on its VA Committee, attending monthly meetings. We have continued to play a leading role in professional matters at SACPCMP, including nominating representatives to serve on committees for identification of work, continuing professional development and professional fees.

The new ten-person Council appointed by the Minister includes a SAICE member for the first time, our president elect (who finds himself in the unique position of serving on ECSA's Council as well!).

Identification of work

The process of formulating identification of work proposals among the six built environment professions has taken place at varying pace. Thanks to the sterling efforts of Past President Ron Watermeyer, ECSA

SAICE has enjoyed a year of increased relevance and recognition of its role against the backdrop of industry developments such as the imminent and long-awaited boom in construction activity in infrastructure and other capital projects, the now acknowledged impending acute shortage of civil engineering skills, and the erosion of technical skills and politicisation of appointments within local authorities

has formulated its proposals and published these for comment.

It is anticipated that, once adopted, identification of work for engineering and other professions will require a change of approach to the current practice of appointment of non-technical personnel in positions requiring professional registration.

Continuing professional development

ECSA has published its CPD policy and detailed process, due to be implemented from January 2006. Particular thanks are due to Vice President Johan de Koker, who championed this initiative within ECSA.

SAICE will have a unique role – as a provider of CPD services to its members and as a ‘verifier’ (on behalf of ECSA) of CPD courses offered by other service providers. Detailed proposals have been developed for these activities, which are expected to contribute in fair measure to SAICE’s future income.

INTERNATIONAL

As secretariat of the Africa Engineers Forum (AEF), in March SAICE hosted the highly successful and well-attended AEF Workshop on Water and Sanitation.

In June SAICE hosted a visit from ICE’s Keith Seago, Vice President: Regions and Amar Bhogal, Deputy Director General (since retired). This opportunity allowed SAICE to engage our ICE colleagues on a broad range of issues as well as the future form of our cooperation and how best to serve the interests of our joint members.

Dawie Botha, Carla de Jager and I attended ASCE’s Conference in Los Angeles in the last week of October, giving us further opportunity for networking with our American and other international colleagues. A separate report on this visit and the themes of ASCE’s conference will be made available in due course. Dawie Botha also attended the WFEO meetings in Puerto Rico in October. The UNESCO Forum planned for Maputo in November has been postponed and is likely to take place in South Africa in early 2006.

PUBLIC RELATIONS

SAICE has enjoyed a high public profile this year, with an (albeit frustratingly brief) television and several radio interviews on the matter of the civil engineering skills crisis. We have also issued a public position statement on the issue of the erosion of civil engineering skills in local government and have written to the Deputy President over her remarks on this matter in Parliament.

SAICE has adopted a new cleaner and more modern logo and this will be rolled out on all future applications as required, and in accordance with corporate identity guidelines to be developed. The stocks of SAICE’s brochure have been depleted and an updated version is being compiled as a matter of urgency.



Our magazine, *Civil Engineering*, and our journal have received widespread acclaim for their quality and appearance and the respective panels are to be congratulated on their success. The increased magazine advertising revenue has made a significant contribution to SAICE’s improved financial position.

FINANCES

As stated above, SAICE currently has an annual budget close to R10 million, with a very significant contribution to income coming from sources other than member subscriptions. The Finance and Administration Committee, under the leadership of Vice President Martin van

Veelen, are congratulated on their performance during the year in putting SAICE on a sound financial footing and in containing increases in member subscriptions.

The new funding formula for branches and divisions is being rolled out and should bring a higher level of corporate governance to our financial management.

SAICE moved into its own building in Thornhill Office Park in April and the bold decision seems to have been a wise one, with much enhanced facilities available to individual members and structures. The cost to the Institution will be more easily managed in the future, particularly if branches and divisions continue to support this by investing their funds in the common SAICE ‘pool’.

