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ON THE COVER

The recent arrival of the 9 ton rapid impact compactor acquired by RIC Africa (Pty) Ltd is a welcome addition to the dynamic compaction industry in South Africa. RIC Africa specialises in increasing the bearing capacities and stiffness for various types of soils and applications through rapid dynamic impact loading (see article on page 3)

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SAICE AND PROFESSIONAL NEWS

Innovative new ground improvement method uses controlled dynamic compaction

EXCITING TECHNOLOGY has recently arrived in South Africa. Rapid Impact Compaction (RIC) Africa (Pty) Ltd, which is the only specialised contractor in southern Africa, is a newly formed company situated in Cape Town who specialises in increasing the bearing capacity and stiffness of soils through controlled impact loading.

Dynamic soil compaction methods have historically involved the use of tall cranes and free-falling weights, imposing inherent limitations on the types of sites that can be treated.

The rapid impact compactor (RIC) is a significant enhancement to the dynamic compaction industry. Its carrier is a 45 t track-mounted excavator, allowing improved mobility and site accessibility.

The rapid impact compactor was originally developed in the early 1990s by BSP International Foundations Ltd based in the United Kingdom, in conjunction with the British Military, as a means of quickly repairing damaged aircraft runways.

Dynamic energy is imparted by dropping a 9 t weight from a controlled height onto a patented foot. Energy is transferred to the ground safely and efficiently, since the RIC's foot remains in contact with the ground. Compaction parameters are automatically controlled and monitored from the RIC's cab with an on-board data acquisition system.

COST SAVING

Owing to fast ground coverage and compaction efficiency, this method of compaction generates a significant cost saving over conventional dynamic compaction methods.

FEATURES

The RIC is a welcome supplement to the current suite of ground improvement tools available to the ground engineering community. Its versatility can provide engineers with a more cost-effective means of dealing with poorly compacted or loose shallow deposits.

Key operational features

The RIC impacts the soil at a rate of 40–60 blows per minute using a 9 t weight.

- The drop height of the weight can be adjusted using the in-cab computer to between 300 mm and 1,2 m, allowing the operator to regulate vibration when in close proximity to other structures.
- Approximately 800–2 500 m^2 can be covered in an average single-sift day (depending on the 'blow-per-position' setting).
- The energy is transferred to the soil through a 1,5 m diameter steel 'foot' that rests on the ground surface.
- Measured noise levels are in the order of 88 dBA at 8 m.

Specifications (compaction rig and excavator)

- Height of rig . . . . . 7,90 m
- Length of rig. . . . . 9,45 m
- Width of rig . . . . . 3,5 m
- Approximate working weight . . . . 65 t
- Ram weight . . . . . 9 tons
- Maximum drop . . . . . 1,2 m
- Blows per minute 40–60
- Foot diameter . . . . . 1,5 m

ON-BOARD COMPUTER

The RIC employs an on-board computer to control impact set termination criteria and to record critical data. The data are exported to a personal computer for further analysis.

Depending on the soil condition and the amount of consolidation achieved the termination criteria is set. These parameters include the number of blows required at each impact point and the final settlement (in mm) specified, for example 60 blows per impact point and final set point of 5 mm.

Two proximity sensors situated inside the frame and along the 9 t drop weight measures the impact velocity. The on-board computer then calculates the energy transferred and the stroke height for each blow and records the data for each impact point.

The acquired data at each impact point include:

- Time of impact point
- Total blow count
- Final set (mm)
- Final depth achieved (mm)
- Total energy input (kN.m)

By controlling the impact loading the deflection of the soils is monitored on a per blow basis to determine when compaction of the soil is complete (ie, when additional blow counts will not be effective). The rapid impact compaction treatment is typically effective up to depths of 6 m, although improvements have been seen up to 9 m in some conditions.

GRID PATTERN PASS SEQUENCE AND SPACING

The grid pass sequence and spacing are determined prior to the commencement of rapid impact compaction. This is dependent on the type of material, depth of material to be compacted and the water table.

There are 13 positions (impact points), referred to as the 13-spot, in each 6–9 m grid, depending on the above criteria. The 13 spots are performed in three passes. This is to ensure that when the second and third passes are done, the pore water pressure has sufficient time to dissipate. Typical strips of 7 m x 50 m are completed per pass.

In addition to the above, a fourth pass (ironing pass) can be introduced. The area will be levelled and plates with dimensions of 2,5 m x 2,5 m can be attached to the bottom of the compaction foot. The stroke height of the hammer can be adjusted from inside the cab to compact the final top 500 mm to 1 000 mm layer.

GEOTECHNICAL INFORMATION

Site specific geotechnical information is an integral part of the operation of rapid impact compaction. It is required to determine the effectiveness of rapid impact compaction prior to the commencement of any compaction activity. Such test includes boreholes, dynamic cone penetrometer super heavy (DCPSH) tests, cone penetration (CPT) tests, standard penetration (SPT) tests, grain size analysis, percentage silt content, in-situ testing and the depth of the water table.

An independent geotechnical engineer, appointed by RIC Africa (Pty) Ltd, analyses the ground condition and reports on the expected effectiveness of rapid impact compaction.

During compaction activities ongoing test are performed, and together with the data recorded from the on-board computer the consolidation of the material can be monitored.

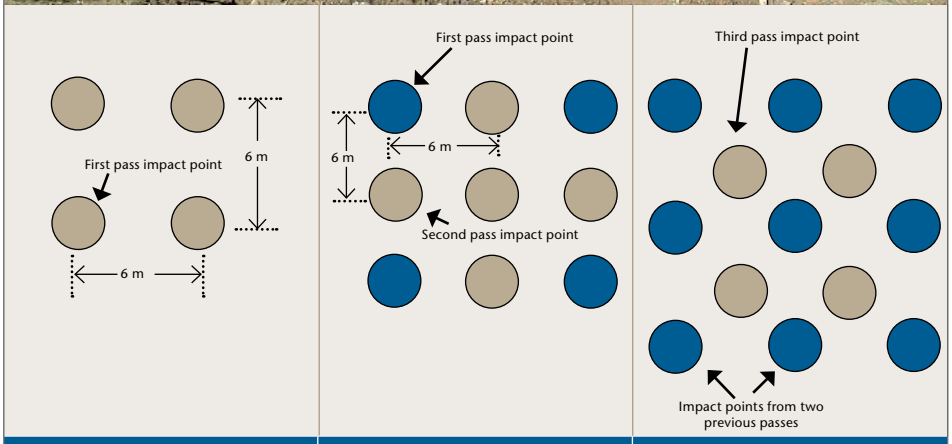
In some instances it is advisable to install piezometers to monitor the water table during compaction activities. The ground response can also be monitored by installing settlement plates at different depths. Sufficient time, at least five to seven days, should be allowed to pass before the post compaction tests are performed to ensure that pore water pressures has dissipated.

Post-compaction tests such as SPTs and/or DCPSH are performed and compare to the pre-compaction tests results. These pre- and post-compaction results illustrate the increased bearing capacity of the material and are expressed in N-values.

PARAMETERS INFLUENCING RAPID IMPACT COMPACTION

Various parameters will influence the effectiveness of rapid impact compaction.

Figure 1 Grid pattern pass sequence



FIRST PASS	SECOND PASS	THIRD PASS
Primary of impact points is a 6 m square grid	Secondary spacing of impact points of 3 m square grid, placed between the first pass impact points	Secondary spacing of impact points of 3 m square grid, placed between the first pass impact points

Table 1 Variation in test results using typical RIC 9000

Type of material	After compaction	Depth of influence
Sands	N>20 Typical N=20–30	6 m
Silty sands	N>15	4,5 m
Sandy silts	N>10 Typical N=10–15	3,5–4,5 m
Miscellaneous fills	N>10	3–5 m

- **Soil type** Cohesionless soils are more easily densified than cohesive soils.
- **Subsurface stratigraphy** Any natural barrier, such as a very dense layer or a layer of soft soil, can absorb compactive energy that is intended for deeper soil layers, inhibiting compaction of these deeper layers.
- **Depth and thickness of the compressible layer** These dictate the grid spacing.
- **Groundwater level** Excess pore water pressures may inhibit densification if not allowed to dissipate sufficiently between drops.
- **Energy per drop** Product of mass of weight times height of drop, maximum depth of densification increases with increased mass and/or height.
- **Total energy applied per unit area** The degree of densification increases with increase

RIC AFRICA PROJECTS

RIC Africa (Pty) Ltd is currently involved in a project at Cape Town International Airport to consolidate 15 ha of fill (up to 4 m deep) that has been loosely dumped on site. This site will subsequently be developed to accommodate industrial industries and services.

The company has also been involved in smaller contracts involving the compaction of material that did not have sufficient bearing capacity to support the proposed buildings and structures.

RIC is also operating in other countries:

- **In North America** where RIC Canada uses dredged river sand for the remedial filling of construction projects
- **In the Middle East** where much work on gas terminal and port extensions is carried out using either sand dredged from the sea or rocks mined from nearby mountains as the fill material

in total energy applied, to a finite degree (dmax), after which no further densification can be achieved.

- **Grid spacing and sequence** If the spacing is too wide, there may be windows of undensified soils, and if the spacing is too narrow at the beginning of the programme, the upper soils may densify too soon, inhibiting compaction of the lower soils.
- **Time between passes** Must allow for pore water pressure dissipation
- **Soil at point of impact** Soft soils beneath the weight may absorb the applied energy.
- **Characteristics of the weight** Dimensions and impact surface area affect the depth of influence.

GROUND VIBRATIONS

At 30 m the peak particle velocities have been measured to vary from 1,5 mm to 5 mm per second. Vibrations will vary with material type and will increase as the degree of compaction achieved increases. Results to date indicate that without site specific testing, a safe working distance to structures can be in the order of 5 m. To further mitigate any vibration transgressing towards surrounding structures, a cut-off trench is excavated before compaction activities commence.

VERSATILITY

Having the RIC mounted on a tracked machine gives it the versatility to move about in narrow and limited spaces.

MOBILITY

The RIC is transported on two trucks and assembled in less than two hours. 'Helper' cranes or other hoisting devices are not needed, as the machine is designed for self-erection.

APPLICATION

Versatility of the RIC equipment is such that numerous applications are envisioned. While the machine has essentially been designed for the compaction of granular soils, benefits have also been noted in random fills and mine wastes. Compaction of fills and loose natural deposits is the typical objective, but the RIC equipment can also serve as a diagnostic tool, identifying zones that do not respond well to dynamic compaction.