CONCLUSION

As the end of my presidential year approaches rapidly, I would like to thank Executive Director Dawie Botha and his seemingly tireless staff at National Office, all office bearers, committee and panel chairmen and members, Council members and indeed the whole SAICE ‘family’ for the guidance and support they have given me during the past ten months. I must also acknowledge within this forum the unequivocal support given to me by my employer, Murray & Roberts, and my team members, which enabled me to take on this role. Lastly, I must thank Michèle and our children for their love and encouragement during what must at times have been a challenging year for them.

This year has been one of great enjoyment and personal growth for me and I will treasure its memories for a long time to come. With only a few official duties left to fulfil this year, I look forward eagerly to taking up my place on Council in 2006 as immediate past president under Sam Amod’s able stewardship.

Mike Deeks
President 2005



National Science and Technology

THE ANNUAL National Science and Technology Forum (NSTF) Awards recognise individuals and organisations for outstanding contributions in the fields of science, engineering and technology (SET). In the words of Denis Hunt, who was chief adjudicator in 2004, NSTF hopes that this recognition will 'encourage other individuals and organisations to greater efforts since it is only through the efforts of individuals, either on their own, or collectively in organisations, that science and technology will flourish'.

The winners of the 2004 NSTF Awards were announced in May. SAICE, as a member of NSTF, is proud to have been involved in the 2004 adjudication process through its executive director, Dawie Botha, who serves on the NSTF executive committee in his dual role as current chairman of the executive committee of SETAG (Scientific, Engineering and Technological Societies and Allied Professions Group of SA) and as SETAG's engineering representative at NSTF. In this capacity he was instrumental in the nomi-

nation of two prominent SAICE members as adjudicators, namely Professors Alex Visser and Elsabé Kearsley, both of whom are known for their research expertise.

Of particular interest to SAICE is the representation of mathematics advocates among the finalists, especially in view of SAICE's ongoing attempts to promote improved mathematics and science education among learners.

Finalist Professor John Webb, Department of Mathematics, University of Cape Town, has popularised mathematics in all sectors of South Africa with his quarterly magazine *Maths Digest*, which has reached around 140 issues and is distributed to 2 000 schools. His pioneering work in mathematics competitions and in the Mathematics Talent Search has improved the performance of disadvantaged learners. He is mainly responsible for South Africa's success in the International Mathematics Olympiad through his focus on having learners apply themselves to problem-solving and lateral thinking by exposing them to appropriate challenges.

Professor Jan J A Smit, Director, School of Science, Mathematics and Technology Education, North-West University, Potchefstroom, is another such advocate among the finalists. His contribution to science and mathematics education in South Africa through in-service training of science and mathematics educators has been of immense value. His research is focused on real problems in South African science education, and research results are implemented in training programmes. He is the author of the popular book *Quarks, crickets and catfish through the eyes of a physicist*.

The contribution to science and mathematics of finalist AMESA (Association for Mathematics Education of South Africa, University of the Witwatersrand) is the promotion of excellence in research across the whole spectrum of mathematics, school mathematics curriculum policy development and mathematics teacher education. As a professional organisation AMESA played a mandatory role between mathematics teachers, researchers, teacher educators and government at the time of

► **The 2004 NSTF Awards were presented by Minister Mosibudi Mangena, Minister of Science and Technology and patron of the NSTF Science and Technology Awards. The winners were as follows:**

► Category A

An individual over a lifetime

Professor George F R Ellis, Emeritus Distinguished Professor, Department of Applied Mathematics, University of Cape Town
Runner-up Professor Peter I Folb, Chief Specialist Scientist, Novel Drug Development Platform, MRC, Parow

► Category B

An individual through research and its outputs over the last five years or less

Professor Paul D van Helden, Co-director, DST/NRF Centre of Excellence in Biomedical TB Research, Faculty of Health Science, University of Stellenbosch
Runner-up Dr Olive Shisana, Executive Director, Social Aspects of HIV/Aids (SAHA) Research Programme, HSRC, Cape Town

► Category C

An individual through activities other than research and its outputs over the last five years or less