Such areas may include high-plasticity soils, buried tyres (or other uncompressible debris), and a host of other unexpected 'surprises'. Identification of these zones allows the engineer to accurately localise areas for removal and recompaction, and can provide superior economy on sites where the only apparent solution is to replace all fills because investigations have indicated the presence of some undesirable soils.

OVERVIEW OF POTENTIAL AND CURRENT APPLICATIONS

- Compaction of loose granular soils to improve bearing capacity and reduce settlement
- Mitigation of soil liquefaction potential
- Densification of bulk fills (ie, lifts of about 6 m), eliminating the need for small lifts and making possible the use of compaction equipment within confined excavations
- Compaction of foreshore fills, where granular material has been placed both above and below the water table
- Foundation compaction below footings and bearing walls
- Densification of bridge end-fills and highway sub-grades
- Backfilling excavations at remediation sites, particularly where excavations extend below the water table and groundwater pumping is not desirable because of pre-disposal treatment requirements
- Compaction of loose native granular soils to limit the potential for liquefaction during seismic events
- In association with deep compaction technologies such as vibro-flotation or stone columns to eliminate the need for confining fills, or excessive stone takes often required to meet the compaction requirements in the upper 2–5 m.
- In association with conventional dynamic compaction or blast densification to improve the compaction achieved in the upper zone
- In conjunction with wick drains to expedite surge charging of materials

CONCLUSION

Owing to the speed and the cost-effectiveness of the process, developers and engineers often prefer the process of rapid impact compaction to the more conventional method of compaction. In some instances the RIC method of obtaining sufficient bearing capacity also takes preference over the use of piles and ground beams.

RIC Africa believe that by introducing this new and exciting technology to the South African engineering industry they will explore new avenues on how compaction can be achieved.

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A mining case study

The safe maintenance of underground railway

TO DATE, THE DESIGN, construction and maintenance of underground railway tracks in the mining industry in South Africa have been carried out on an ad hoc basis without proper standards and guidance, while existing standards have generally not been complied with. Tracks underground are therefore generally in a poor condition as a result of incorrect design and construction procedures, as well as inadequate maintenance planning.

The main reason for this is that the transportation of freight and/or passengers is not the mining industry's core business. In this it differs from railroad companies, who invest heavily in their staff by putting them through various training workshops and courses to help them appreciate the importance of track design and maintenance.

NEW CODE OF PRACTICE

The Mine Health and Safety Inspectorate recently issued a requirement to all underground mines to compile a 'Code of Practice (COP) for Underground Railbound and Transport Equipment'. The COP requires the mines to perform a risk assessment on their railbound and transport equipment and to conform to certain standards. The core drive of the COP is to reduce rail-bound transport accidents in the underground mining environment, which accounted for some 10% of all mining accidents reported from 1998 to 2001. The COP will also serve as a legal document in case of an accident.

The following will apply or will be required for the design, construction and maintenance of railway tracks:

- SANS 0339:2000, 'Design, Construction, Maintenance and Safe Use of Permanent Underground Rail Trackwork in Mines', must be complied with.
- SANS 916, 'Fishbolts and Nuts for Light Rails', must be complied with.
- SANS 914, 'Fishplates for Light Rails', must be complied with.
- The safe operating speeds for all tracks must be determined.
- Haulages for the various tracks must be determined.
- A maintenance strategy must be implemented.

Issues other than railway tracks to be addressed in the COP include the following:

- Design specifications of locomotives
- Locomotive braking systems
- Gradient calculations with respect to power, speed, brakes, etc
- Displays on locomotives
- Ergonomics – safeguarding of driver
- Rolling stock – coupling systems, etc

UNDERGROUND TRACK GEOMETRY MEASUREMENTS

A railway track profile is defined in space by a vertical profile, horizontal plane, and transverse profile. Some of the most important track geometry parameters that need to be measured and properly maintained to avoid derailments are superelevation, twist, gauge and straightness

Figure 1 Track quality measurement (TQM) system

Can measure accurately worn and lipped rails

With self-cleaning measuring rollers and wheels

Self-powered, but can be pushed or pulled

TQM in four tough, purposely made bags

track

A railway track profile is defined in space by a vertical profile, horizontal plane, and transverse profile. Some of the most important track geometry parameters that need to be measured and properly maintained to avoid derailments are super-elevation, twist, gauge and straightness (horizontal and vertical). Track geometry measurements are used to determine the track condition to ensure that the safe geometry tolerances of the track classifications are met

(horizontal and vertical).

Track geometry measurements are used to determine the track condition to ensure that the safe geometry tolerances of the track classifications are met. Hence work places are identified along the track that requires realignment by tamping. On surface railroads, track geometry measurements are usually made through a self-propelled track geometry recording car. Various railroads have different standards for the various measurements and the frequency to running these track-recording cars. In the underground environment very little or no underground geometry measurements are taken.

Track geometry measurements help to achieve the following:

- The safe geometry tolerances of the track classifications are met, thus reducing the risk of derailments.
- Work places are identified for the maintenance crew.
- It allows for cost-effective maintenance of

Table 1 New proposed track geometry permissible deviations standards for a 762 mm track (measurements in mm)

Parameter	Track class		
	High-speed haulage	Medium-speed haulage	Low-speed haulage
Vertical misalignment (slacks) over 5 m length	±10	±20	±60
Horizontal misalignment (kinks) over 5 m length	±10	±20	±60
Super-elevation on a straight	5	15	35
Cross slack (twist) over 2 m length	±3	10	20
Gauge	+10 –5	+20 –8	+30 –9

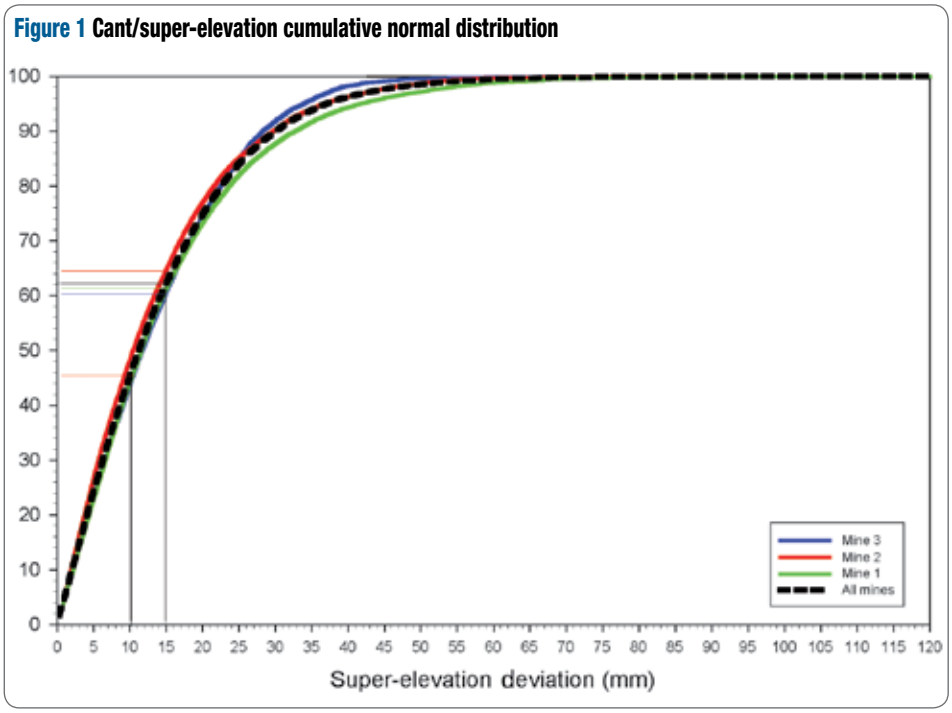
Table 2 New proposed track classification criteria

Parameter	Track class		
	High-speed haulage	Medium-speed haulage	Low-speed haulage
Maximum axle load, tons	>10	10	10
Maximum speed (on straight), km/h	>16	16	5
Minimum rail size, kg/m	30	22	22
Sleeper spacing (minimum number of sleepers per 9 m rail length)	13+	12	11

Table 3 Percentage of measured values within the new proposed SANS deviation limit for a medium-speed haulage

Mine	Super-elevation	Twist	Gauge (positive)	Gauge (negative)	Horisontal alignment	Profile
Mine 1	61%	72%	86%	87%	56%	40%
Mine 2	65%	70%	75%	94%	60%	71%
Mine 3	60%	75%	82%	99%	63%	76%

Figure 1 Cant/super-elevation cumulative normal distribution



the track, since areas that do not require geometrical alteration are not worked in. Various hand-held push devices are also available, measuring various parameters of track geometry. Of these, the track quality measurement (TQM) system is the most sophisticated and advanced (figure 1). Hand-held push devices measure the unloaded track profile, whereas a heavy, self-propelled geometry car measures the loaded profile. The TQM is ideal for underground geometry measurements, since it can be easily assembled/disassembled underground. The TQM collects the following parameters every 10 cm along the track at a rate of 5 km/h:

- Distance (km)
- Horizontal versine (mm)
- Vertical versine (mm)
- Gauge (mm)
- Twist (mm)
- Super-elevation (mm)
- Longitudinal level (mm)

UNDERGROUND TRACK GEOMETRY CONDITIONS IN THE MINING INDUSTRY

Numerous pilot case studies were conducted at a number of underground mines by measuring the basic track geometry condition and comparing the results to the current SANS 0339:2000 standard. Some 60 km of underground track was measured.

The results showed that, on average, only 30–60% of the underground track in mines comply to the permissible deviations standards in the current SANS 0339:2000 standard. The implication – upgrading or reconstructing between 40% and 70% of the mine's underground track – is not realistic or feasible.

The basis for the high standards in the current SANS 0339:2000 standard is not clear, but they probably originated from surface track standards. We are also not aware of any other previous studies or research where substantial sections of underground track geometry was properly measured and compared to the permissible deviations values given in SANS 0339:2000.

Recently the Mine Health and Safety Inspectorate, in conjunction with the mining authorities, agreed to revisit the high standards in SANS 0339:2000. A SANS technical committee was formed and new, more moderate, track geometry permissible deviations standards are currently being established. The new version of SANS 0339 should be published within a year, and the new proposed track geometry parameters for a 762 mm track gauge are reflected in table 1 on page 9.