Dr Steve J Lennon, Executive Director (Resources and Strategy), Eskom, Johannesburg
Runner-up Dr Theresa-Anne Davies, Chief Executive Officer, Jobworx, Durban

► Category D

A corporate organisation over the last ten years

Joint winners
■ Kumba Resources Research and Development, Pretoria
■ Kirstenbosch Research Centre, South African National Biological Institute, Cape Town

► Category E

An SMME over the last three years

Groupline Technical Ceramics (Pty) Ltd, (GTC) Jet Park, Ekurhuleni

Runner-up Hazleton Pumps (Pty) Ltd, Centurion

► Category F

A not-for-profit organisation over the last three years

Agribusiness for Sustainable Natural African Plant Products (ASNAPP), Stellenbosch
Runner-up South African Society for Intelligent Transport Systems (SASITS), Johannesburg

► Category G

Eskom Research Capacity Development Awards – Researcher for research capacity development over the last 5–10 years

Male winner Professor Jonathan D Jansen, Dean of Education, University of Pretoria
Female winner Professor S Priscilla Reddy, Director, Health Promotion Research and Development, MRC, Parow

► Category H

T W Kambule NRF Research Awards – Senior black researcher over the last 2–5 years

Male winner Dr Giovanni Hearne, Senior Lecturer, Physics, University of the Witwatersrand
Female winner Dr Olive Shisana, Executive Director, Social Aspects of HIV/Aids (SAHA) Research Programme, HSRC, Cape Town

► Category J

T W Kambule NRF Research Awards – Junior black researcher over the last 2–5 years

Male winner Professor Vikash Sewram, Chief Specialist Scientist, MRC, Parow
Female winner Dr Debra Meyer, Senior Lecturer, Department of Chemistry and Biochemistry, University of Johannesburg

Forum 2004 Awards

rapid curriculum policy change, serving as an important link between government and the mathematics education community. Through its publications and its teacher development programmes and activities, which are geared to the popularisation of mathematics, AMESA reaches teachers and learners in historically disadvantaged areas and contributes to the development of leadership and excellence in mathematics education at all levels.

The inclusion of SASITS (South African Society for Intelligent Transport Systems) as a finalist is also of interest to SAICE, especially to its Transportation Division. This Section 21 company contributes significantly towards safer and more efficient transport in South Africa through collective activities designed to stimulate the growth and modernisation of a local ITS industry to supply products, systems and systems

integration for local needs. Transport is of immense importance to the economy and the ability to move people and goods efficiently and safely is of critical concern. SASITS achieved runner-up status in the category 'A not-for-profit organisation over the last three years'.

Other finalists whose research would be of interest to SAICE were:

- ▶ Professor **Leon van Rensburg**, Department of Plant and Soil Sciences, Environmental Science and Development, University of North-West, Potchefstroom
- ▶ Professor **Tshilidzi Marwala**, School of Electrical and Information Engineering, University of the Witwatersrand
- ▶ Professor **Nelson M Ijumba**, Dean of Engineering, University of KwaZulu-Natal
- ▶ Dr **Jannie P Maree**, Fellow, Division for Water, Environment and Forestry, CSIR

Of particular interest to SAICE is the representation of mathematics advocates among the finalists, especially in view of SAICE's ongoing attempts to promote improved mathematics and science education

- ▶ Dr **Giovanni Hearne**, Senior Lecturer, Physics, University of the Witwatersrand
- ▶ **Kumba Resources** Research and Development, Pretoria
- ▶ **Water Harvesting Group**, ARC, Pretoria □

SAICE's October 2005

LIKE PREVIOUS October Council meetings, 'communication' was again the golden thread woven through the fabric of the day, resulting in fruitful discussions on various matters of immense importance to SAICE members. The following snippets offer a brief summary of the proceedings.

2006 BUDGET AND MEMBERSHIP FEES

Council approved a budget of close on R10 million and a nominal increase of 5 % in membership fees for 2006. It was reiterated that around 80 % of membership fees are channelled back to members in the form of the magazine and journal, the administration grants to branches and divisions, the benefit of the discount on registered members' annual ECSA fee, and the incalculable advantages to members that are effected through SAICE's continued negotiations and communication with industry and government.

IDENTIFICATION OF WORK

The Built Environment Professions Acts of 2000 require consultation with voluntary bodies and persons who might be affected by any laws regarding the identification of the type of work which may be performed by persons registered in any categories provided for in these Acts. ECSA established an Identification of Work Steering Committee to develop proposals in this regard and SAICE's 2004 president, Ron Watermeyer, played an enormous role in the workings of this committee.

Ron explained that the steering committee had developed a baseline report and a Framework for the Identification of Engineering Work, both of which have been posted on the ECSA website for comment (www.ecsa.co.za). The baseline report proposes a procedure to specify engineering work that needs to be reserved for registered engineering persons and provides a preliminary list of identified engineering work functions to be reserved. The framework firstly sets out the approach to the identification of work, secondly establishes the manner in which work for categories of registered persons may be identified, and thirdly provides the logical framework for the development of regulations. The ECSA Council will have to submit these recommendations to the Council for the Built

Environment (CBE) for further consultation and integration with the other built environment professions.

CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

Registered persons are required by the ECSA Code of Conduct to practise strictly within their area of competence and to maintain and enhance this competence. To ensure compliance, CPD will be more formalised in future. Tom Mckune of the SAICE Education and Training Department clarified the three categories from which a total of five credits per annum have to be accumulated:

- Developmental activities
- Work-based activities
- Individual activities (one credit for membership of SAICE, that is, 20 % of the requirement)

At least one credit, maximum four, per annum must come from the first category, which is why SAICE seriously involves itself with offering lectures, courses and conferences to its members. On behalf of ECSA, SAICE will also act as a verifier of CPD courses offered by other service providers. Regular updates on CPD issues will appear in future issues of this magazine.

STRUGGLING SAICE UNITS

For various reasons some branches and divisions are struggling to meet their obligations. This has resulted in inadequate servicing of the professional needs of the SAICE members in these units – no project award nominations, no bridge building, no career guidance initiatives, no best student awards, no recognition and nomination of eminent members to the rank of SAICE Fellows, no CPD opportunities being created, no professional networking. Various possible solutions to this problem were discussed. It was then decided to request SAICE members to send their suggestions to Johan de Koker (JohandeK@spoornet.co.za) for further debate.

PROPOSED NEW DIVISIONS AND INTEREST GROUPS International and Project Management Divisions

In this regard please refer to the 'President's Report' on page 32.

Diversity Focus Group

In order to create an enabling environment for various groups of members who do not currently have a critical mass within the Institution and who might therefore be feeling marginalised, it was decided to test the viability of an interest group representing, for example, women, students, technicians and technologists.

History and Heritage Panel

Civil engineering professionals leave important landmarks and over the years many of these accomplishments were documented by various parties, often independently of the Institution. A dedicated group is needed within the Institution to coordinate these efforts. It was therefore decided to establish the History and Heritage Panel, to be led by Tony Murray. Interested members are invited to contact Tony (asmurray@iafrica.com).

SPEBS

Council was briefed on the activities of the SAICE Patrons' Engineering Bursary Scheme (SPEBS). To date 233 bursaries have been granted to 142 students during various levels of their courses leading towards the National Diploma or Degree in Civil Engineering. It was heartening to be reminded again that SPEBS, which is administered wholly from donations, receives a large chunk of its financial support from SAICE branches and divisions, and from SAICE members in their private and/or business capacity.