The SANS committee also intend to change the track classification criteria in the proposed new SANS document. The new document will consist of three track classes, compared to five in the current SANS document. The new proposed track classification criteria appear in table 2 on page 9.

Almost all the main haulages on the platinum mines fall in the category of medium-speed haulage (see table 2). The percentage of measured values within the new proposed SANS deviation limit for a medium-speed haulage of all the measured values taken at the various platinum mines are given in table 3 on page 9.

It is clear that the track geometry deviations (exceptions) for different parameters occur mostly at the same location. In other words, if there is an exception occurring because of twist, the probability is high that an exception for the super-elevation parameter is also present in that area. This supports the view that the full life span of some components will not be utilised, as these components will start to deteriorate at an accelerated rate as a result of the poor performance of weak components.

Maintenance requirements will largely be influence by the parameter performing the worst. In most cases – as indicated in table 3 – it would be related to the super-elevation parameter. The super-elevation cumulative normal distribution (S-curve) is presented in figure 1.

From figure 1 it is apparent that some 60% of all mine tracks conform to the permissible 15 mm deviation on super-elevation. This compared to the current class 3 and class 4 SANS standards, where the permissible deviations are 8 mm and 10 mm respectively, resulting in approximately 45% of all tracks conforming to the class 4 standard.

Although the moderated standards did change the required maintenance and renewal input by approximately 15%, mines in general will require to renew and/or upgrade up to 40% of track. This could have a considerable impact on mines, their operations and their profitability over the next few years.

CONCLUSION

When the results of pilot case studies to measure the basic track geometry conditions at a number of underground platinum mines are compared to current SANS 0339:2000 standards, it is evident that up to 40% of all the tracks in these mines require maintenance input in order to ensure that most of the track would be within the medium speed deviation limits.

We propose that more measurements and research should be done on the safety standard limits of underground railway tracks to assist railway transport managers in the mining industry to better manage and maintain their railway track in a scientific way.

We also encourage mine management and engineers to vastly invest in railway design, construction and maintenance management workshops and/or short courses in order to increase the skills level of staff in this integral function in the mining industry.

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Effective asset inventory solutions in the South African transportation, and utilities environment

THE COLLECTION OF asset data in the transportation environment often tends to be an ineffective process requiring different forms of independent technologies to be integrated to achieve a desired result. To produce an asset inventory that is customised to the client's requirements is often an expensive and time-consuming process. The information delivered often only presents a snapshot of an asset's local environment, making it difficult for users to relate to the functional use and placement of assets relative to the larger functional environment.

To overcome these known shortcomings in the South African transportation industry, a unique asset inventory system has been launched in January 2006. The system comprises the integration of cameras, a differential geographical positioning system (DGPS) and a computer enabling the capturing of assets at speeds up to 100 km/h with sub-meter accuracy.

This open scalable solution relies on the use of:

- High-resolution digital cameras (IEEE1394)
- Positioning systems such as DGPS receivers, distance measurement instruments (DMI), an inertia measurement unit (IMU), etc
- Photogrammetric features to create a unique spatial referenced data collection tool

One of the major challenges that face service providers in the transportation industry is the requirement to accommodate a variety of database structures and formats

The data collection methodology is split in two phases (figure 1), while phase 3 involves the utilisation of the data in the client's asset management system:

- Phase 1 involves geo-referenced image data collection from a road or rail vehicle.
- Phase 2 involves data extraction from a user desk.

Image data collection surveys are based primarily on the use of hardware (1 600 x 1 200 pixel resolution cameras, a DGPS and a computer) and software components installed on a rail or road vehicle traveling at traffic speed. The image capture frequency can be specified as per requirements, whether on the basis of distance (eg one image every 5 m) or fixed frequency (eg five frames per second).

Data extraction entails the use of software to analyse and interpret geo-referenced digital imagery. Asset inventory information is extracted as per the client's requirements. Any visible element on captured imagery can be positioned geographically and measurements (distance, etc) performed. AVI files, geo-referenced JPEG images and other spatial data formats are generated, and these can be integrated in GIS or asset management systems.

The system and processes are designed to capture and assess inventory and infrastructure assets and features managed by:

- Transportation authorities (road, railways, public transit, etc)
- Utilities (telecommunications, electric distribution, etc)
- Municipalities

APPLICATIONS

The main fields of application are the following:

- Video logging
- Inventory of roadside infrastructure assets (road signs, guardrails, light poles, etc)
- Road lane measurements
- Inventory of railway infrastructure assets
- Inventory of forest roads
- Inventory of electric distribution networks and/or telecommunications infrastructure (poles, equipment in poles, etc)
- Inventory of urban equipment (drainage, fire hydrants, etc)
- 360-degrees imaging
- Centreline data capture and inventory of data relevant to emergency response programmes

RECENT PROJECT

The most recent project undertaken was a rail asset survey from Nacala (Mozambique) to Blantyre (Malawi), a distance of some 800 km. The purpose of the project was to determine the extent of existing fixed rail infrastructure assets and carry out a partial assessment of their condition.

The scope of work entailed the spatial data collection and attributing of a number of pre-determined fixed asset types and associated images every 50 m along the survey path. As a final project deliverable, the data had to be presented in both linear and GIS format via an asset maintenance management system. This information, together with with the engineer's assessment of the infrastructure, would contribute to determining the infrastructure maintenance and/or replacement priorities.

Image data collection was effectively completed in eight days – a great achievement given the restrictive operational environment and poor track condition.

MAJOR CHALLENGE

One of the major challenges that face service providers in the transportation industry is the requirement to accommodate a variety of database structures and

Image data collection was effectively completed in eight days – a great achievement given the restrictive operational environment and poor track condition

formats. This project was no exception. Data had to be captured into an existing Microsoft SQL Server database. The proprietary software used to extract the spatial information from the geo-referenced digital imagery enables the user to set up an ODBC connection, hence the ability to extract spatial information directly into a client database.

Extracted data are shown in a digital imagery interface, but also generated on the fly in a three-dimensional GIS overview map. This enables the user to immediately verify the spatial correctness of the data. Simultaneously a form is generated which prompts the user to capture the attributes associate with the spatial element. Figures 2 and 3 show examples of an asset extracted from the imagery and a GIS view of the captured asset, respectively.

Spatial information for the full extent of the rail line was captured within 22 working days. The output was delivered effectively within 35 working days, including the subsequent setting up of the maintenance management system according to the client's requirements.

It is clear that the system offers an effective solution to visual condition assessment and spatial data issues that have historically been associated with service providers in the transportation industry in South Africa. □

Figure 1 Data collection methodology

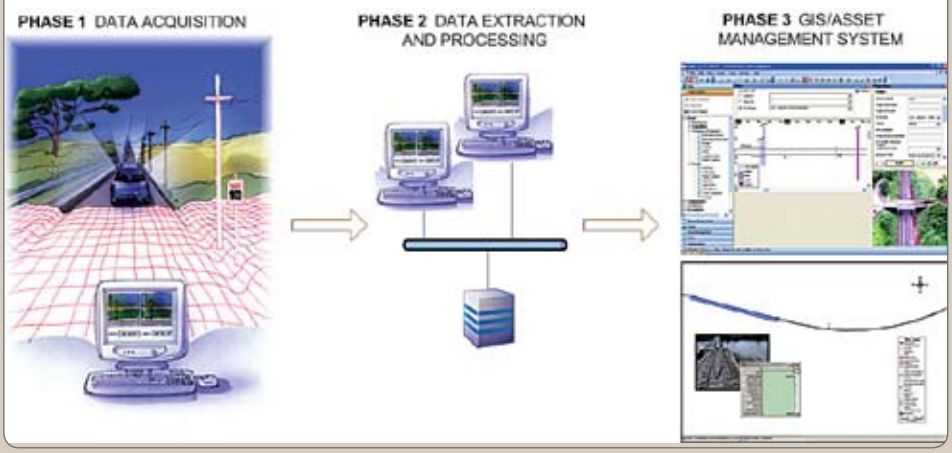


Figure 2 Example of a bridge extracted using digital imagery

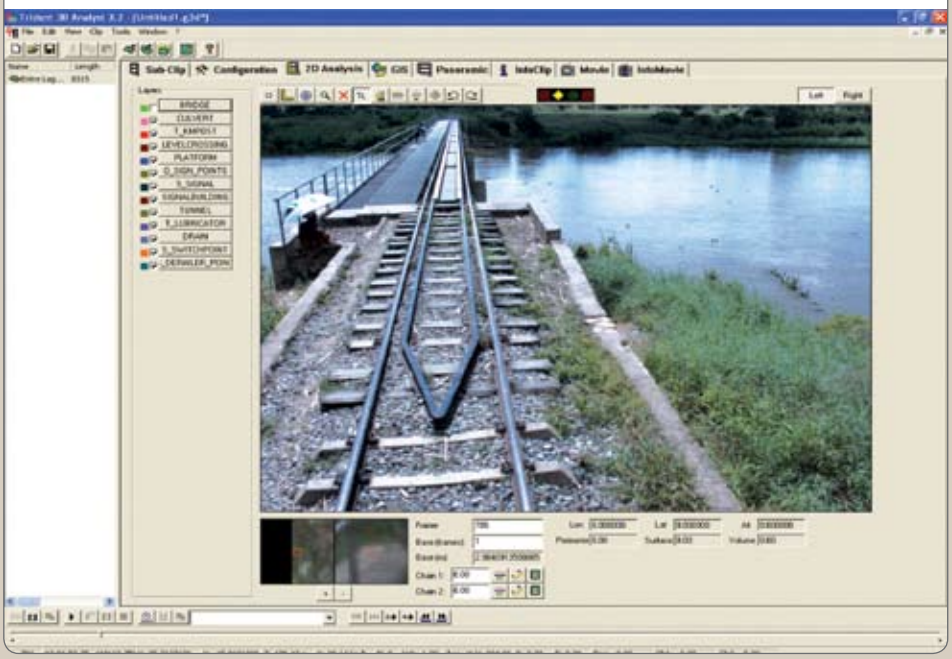
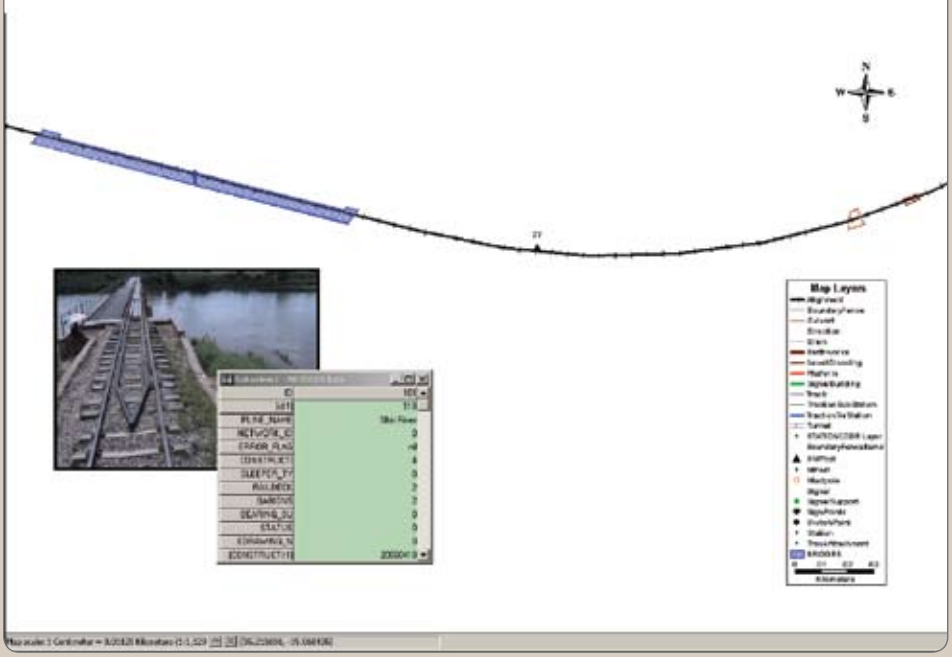