SAICE BEST PAPER AWARDS FOR 2003 AND 2004

The publication of technical papers on civil engineering has been a core function of SAICE since 1903 and distinguishes the Institution as a learned society. Ron Watermeyer, 2004 president, initiated the resurrection of an award to the best paper, which is to be selected from papers published in the previous year in the SAICE Journal. The following papers were selected as the best papers for 2003 and 2004 and certificates were handed to those authors who were able to attend:

Council meeting



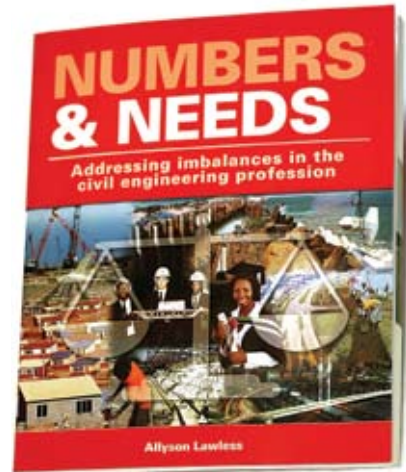
► **SAICE Best Paper Award for 2003**

Kobus van Zyl and Marietjie Husselmann with Ron Watermeyer



► **SAICE Best Paper Award for 2004**

Jaco Liebenberg with Ron Watermeyer



► **Book launch**

Numbers and Needs – a must-read handbook

2003

Potential application of end-use demand modelling in South Africa – J E van Zyl, J Haarhoff, M L Husselmann (vol 45, no 2)

2004

Towards a mechanistic structural design procedure for emulsion-treated base layers – J J E Liebenberg, A T Visser (vol 46, no 3)

BOOK LAUNCH

The results of the SAICE Allyson Lawless Skills Research Project were launched in book form as part of the Council proceedings. *Numbers and Needs* is deemed to be the definitive work on this matter and is considered a world first as well as a must-read handbook. (See page 40 of our October issue for more details.)

CONCLUSION

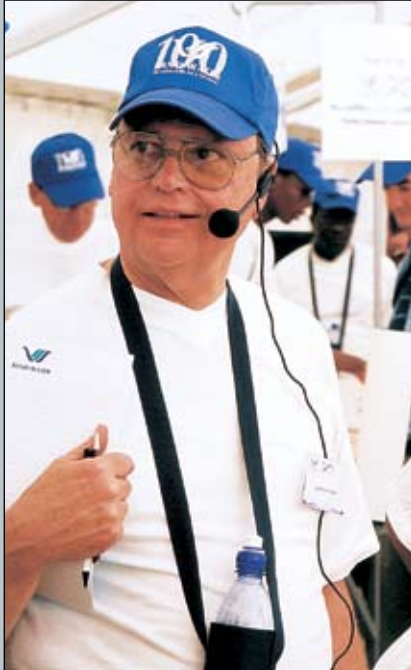
Council members left the meeting feeling confident that their concerns are being addressed by the Institution and that being a member of this respected family makes professional sense!

► Report compiled by Verelene de Koker, assisted by Dawie Botha

Obituaries

Lourens Human A quiet, special person

SAICE AND RAND WATER are mourning the death of Lourens Human. His passing away on 19 July 2005 came as a shock to all. His colleagues at Rand Water had wished him well on his retirement as recently as December 2004. At SAICE National Office he



still attended meetings, never neglecting to do a quick round to say hello to everybody.

Thirty-six years ago Lourens became a member of SAICE and we at National Office came to know him as a dedicated member who contributed generously to the activities of the Institution. He had a passion for water engineering and served on the Institution's technical division for water engineering for many years, also as chairman.

When SAICE turned 100 in 2003, the Institution approached Rand Water, which shared centenary status with SAICE at that time,

to establish a water competition for schools. This joint venture, the Rand Water-SAICE Centenary Schools Water Competition, is now in its third year and doing very well. Lourens not only became our link with this initiative, but was its real father, undoubtedly inspiring many youngsters to consider studying civil engineering.

Professor Kobus van Zyl of the University of Johannesburg stated: 'Lourens Human played a pivotal role in the establishment of the Rand Water-SAICE Centenary Schools Water Competition. He was one of the people who initiated the competition, and he took on the main responsibility for running it. I think it is safe to say that without Lourens's commitment and dedication, there would not be a competition today.'

Lourens will be remembered by his family and friends not only as a meticulous worker, but as a very kind person with a ready smile, perseverance, patience and a tranquillity that he transferred to all who met him – a true gentleman!

Of Lourens Human it can be said:

*Not how did he die, but how did he live?
Not what did he gain, but what did he give?
These are the units to measure the worth,
Of a man as a man, regardless of birth.
But had he befriended those really in need?
Was he ever ready, with word of good cheer,
To bring back a smile, to banish a tear?
Not what did the sketch in the newspaper say,
But how many were sorry when he passed away.*

(Name of poem and poet unknown)

The exceptionally large funeral was testimony to the worth of a very special person.

SAICE salutes this valued member!

Roy Petersen, 1938–2005



ROY FREDERICK PETERSEN, former provincial roads engineer in the Western Cape and Fellow of SAICE, passed away on 25 August 2005 after losing the fight against cancer.

Roy Petersen matriculated at Boys' High School Worcester, attaining a place among the top ten scholars in the former Cape Province. He subsequently graduated from UCT with a BSc (Civil Engineering) followed by a BCom from Unisa in 1969 and a BCom (Hons) in transport economics in 1987.

He joined the Roads Department of the Cape Provincial Administration after graduating. After completing the training course that was applicable to engineers in the department at the time, he was appointed resident engineer for a municipal contract at Barkly East. On its completion he was transferred to the Geometric Design Section and became involved in the interchange design and construction that marked the 'sixties in the Cape.

In 1966 he became resident engineer of the Beaufort West Construction Unit and planned and supervised the building of Meirings Poort Pass between Beaufort West and Oudtshoorn, a project of which he was justly proud.

Roy served on the committee of the Division of Highways and Traffic Engineering of the South African Institution of Civil Engineers from 1982 to 1984.

He also served on the Steering Committee on Roads Safety Research, the CSRA Route Numbering Sub-Committee, CSRA/CUTA Committee on Geometric Standards, the Committee of Transport Officials (COTO), and committees within the community. At one stage he was the chairman of the Metropolitan Transport Advisory Boards of Cape Town, East London and Port Elizabeth.

Roy co-chaired the CODATU congress in Cape Town in September 1998. He enjoyed international recognition for his work in integrated transport planning and public transport.

He became deputy provincial roads engineer in 1991, then, from 1 November 1993, he was acting provincial roads engineer and from 1 April 1995 the acting head of the Department of Transport and Public Works in the Western Cape. On 1 July 1995 he was appointed head of department (deputy director-general) and provincial roads engineer in the Western Cape.

Roy 'retired' on 31 May 2001. However, as a 'contract' employee, until his death Roy continued to manage several important facets of the department's planning programmes, particularly in the public transport field, with heavy emphasis on the Klipfontein Corridor Project.

Our deepest sympathy goes to Annaline and his two daughters, Nicky and Melissa.

GIJIMA

Branch Visits



In the Rheology Lab, Cape Peninsula University of Technology (rheology is 'the branch of physics concerned with the flow and change of shape of matter, especially the viscosity of liquids')



The group with Professor Paul Slatter, slurry expert (left)

Western Cape

Thanks to South African Airways? Or is it Airlink? Or Express? But we only had one choice to get from Upington to Cape Town – one midday flight per day, and that's that. That meant two nights in the Western Cape (not that we minded ...).

Thank you to our hosts for a lovely

dinner at Hildebrand's, which was a bonus in terms of contact time.

Neil Armitage taught us a lesson or two about fitness – if you study at UCT, you have to negotiate stairs, and scurry like rats in the maze of passages to go where you need to go. So we were 'uitasem' when we eventually reached the classroom.

Ninety second-year students and later forty third-year students had the privilege to listen to the president. They will always remember their first encounter with the SAICE leader – hopefully they will meet another forty or fifty or so presidents in their lifetime.