Figure 3 A GIS view of the bridge and its properties in an asset management system



Innovative engineering solutions leading to growth in rail transportation sector

THE LAST FEW YEARS have seen the Rail and Ports Division at consulting, design and management engineering company Arcus Gibb develop into a formidable team offering an array of services to the rail transportation sector.

Arcus Gibb's team of specialist railway systems engineers and managers has experience in the development and implementation of railway projects of all sizes and at all stages. 'Rail engineering is a sector that requires specific and unique expertise, and in most cases, projects require innovative solutions to ensure practical success. Using a total railway systems approach, we provide our clients with advice on, and solutions to, the complex interface issues of railway ownership and operation,' says Transportation Managing Director Nick Ras.

Arcus Gibb provides engineering services for all major disciplines needed to support and enhance a safe, reliable and profitable railway system including, signalling and train control, communications, operations, permanent way, civil engineering and structures, electrification system design, and railway engineering services.

GAUTRAIN

The company has been involved in the Gautrain high-speed rail link since its inception. This major rail system will connect the city of Pretoria with Johannesburg including the international airport and the financial centre of Sandton, and will ultimately provide rail transportation that will meet global standards.

KEI CORRIDOR

Recently, the Eastern Cape Department of Roads and Transport appointed Arcus Gibb to develop a long-term and sustainable socio-economic growth strategy, an integrated development plan, and an implementation action agenda for the Kei Corridor. The study area is largely situated in the East London to Mthatha corridor. Part of this appointment has been to investigate the feasibility to involve the private sector for the train operations on the Amabele to Mthatha branch line. The branch line connects Mthatha to the Spoornet mainline at Amabele station, approximately 80 km north-west of East London, and covers a distance of 280 km.

An operational business plan has been developed and a key aspect of this model is the potential freight that could be transported on the rail corridor. In the early 1990s approximately 410 000 tons per annum was transported on rail, but since 1996 the train service has been more or less suspended.

A detailed freight demand study was required to determine the current freight movements in the corridor. The study required, among other things, analysing historical Spoornet freight data to determine the key commodities transported, road-side origin-destination surveys to determine the existing freight movements, interviews with key cargo owners and evaluation of identified development projects. The total freight transported in the corridor has been estimated at 7,5 million tons per annum.

An in-depth analysis of data was done to separate the potential rail eligible freight from the total volume. A diversion model has been developed based on international and local studies and the potential diversion from road to rail was estimated in the region of 200 000 to 400 000 tons per annum for a low and high scenario respectively. The operational business plan has been tested for the freight scenarios and the requirement for a government subsidy has also been simulated for various funding levels.

SUMO COLLIERY

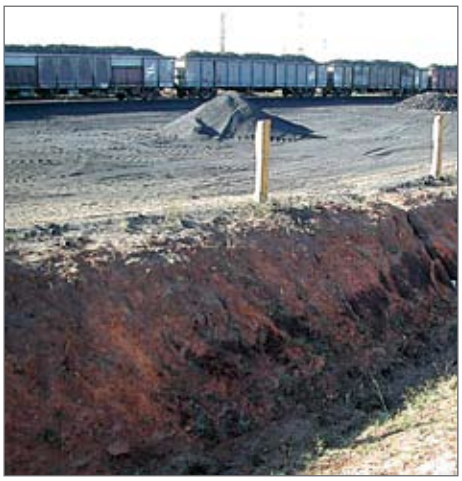
The Sumo Colliery in Mpumulanga is planning to increase its coal output to its markets in 2006 and requires expansion of its current loading facilities at Rietkuil station. Arcus Gibb has been appointed to provide design and construction management services for the new private siding facilities at Rietkuil station.

The new private siding facilities will consist of two lines each approximately 1 000 m in length and three coal-loading areas adjacent to the lines to facilitate the loading of different coal products. After completion of the siding facilities it will be able to accommodate a block load of 100 CCL type coal wagons (jumbos) for despatch to the export harbour of Richards Bay. Arcus Gibb is providing multi-disciplinary rail services including various aspects of railway engineering such as permanent way, signalling and overhead electrification design.

The siding will be constructed with 48 kg/m rails and concrete sleepers on a ballast layer. Bulk earthworks are required for the construction of the loading areas as well as the pavement layers of the track formation. A key aspect of the coal loading area is the management of surface water to settlement and evaporation ponds to prevent pollution of the ground water. Traction power is provided by 3kV DC overhead track equipment.

The operational plan developed in conjunction with Spoornet allows for partial electrification of the line. Electrification is only required for the extent of the locomotive movements as the coal wagons will be shunted into the siding. Access to the siding is granted by the signalling system controlled from the Centralised Traffic Control (CTC) centre situated at Ermelo. Alterations to the existing signalling layout is required to compliment the operational plan which includes installation of new signal aspects and changes to the interlocking. Construction of the earthworks has started and the expected completion date is the end of May 2006. □

Left: Rietkuil siding prior to siding and loading construction
Right: Bulk earthworks for new siding at Rietkuil station



Update on railway engineering at the University of Pretoria

Various activities are planned for 2006 and 2007 by the Chair in Railway Engineering at the University of Pretoria

WHEEL-RAIL INTERACTION COURSE IN AUSTRALIA 2006

The Australasian Railway Association (ARA) requested the International Heavy Haul Association (IHHA) to present a four-day course as an add-on to the **7th International Conference on Contact Mechanics**.

The IHHA agreed and requested Pretoria's Chair in Railway Engineering to coordinate the project.

The course will take place in Brisbane from 20 to 23 September 2006.

WHEEL-RAIL INTERACTION COURSE IN SWEDEN, JUNE 2007

The IHHA STS2007 takes place in Kiruna, Sweden, from 11 to 13 June 2007.

It has been decided to couple a three-day **Wheel-Rail Interaction course** with the IHHA conference. Details and dates are available on www.ihha2007.net (follow the link to 'WRI Course').

COURSES AT THE UNIVERSITY OF PRETORIA

- **Introduction to Multi-Disciplinary Concepts in Railway Engineering (IMDCRE)** will be offered from 17 to 21 July 2006.
- **Advanced Concepts in Railway Infrastructure Maintenance Management (ACRIMM)** will be offered from 30 October to 3 November 2006.
- **Railway Business, Operations and Engineering (RBOE)** Queensland University in Australia developed this as a correspondence course for CPD and postgraduate credits. A project has been initiated to adapt this course and present it on a face-to-face basis for South African participants.

Ten participants from Spoornet have enrolled for the course on a distance-training basis, and a team of lecturers will soon start to study the material in order to do the conversion.

Plans are to present the course towards the end of 2006 or early in 2007.

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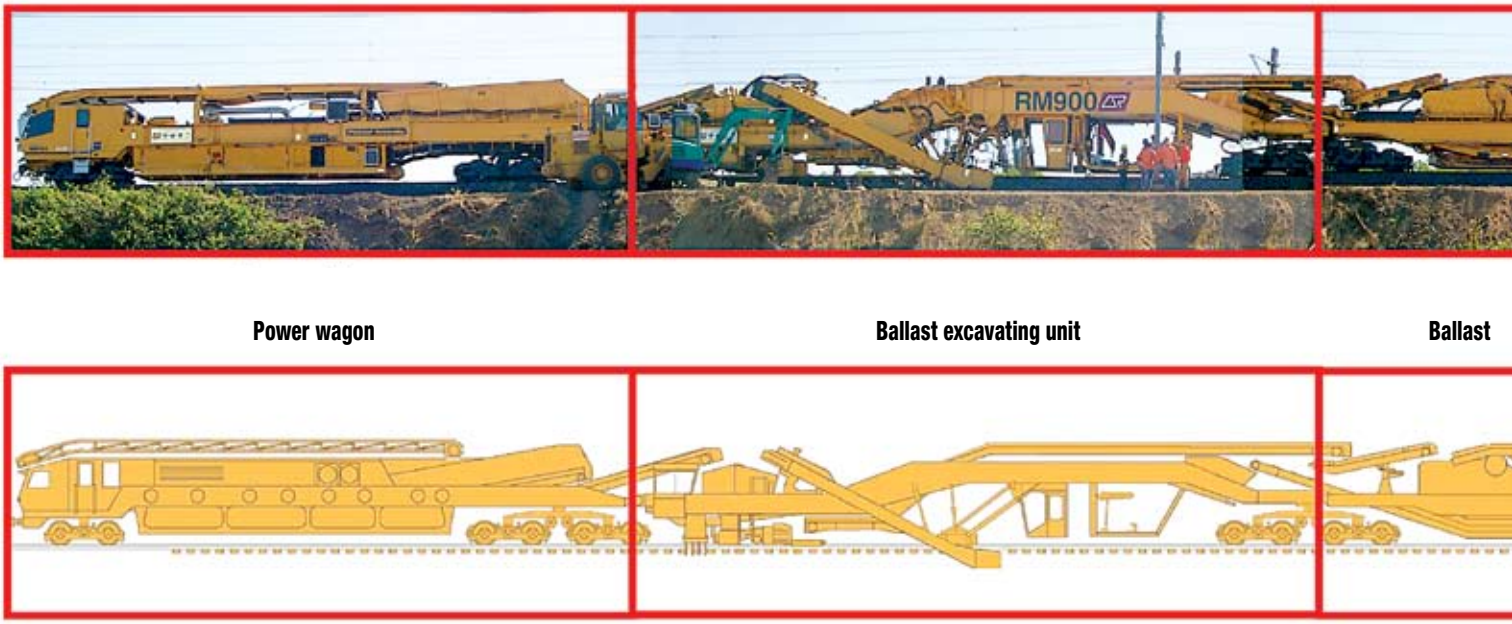


Figure 1

New high-technology, high-maintenance machinery for

IN APRIL 2004 Spoornet awarded three five-year mechanised track maintenance contracts to Ramco, a black-empowered company initiated by Plasserail.