Then on to the next stop. Paul Slatter and his labs at CAPUT – no, they are not KAPOT – do research on pumping anything from toothpaste and handcrème to heavy mining slurries. It is not only interesting, but crucial in our modern economy. And I learned a new word: rheology. Do you know what it means?

Next stop was refresh the innards at The Figtree next to the Liesbeek and then rush to meet the Western Cape committee. Needless to say, we tried to follow Brian Holdridge there, but he drives too fast. Fortunately we could tail Tony to get to Kelvin Grove.

The committee meeting addressed a range of issues regarding communication, money, management of SAICE and other important matters.

Then it was members and awards and presidential address and cocktails and 'old' friends and 'new' friends and colleagues.

Southern Cape

On a dark and stormy Wednesday morning we left the hotel, warded off speeding perils on wet, shiny roads that limited visibility,

only to be confronted by a crowd at the airport. It seemed everybody was waiting to fly somewhere away from Cape Town.

Unfortunately Equity services at Cape Town Airport provided us with a 'memorable' bus ride to the plane:

- A leaking bus
- A bus with one windscreen wiper
- A bus with torn seats
- A bus steamed up, with a driver who battled to see beyond the windscreen – how do you fancy colliding with an aeroplane?!
- A bus that stopped on the wrong side of the plane and then disgorged passengers to negotiate the fuel truck, the fuel pipe, the pouring rain and 30 metres in the howling wind

Well, well ... We survived, but Equity will not if they continue with this treatment of passengers.

Enough of that. The sunrise over the thick cloud dissipated our fears and George appeared in a sea of green.

Willie Claassen and his committee were waiting. They presented their branch award to the Thesen Islands Development and then listened to the president. And then on to Pinnacle Point development to find out how the younger generation of engineering professionals are dealing with fickle fynbos, amazing archeology, frail environments, wonderful opportunities and seaside vistas.

We also had an excellent discussion with livewire local authority councillor Marie de Klerk, who attended the day's activities. She is a fresh breath of air in terms of her contribution and understanding of infrastructure. She was also delighted to receive our *Foundation for the Future* book. Councillors beware, or rejoice, or note! – Here comes a well-informed councillor!

Dankie, Willie en span! □

Magazine features, 2006

THE FOLLOWING ARE our features for 2006. Please send your contributions to the chair of your division/branch, or directly to the editor, Sarie Moolman, at smoolman@netactive.co.za. The sub-feature 'Branches' will have a different format this year, in that branches will be requested to focus on their activities, not projects. Contributions from branches (projects) should be sent to the divisional chair, for instance Geotechnical, Water, etc, or directly to the editor. Shorter articles (one-pagers) are welcome! Please contact Sarie (082-376-2652) if you need more information.

ISSUE	MAIN FEATURE 1 (DIVISIONS [§])	SUB-FEATURE (BRANCHES*)	D-DATE: SUBMISSIONS TO EDITOR
JANUARY	Legal and Management; Health and Safety; Human Resources	Young engineers	20 November 2005
FEBRUARY	Awards	International	2 January 2006
MARCH	Structural [§]	Around Lowveld* and Highveld*	1 February 2006
APRIL	Geotechnical [§]	Around Northern Cape* and North West*	1 March 2006
MAY	Railways and Harbours [§] (Coastal)	Around KwaZulu-Natal (Durban,* Pietermaritzburg* and Zululand*)	3 April 2006
JUNE	Water [§]	International	1 May 2006
JULY	Construction	Around Gauteng (Witwatersrand and Pretoria*)	1 June 2006
AUGUST	Environmental [§]	Around the Eastern Cape (Amatola,* Algoa,* Transkei*)	3 July 2006
SEPTEMBER	Transportation [§]	Around Free State* and Limpopo*	1 August 2006
OCTOBER	Urban and Rural	Around the Western Cape* and Southern Cape*	1 September 2006
NOVEMBER/DECEMBER	IT [§]	Innovations (contributions from inter alia tertiary institutions offering civil engineering courses)	2 October 2006