To carry out the contracts, Ramco had to acquired new high-technology heavy on-track maintenance machinery. Spoornet set high objectives for increased rail traffic which will reduce available maintenance time. The new machinery had to support these objectives by being capable of high production in short maintenance windows.

The contracts included the RM900 ballast cleaning machine, which is capable of screening more than double that of the existing machines, the highly versatile 09-24 Dyna-CAT tamping machine capable of high-production track and turnout tamping with integrated stabilising, and a second 09-3X Dynamic tamping machine. These are the second-fastest tamping machines available in the world after the 09-4X introduced this year.

The machines have been supplied to Ramco by Plasserail. Plasserail has manufactured more than 150 machines locally over the past 45 years. The skills and experience acquired over the years (combined with a low staff turnover) made it possible to provide the high-technology machines at affordable prices since a considerable part of the new machines have been built locally.

THE RM900 BALLAST CLEANING MACHINE

As part of the Spoornet recapitalisation programme, Ramco was awarded a contract to provide a high-production ballast-cleaning machine.

The machine of choice – the Plasser & Theurer RM900 ballast cleaning machine – represents the latest technology available. The 90 m long, 285 t machine landed in the first week of 2006.

In terms of high-capacity ballast cleaning, the RM900 delivers a production rate of up to 520 m screened per hour depending the ballast volume below the sleeper. This is achieved with the greater screen area of two vibrating screen boxes and a larger excavating chain. The machine consists of four permanent units:

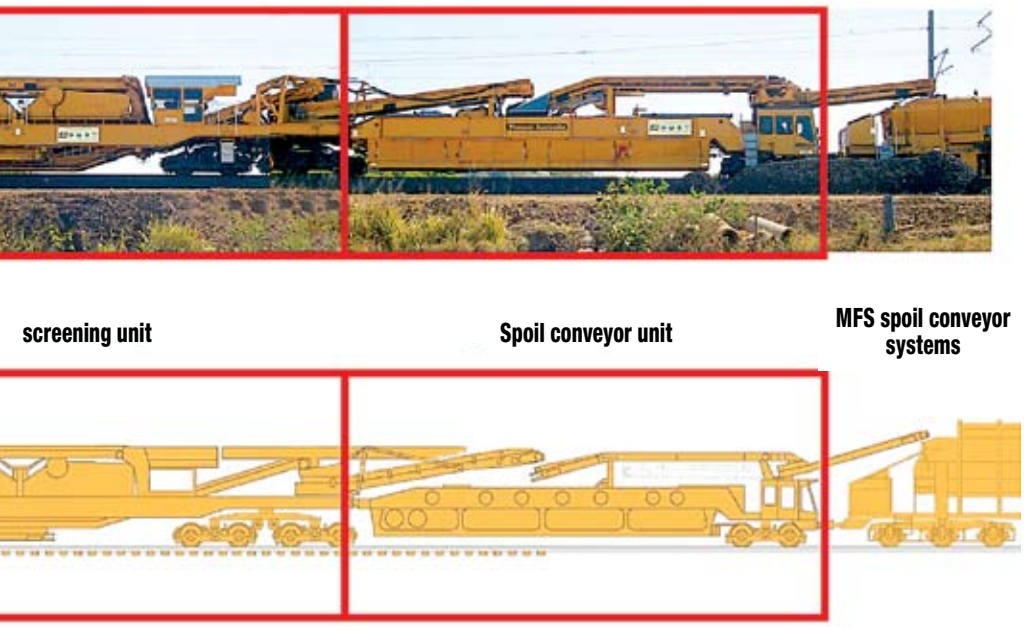
- Power wagon – housing one of the two 550 kW diesel engines
- Ballast excavating unit – for the high capacity excavating chain
- Ballast screening unit – consisting of double screen boxes, each with three layers of screening mesh
- Spoil conveyor unit – where the other 550 kW diesel engine, associated hydraulics and spoil conveyors are housed

The drive is hydrostatic via hydraulic motors, which offer the greatest reliability and best weight to output ratio achievable. Eight of the sixteen axles are driven for maximum traction during the ballast cleaning operation for hauling up to 14 ballast wagons behind the machine during ballast cleaning. This allows simultaneous ballast offloading during the screening process, optimising the occupation time without having to move out of the way for ballast replenishment.

To allow effective lifting of the track during the ballast cleaning process, maximum wheel base is required. However, a too long wheel base fouls the adjacent line on curves. Therefore one bogie has been made moveable by shortening the wheel base during travelling.

A 300 mm high endless excavating scraper chain is guided by a down chute, a solid cutter bar underneath the track and an up chute.

- The scraper chain consists of scraper shovels with ripper fingers which loosens



production track Spoornet

the encrusted material from the ballast bed and conveys the material in the up chute directly to the conveyor belt for the screening unit.

- The cutter bar enables an exact and straight cut over the entire excavating width by using an electronic monitoring system for height regulation. Interchangeable cutter bars and extensions are available to allow cutting widths varying between 3,720 mm and 4,920 mm. A crane is provided to assist in the handling of the cutter, as it can be removed and stowed safely between shifts.
- Hydraulically operated plough flaps on both the up and down chute makes it possible to increase the excavation width to over 5 m at formation level, optimising the retention of available ballast.

This combination produces a level subgrade in the longitudinal direction at the required cross fall.

A pre-lifting and -slewing device is located close to the excavating chain to lift the track clear off the cutter bar when the cutting depth is less than 300 mm and to perform lateral displacement of the track where required. This feature eliminates any required pre-lifting and minimises pre-slewing ahead of the ballast cleaning operation.

The excavated ballast is transported by a central conveyor belt to a longitudinally adjustable conveyor belt which equally distributes the ballast into the first screening unit and via another conveyor belt into the second screening unit. These two screening units with a combined screen surface area of 50 m^2 separate the ballast from the spoil. With the excavation chain running, the screen drive oscillates the screens at an optimum frequency.

The screening units consists of three steel mesh decks, with appropriately sized mesh fitted to the respective decks. In super elevated curves up to 160 mm, the entire screening unit is hydraulically adjusted by the operator to always remain horizontal, allowing an even flow of the spoil.

Re-usable screened ballast is returned to the track through a 4 m^3 ballast hopper which allows controlled volumetric distribution of the ballast and can also be used to supply missing quantities of ballast occurring at the end of work on the run out.

The plough assembly controls the height of the track and the adjustable flaps ensure that the ballast is distributed uniformly under the whole cross-section of the track and around the sleeper ends. The condition of the track behind the ballast cleaner is therefore already in the SC standard, minimising tamping and the amount of lift required by the tamping machines.

Simultaneous ballast unloading immediately behind the ballast cleaning operation is managed by Ramco staff. This maximises the amount of time the ballast cleaner can work in a given occupation time and enough ballast is immediately available for the regulating and tamping machines to start finalising the track. Because the machines do not have to move out of the way for ballast replenishment, at least 60 minutes additional cutter bar time is possible every day.

Spoil rejected from the screen box can either be discharged next to the track or onto spoil conveying systems in front of the machine. The spoil conveyor belts are in two sections, the first section can be swiveled to the side, making it possible to discharge the spoil as far as 8 m from the centreline and the second section can either discharge the spoil onto spoil wagons in front of the machine or can also swivel to spoil next to the track.

The three MFS spoil conveyor wagons provided with the RM900 has already proved its worth, productivity and reliability on the coal line. The MFS system is an open, high-sided hopper wagon, with a floor mounted conveyor belt which covers the entire width of the machine, with a storage capacity of 38 m^3.

The RM900 has a dust suppression system with a water tank capacity of 40 000 ℓ located behind the ballast cleaner.

THE 09-24 DYNA-CAT

New from Plasserail, the 09-24 Dyna-CAT is the most versatile tamping machine available on the market today. It offers unrivalled production, quality and durability both in open line and turnouts, which reduces the unit costs of maintenance and limits the disruption to traffic to a minimum.

The 09-24 Dyna-CAT is based on the American 09 Dyna-CAT, with the exception that it is capable to slew the tamping units sideways as well as turning them to easily access the skew sleepers on the turnout leg, making it the first of its kind in the world.

The machine uses the continuous action tamping principle where the tamping units are mounted to a satellite frame which is separated from the main frame that houses the cab (and is this case also the stabilising units). This allows continuous motion of the main frame, while the cyclic braking and acceleration for the tamping action is

Figure 2 The 09-24 Dyna-CAT

Figure 3 The 09-3X Dynamic tamping machine

performed by the satellite frame.

This allows far greater tamping speeds than what is possible with traditional tamping machines.

The machine features double header tamping units (two units over each rail) with 24 tines. Instead of using double tines on the gauge side of the track, the machine uses a single tine which improves access to restricted areas.

The versatility lies in the well proven, laterally adjustable splithead tamping units that are fitted to the machine. The four tamping units are split in half (field side and gauge side) and can be raised and lowered individually. The units can slide out sideways allowing tamping of the turnout portion of the set during the same pass as the straight making it possible to tamp the turnout between traffic without occupying both lines. The tamping heads can also rotate in the horizontal plane enabling hassle free tamping of the skewed sleepers on the turnout portion of the set. In restricted areas of the turnout the machine will be converted from continuous action to index tamping.

The machine is fitted with bogies instead of single axles. This attribute to better axle load distribution and better steering.

Telescopic third rail lifting system

The quality of the machine's turnout tamping ability is enhanced with a fitted auxiliary hydraulically operated, telescopic third rail lifting system. These clamp assemblies provide controlled and synchronised lifting of the turnout portion during switch tamping operations and eliminates the need for cumbersome, manually placed track jacks, hydraulic hose reels and the related labour/maintenance costs.

Dynamic track stabilisation

The main frame is equipped with two vibratory stabilising units to restore the track's reduced resistance to lateral displacement after tamping. Dynamic stabilisation sets the track in horizontal oscillation directed crosswise/laterally to the track whilst at the same time applying a controlled static vertical load.

Measuring behind

A tow-behind measuring trolley measures the tamping and stabilising quality in real time behind the machine.

The measuring behind system, designed for Plasserail's 09-tamping machine, consists of a Windows-based standalone system, industrial measuring computer, a trolley with a 5 m measuring cord and supporting software. The trolley is equipped with a three-point measuring system to record the parameters: alignment, left and right; profile; distance; and inclination.

While tamping and stabilising, the system will immediately warn the operator should the values measured behind the machine exceed set standards. The system will also print a report every 500 m for quality control purposes.

SECOND 09-3X IN SA

The 09-3X Dynamic tamping machine, of which one is already in use in South Africa, utilises the continuous action tamping principle where the main frame housing the operator is in continuous motion and the cyclic braking and acceleration for the tamping action is performed by a satellite frame.

The machine tamps three sleepers at a time, when combined with continuous action tamping, produces up to 60 sleepers per minute. The 09-3X has now taken in the position of the second fastest tamping machine in the world after the brand new 09-4X just introduced.

For tamping in restricted areas, the machine can be switched to index action, single sleeper mode.

To further enhance the track quality and durability after tamping and to capitalise on the savings brought about by the high production of the machine, the 09-3X is supplied with dynamic stabilisation.

The controlled settlement with dynamic stabilisation achieves a low force re-arrangement of the ballast stones. The ballast is therefore not unduly stressed which reduces the abrasion and crushing of ballast during the initial high settlement under traffic, which in return prevents unnecessary ballast fouling.

After stabilisation the track's resistance to lateral displacement has been restored, enabling the track to be reopened at full line speed. □

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Ballast cleaning a prerequisite for a sustainable, reliable, safe and cost-effective railway track

TO THE UNINFORMED, it might be hard to imagine that ballast, and more particularly well-maintained ballast, is a critically important component of the track.

THE FUNCTIONS OF BALLAST

- The ballast resists vertical, lateral and longitudinal forces applied to the sleeper in order to retain the track in its required position.
- The depth of the ballast provides the resiliency of the track and reduces pressures from the sleeper-bearing area to acceptable stress levels for the underlying formation.
- One of the most important functions of the ballast is to provide large voids for the movement of particles through the ballast and to allow effective drainage of water entering the ballast bed. Effective drainage means the ability to direct water away from the formation as fast as it enters the ballast.
- The ballast allows correction of top and alignment defects of the track, that is, it allows correction of the track geometry. Geometry correction is required because the track progressively moves vertically and laterally under repeated loading from traffic. This deviation from the desired geometry is generally irregular, therefore passenger ride quality decreases and dynamic loads increase. In ballasted track, tamping is the most effective way of correcting geometry faults.

Figure 1

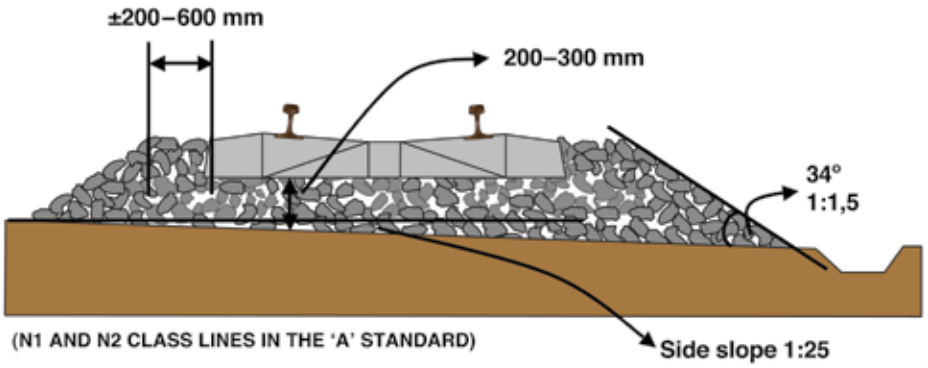


Figure 2 Ballast grading curve

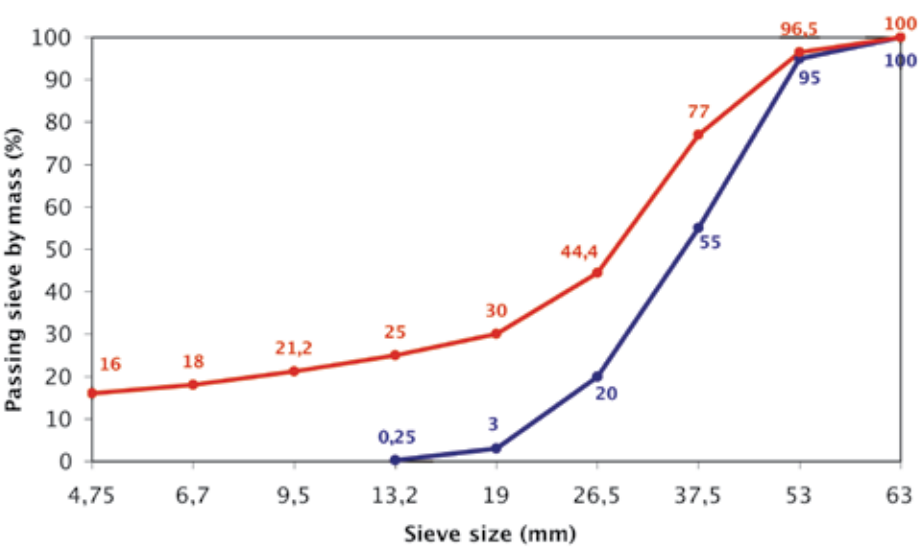


Figure 3 20% fouling

Figure 4 60% fouling

THE DESIGN CRITERIA OF THE BALLAST BED

For the ballast bed to perform these functions effectively, it has to conform to certain design criteria:

- The sleeper should rest inside the ballast with the cribs filled with ballast to resist the lateral movement of the track.
- The slope of the ballast should be at the natural fall angle of the ballast.
- The ballast depth should be sufficient to effectively distribute the loading on the formation.
- The formation should have a cross-fall towards the drain at a slope of 1:25. This is required to direct the water that passes through the ballast towards the drain.

DESIGN CRITERIA OF THE BALLAST STONES

The ability of the ballast to perform its function is also controlled by the ballast stone characteristics. This good ballast material is set by the Spoornet specification for the supply of stone contents S406 (1996), which prescribes how new ballast material should be selected and graded at the quarry according to its shape, size and composition. Good ballast material is considered to be stones with the following characteristics:

Cubic and angular

A good ballast stone should have as many sides as possible. This will ensure that different ballast stones can interlock and remain in that stable position. Stone angularity increases the shear strength of the ballast bed.

Round stones are usually smooth and because they do not have flat surfaces, they cannot interlock and are therefore not stable.

Flaky stones on the other hand have too large a surface, which reduces the void spaces. This will cause a very inelastic ballast bed which will damage the rest of the system.

Broadly graded

A mixture of small and large stones in the ballast bed will ensure effective interlocking, which will increase the shear strength of the ballast bed.

The mixture of small and large stones required by Spoornet is set by Specification S406, which is illustrated by the blue line on the ballast grading curve in figure 2.

On the horizontal axis sieve sizes are given. A sieve of, for example, 19 mm can be described as a wire mesh with square holes of 19 mm by 19 mm. It will therefore only allow stones that can fit through a hole of 19 mm by 19 mm.

The vertical axis shows the percentage of a representative ballast sample by mass that may pass through a given sieve.

Abrasion and wear resistant

Availability and economic considerations have been the prime factors in the selection of ballast materials. Therefore a wide variety of materials have been used for ballast. In South Africa quartzite and dolorite make up 75% of ballast stone. These are hard and wear resistant. Quartzite is found all along the gold reef and dolorite at quarries near Vryheid.

If ballast stone is not resistant to abrasion and wear, it will quickly break down into smaller stones, causing fouling of the ballast bed.

Free of dust and dirt

The ballast should not be fouled, but the ballast layer is consistently subjected to contamination or fouling. This is the result of:

- Internal degradation of the ballast bed caused by ballast fracture and abrasion
- External infiltration of alien fines
- Infiltration from underlying granular layers

This finer material will start to fill the void spaces between the ballast stones. Usually the fine material will start collecting at the bottom of the ballast bed and gradually build up to the bottom of the sleeper. The height to which the ballast bed is filled with fines is a direct measurement of the degree of fouling of the ballast bed.