Date	Event	Presenters	Contact details	Notes
30–31 January 2006	Handling Projects in a Consulting Engineer's Practice	Mr Wolf Weidemann	Dawn Hermanus T 011-805-5947 dhermanus@saice.org.za	Venue: SAICE House, Midrand, Gauteng
2–3 February 2006	Business Finances for Built Environment Professionals	Mr Wolf Weidemann	Dawn Hermanus T 011-805-5947 dhermanus@saice.org.za	Venue: SAICE House, Midrand, Gauteng
21 & 23 February 2006	Roundabouts	Various prominent speakers	Carla de Jager T 011-805-5947 cdejager@saice.org.za	Midrand and Cape Town
23–35 February 2006	International Forum on Engineering and Technology for Poverty Reduction		Carla de Jager T 011-805-5947 cdejager@saice.org.za	Venue: SAICE House, Midrand
14–17 March 2006	The Design of Slurry Pipeline Systems	Dr Robert Cooke Dr Angus Paterson Mr Graeme Johnson Mr Peter Goosen	Terry Carolin T 021-683-4734 terry@pcce.co.za	Venue: Graduate School of Business, Breakwater Lodge, Cape Town
30 May – 1 June 2006	PMSA International Conference 2006	Conference is in cooperation with PMI SA Chapter	Taryn van Olden PMSA Conference Organising Committee +27-82-779-1314 info@cyansky.co.za	Venue: Johannesburg Info: www.pmisa.org.za/conference
6–9 March 2007	e-Transport Conference (SASITS)	Conference	Carla de Jager T 011-805-5947 cdejager@saice.org.za	Venue: Gauteng
21–25 May 2007	CIB World Congress	Conference	Carla de Jager T 011-805-5947 cdejager@saice.org.za	Call for Papers Venue: Cape Town

A note of thanks

Civil Engineering magazine has had a particularly good year. We have received noteworthy and increasing support from many stakeholders, but in particular we would like to acknowledge and appreciate the commitment from our advertisers – THANK YOU! Thank you for being astute and recognising the value of the publication and our audience.

This year we have not only had increased exposure from our loyal, regular advertisers but also bookings from a substantial number of new advertisers. *Civil Engineering* is being exceptionally well received in the marketplace and has once again proven to be a publication that is trusted by the industry.

List of advertisers

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CBI Technical Services / Siyabonga Engineering JV	Kwezi V3 Engineers	Specialised Track Systems (STS)
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Concrete Manufacturers Association (CMA)	Liberty Life	Technocad
Classic Seminars	Lukhozi Consulting Engineers	The Waterproofers
Concrete Society of Southern Africa	Maunsell Australia	TOSAS
Concor Technicrete	MedEdge Placements	Totten Sims Hubicki Associates (TSH)
Con-Fab California Corporation	Melis & Du Plessis	TCTA
Department of Transport	Metricomp	TRG International Pipeline Company
Department of Transport and Public Works	Mills and Otten	TTT Africa
EDM Recruitment	Mine Safety Alliance (MSA)	University of Cape Town
Electra Mining	Model Maker Systems	University of Johannesburg
Elsumo	Much Asphalt	University of Pretoria
Envirocycle	Murray & Roberts	University of Stellenbosch
EPNS	South African National Roads Agency (SANRAL)	University of the Witwatersrand
ERWAT	NCP Chlorchem	UWP Consulting
ESOR	Netcare Travel Clinics	VAE SA
Franki Africa	Network Recruitment (Advtech)	Vela VKE
Glenrand MIB	National Home Builders Registration Council (NHBRC)	Water Resources Consultants
Goba	Pandrol Fastclip	Wits School of Civil Engineering
Golder Associates	Pilequip SA	Worldsvie Technologies (Autodesk)
Grinaker-LTA	RAMCO (Plasserail)	WRP (Water Resource Planning and Conservation)
Hamilton Equipment	PPC	WSP SA
Haw & Inglis (H & I)		ZLH (Zietsman Lloyd & Hemstead)