The ballast grading curve in figure 2 can be used to define the degree of ballast fouling. The degree of fouling of new ballast according to specification S406 would be 0%, which is shown by the blue curve. The

Figure 5 100–120% fouling

Figure 6 Mudhole

Figure 7 The RM900 ballast cleaning machine

Figure 8

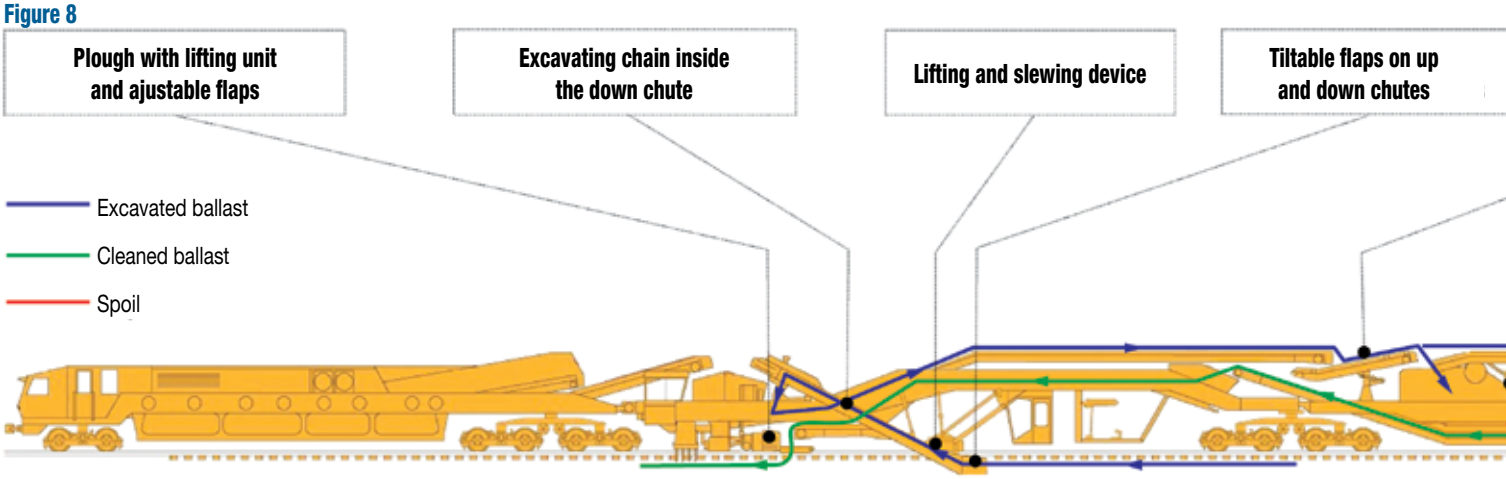


Figure 9

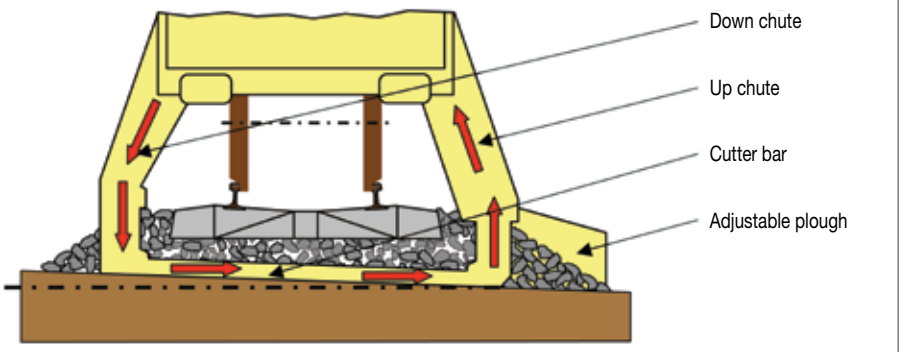
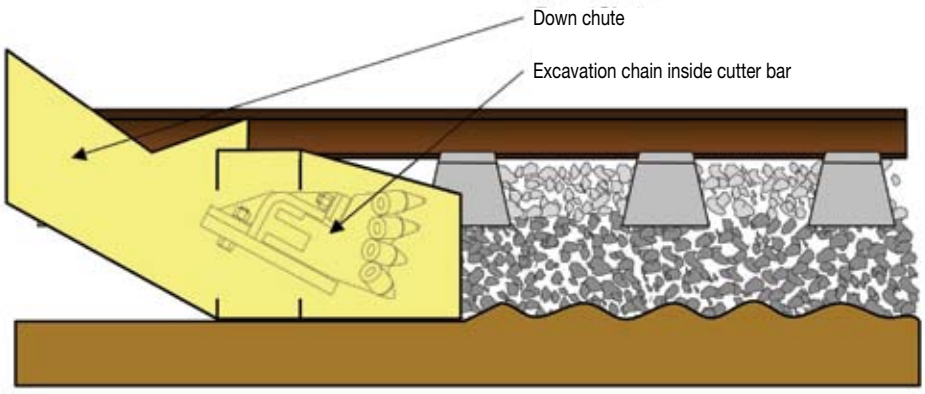


Figure 10



red curve shows ballast with a degree of fouling of 100%. It follows that ballast can be fouled to more than 100%. From this curve we can see how an increase in the degree of ballast fouling increases the range of particle sizes (broadening of the ballast grading curve) and decreases the maximum particle sizes.

Typical examples

Figure 3 shows ballast which is 20% fouled. It can be seen how the bottom layers (approximately 20% of the depth inside the square) are filled with fines.

The ballast in figure 4 is 60% fouled.

The ballast in figure 5 is 100–120% fouled. It can be seen that the whole ballast bed from the formation to the bottom of the sleeper consists almost only of fines. This ballast bed will have very little or no resiliency and no draining ability. Also note how clean the ballast looks in the upper levels and in the cribs. One can easily be fooled into thinking that the ballast is clean. The area of concern, however, is the area below the sleeper.

THE EFFECT OF FOULED BALLAST

Ballast progressively loses its function as it starts to deviate from its design criteria. This loss in function has various detrimental effects on the track structure and maintenance costs, if not attended to timeously. These include:

- **Prevention of effective drainage and the movement of particles through the ballast**

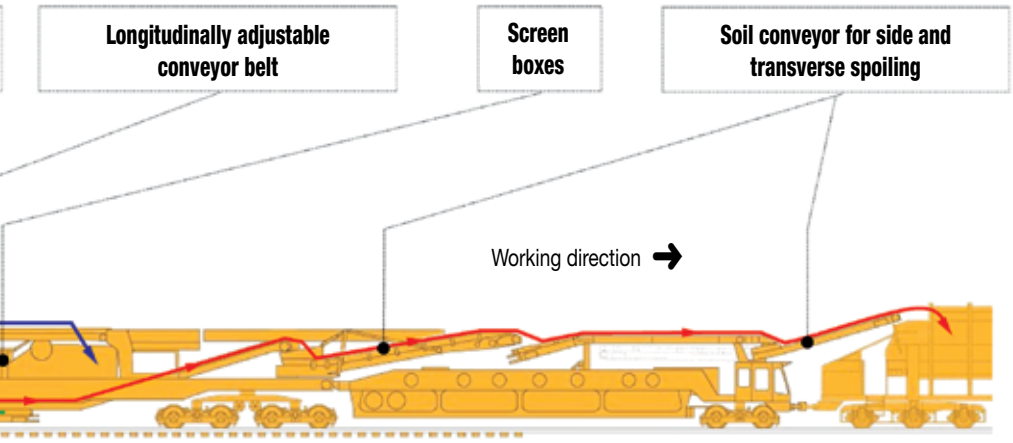
  As the storage capacity between the stones (void space) starts to fill with fines, the drainage capacity of the ballast decreases. The book *Track geotechnology and substructure management* by Prof Ernie Selig and John Waters shows how the ability of the ballast to drain rainwater decreases with an increase in the fouling index.

  According to this book, clean ballast can drain rainwater at a rate of 150 mm per hour. This would be equivalent to a cloudburst, but on the lower end of the scale where the entire ballast bed is uniformly fouled to ±75% by volume fouling degree, it would only be able to drain 1,5 mm per hour of rainfall. With a hard spell of rain the ballast bed will therefore remain wet for a very long time.

- **The formation of mudholes**

  If the ballast bed remains wet owing to the absorbed moisture by the fines, the formation will also become saturated. This will eventually cause failure of the formation. When the formation fails, slurry from the subgrade together with the fines inside the ballast will start pumping through ballast and will be visible on the surface of the ballast bed. The result is mud pumping, also called a mudhole. These mudholes usually extend 300 to 400 mm under the ballast and cover a maximum distance of 120 m (figure 6).

  The pumping mud usually consists of a clayey soil. It is as a result of the presence of the clayey soil that maintenance become ineffective on mudholes. Total rehabilitation becomes necessary, but this is a very extensive and expensive process.



- **Inhibition of the resiliency of the track**
  Fines in the void spaces remove the elasticity of the ballast. In addition, if the fines in the ballast bed become wet and are allowed to dry again, the ballast bed can be cemented into a rock-hard layer. The resultant lack of resiliency will cause reflected shockwaves which are likely to cause rail corrugations and traffic noise. These shockwaves will also damage sleeper fastenings and rolling stock.
- **Fouled ballast and/or an incorrect ballast profile lose(s) resistance to vertical, lateral and longitudinal force**
  Inadequate support at the sleeper head by the ballast shoulder will weaken the track's lateral resistance to displacement. On continuous welded rails this can result in temperature kick-outs. If the fines in the ballast are saturated, the ballast will have decreased resistance to shear deformation due to the clayey or silty particles and water present at the ballast contact points. The fines will act as a lubricating agent, which leads to a decrease in track support and geometry.
- **Poor durability after maintenance inputs**
  The lack of void spaces because of ballast fouling will restrict the effective rearrangement of the ballast stones during tamping. The result is that the track will revert to its original geometry in a very short time. This would require the tamping machine or gang to repeatedly return to the same spot with the resultant effect on train operations.

  Even if the ballast can be sufficiently rearranged to remove the track memory, the fines clinging to the ballast surface will still act as a lubricant, thus reducing the friction between the ballast stones, resulting in poor durability of tamping input.
- **Line speed restrictions**
  These effects will cause line speed restrictions resulting in:
  - **Late deliveries or arrival of goods or passengers, which damage the image of the railways**
    Customers that are lost to the roads are difficult to recover. This is an indirect cost which is very difficult to measure.
  - **Lower rates** Customers also use slow deliveries as a bargaining tool for lower freight rates, further reducing the income of the railways.
  - **Opportunity cost of volumes** Slower moving volumes have an opportunity cost of higher volumes on busy lines.

AT WHICH POINT SHOULD THE BALLAST BE SCREENED TO MAINTAIN ITS FUNCTION?

This point is called the critical fouling point and is not necessarily at a ballast fouling degree of 100%.

The critical fouling point (as described by Esveld) is the point at which it can be shown that the dirt in the ballast is likely to cause an unacceptable loss of geometry retention, an inability to tamp effectively or, due to water retention by the dirt, is damaging the ballast and formation.

Very often fouled ballast goes hand in hand with other deviations from the required design criteria of ballast, such as too little ballast depth, and rounded and smooth stones. The result is that damage will be caused and geometry retention lost long before the ballast has reached a fouling degree of 100%.

The critical fouling point is therefore a unique value for each unique line condition and is reached at the following fouling degrees for the various track standards:

- **S1 ⇒ 70–75%** The coal line and iron ore line
- **N1 ⇒ 75–80%** Main lines on 57 kg rails
- **N2 ⇒ 80–85%** Lines on 48 kg rails

When the fouling degree has reached these measures for a specific track standard, ballast screening should be a high priority.

REINSTATING THE FUNCTIONS OF THE BALLAST THROUGH MECHANISED BALLAST SCREENING

In the past ballast screening was done by a large gang of labourers and other track personnel. Ballast screening by hand is labour intensive and requires extreme physical input from the labourers. Production is therefore very slow. Another disadvantage of this method is the creation of an uneven formation, which may enhance the trapping of water. This irregular formation will result in an uneven depth of ballast layers and thus differing settlement behaviour in the track. The greatest disadvantage of this method must be that the most critical part of the ballast bed, namely the area underneath the sleeper, is often neglected.

To counteract the problems associated with hand screening, mechanised ballast screening is generally applied. These machines are capable of very high production rates of up to 700 m^3 per hour, depending on the model. They produce exceptional quality at a very competitive price.

A ballast cleaning machine is equipped with an endless excavating chain, which passes beneath the track inside a cutter bar and is guided by up and down chutes. The chutes have adjustable ploughs which ensure that ballast at the toe of the ballast bed can also be salvaged.

The cutter bar reinstates the formation cross-fall to a side drain automatically. This cross-fall is a requisite for good drainage.

A lifting unit lifts the track clear of the chain, and the cutting depth can be controlled accurately to ensure an even longitudinal formation, as illustrated in figure 10. This is once again most important to prevent water from being trapped on an uneven formation and to prevent the rails from copying the uneven formation during settlement.

The chain excavates all the material in the ballast bed and transfers it via conveyor belts to vibrating screen boxes which separate the fine material from the re-usable ballast.

The re-usable ballast is returned to the track via a plough assembly, which controls the height of the track, and adjustable flaps, which ensure that the ballast is distributed uniformly under the whole cross-section of the track and around the sleeper ends.

The spoiled fines are transported via the spoil conveyor to spoil wagons, or can be dumped next to the track, if allowed.

CONCLUSION

The ballast is a very important component of the track structure with various functions which are critical to sustain safe passage of traffic.

It is most important that the ballast should be maintained in an acceptable condition before its deterioration starts to damage the other track components. This means that the ballast should be inspected for its fouling degree and that ballast cleaning should be done timeously. Neglecting this will cause damage to the track, which will result in unnecessary maintenance occupations and high maintenance expenses. □

Proudly South African beam track system

TUBULAR MODULAR TRACK is a unique patented beam track railway system that can be used for both light and heavy axle loads.

The system does away with the installation, operation and maintenance difficulties that are normally experienced with conventional ballasted rail track. It offers a more rigid structure, provides long-term stability of track geometry, and reduces maintenance significantly.

- Tubular Modular Track avoids the loss of geometric stability.
- It also avoids the loss of resilience when ballast becomes fouled.
- It requires a narrower formation, which greatly reduces construction costs.
- Maintenance costs are significantly reduced.

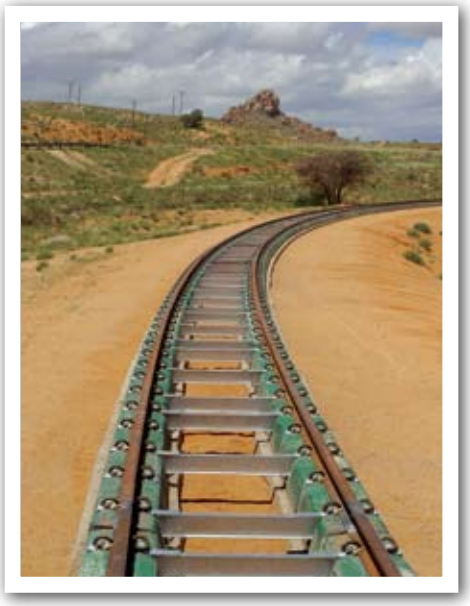
Because Tubular Modular Track is a continuously supported system, there is a significant improvement in the transfer of loads. It also greatly reduces rail stresses, and the use of lighter rail sections is therefore possible. It is very cost effective, and life cycle costs are dramatically reduced.

For example, a section of Tubular Modular Track installed in the main line between Thabazimbi and Rustenburg has carried 20 million gross tonnes of traffic without requiring any maintenance whatsoever.

Revolutionary turnouts, which are also continuously supported, have been developed and installed with great success.

A recent open tender in Namibia for 25 km of track was awarded on this technology against offers of conventional track systems.

The Tubular Modular Track system is a South African designed, tested and installed rail track technology that can be utilised with great confidence! □



Spoornet buys into Universal/ Infrabolt sleeper system

SPOORNET IS REPLACING imported hardwood rail sleepers with the patented Universal concrete sleepers from Infraset.

Very much a world-first in railway technology, the sleepers were first deployed on 40 turnouts sets after a successful pilot project at Pretoria's Capital Park rail junction early last year.

The new turnout installations are working extremely well, so much so, that Spoornet placed orders for a further 170 turnout sets, and tenders are out for the replacement of 430 turnout sleeper sets next year. Placed in perspective these orders equate to 24 000 and 60 000 linear metres of concrete sleepers respectively.

Developed in close collaboration with Spoornet's Track Technology Centre and Metrorial, the Universal sleeper system would not have been so successful without the subsequent development of Infrabolt. Another world-first in rail technology, Infrabolt is a new rail-to-sleeper bolt fastening system jointly developed by Infraset, Nedschroef and Pandrol.

Infraset's Railway Division General Manager, Kobus Burger, said that before the advent of Infrabolt, a footprint of every single sleeper to be replaced had to be made.

'There are hundreds of thousands of different bolt-hole positions and obviously making individual footprints for each one was not practical. In developing Infrabolt we undertook several experiments. We finally settled on drilling through concrete sleepers on site and then inserting steel collars into the bolt-holes to prevent the concrete from cracking; an unorthodox solution, but one that has proved remarkably effective,' said Burger.

Spoornet senior track engineer Willie Goosen says that the Universal sleeper/ Infrabolt solution is regarded as a technological breakthrough by the rail giant.

'We still have some 15 000 turnouts supported by timber sleepers and have been looking for an alternative to timber for many years. Besides the financial implications, concrete sleepers offer several advantages.

"In the first instance they can now be used in exactly the same way as timber sleepers. This means they are very easy to install and give us great flexibility. Like timber sleepers, they are inserted under the track and only then are the bolt-holes measured and drilled.

'Prior to the introduction of Infrabolt concrete replacement sleepers had to be pre-measured on site and then cast at the factory with bolt-hole settings to within 0,25 mm. It was very complex and time consuming. Now the sleepers can be cast to standard lengths which simplifies the whole replacement process and makes it much quicker. Furthermore, if a sleeper is damaged it can be easily and quickly replaced.

'The Universal/Infrabolt system also provides a turnout with a performance which is comparable to the 30-year lifespan of the state-of-the-art DESEC concrete sleeper turnout system. We use the DESEC system when constructing completely new turnouts from scratch. Not only is the system comparable to the performance of DESEC, but its conversion cost from timber to concrete is around 20% of the installed cost of a new DESEC turnout.

'Concrete-based turnout sets also yield a much longer gross-tonnage lifespan than timber-based units. However, there is a lot more to the process than simply replacing the timber sleepers with Universal sleepers. Thorough pre-inspection, planning and maintenance work must be conducted to bring the steelwork of the turnout to the required standard before sleeper replacement occurs.

'For instance, all the steel-work must be checked for skid marks, broken bolts, and broken or worn plates, and we also check geometric conditions such as alignment, gauge and sleeper spacing. Accurate spacing between sleepers is extremely important to ensure consistent elasticity and when a train passes over the turnout. To achieve consistent elasticity we often have to correct the sleeper spacing we find on old timber turnouts by adding one or two additional sleepers when installing a Universal/Infrabolt sleeper replacement set.

'Once installed the greater weight of a concrete-based turnout also means that it maintains its geometric integrity much longer and requires less intermediate tamping. A concrete sleeper turnout set is also better equipped much to withstand temperature induced forces which can be as high as 160–200 tons per track and result in distorted turnout geometry.

'A more obvious advantage of Universal/ Infrabolt is that we are assured of a constant and reliable supply. Hardwood sleepers have to be imported and are difficult to source. Secondly we have quality problems with the wood which often cracks due to climatic differences,' observes Goosen.

Burger says another major plus is the fact that the Universal sleeper is manufactured using local labour and materials, thereby creating jobs and stimulating the economy.

'We have begun marketing the Universal sleeper system in the United States and Australia.

'One of America's largest rail operators is very interested not only to save the further depletion of hardwood forests, but because the chemicals used to protect the wood is harmful to the environment. The fact that Universal sleeper/Infrabolt solution uses standard sleepers which can be mass produced makes the system very suitable to America's rail network where there are also hundreds of thousands of turnout permutations. The Australians are interested for the same reasons,' concludes Burger.

The Universal sleeper/Infrabolt system have to date been installed by rail construction specialists RACEC (Railway and Civil Engineering Construction). The company began installing the Universal sleeper system last year at a rate of one turnout conversion every three days. However, RACEC's installation teams have honed their skills to the point where it can now install one turnout in a single day. □

Above: Timber sleepers which formed part of a turnout prior to being replaced by an Infraset Universal/Infrabolt sleeper turnout set Right: A close-up view of a Universal/Infrabolt concrete sleeper system which replaced a timber sleeper system on this turnout

ABOUT VAE SA

VAE Perway was founded four years ago as a joint venture with the South African government-owned transport company Transnet. With the aim of being able to produce high-tech turnouts here in South Africa, VAE in this time has made available its leading global know-how and patents to the Perway plants in Kimberley and Bloemfontein.

Spoornet has plans for large-scale expansion. Major investments for upgrading existing lines, or for the construction of entirely new lines of track, are foreseen or are already being realised. The partnership between Spoornet and VAE has already exceeded all the targets set out at its inception in 2001.

The VAE Group operates more than 33 production plants in 17 countries on every continent and pursues the philosophy of maintaining its own production capacity in vital markets. Authorities appreciate this philosophy, as local employment is created and the value added does not leave the respective region or country.

In terms of the philosophy 'Think globally – act locally', VAE has adopted a successful approach leading to the group's ranking as a global market leader.

R16 million upgrade to Kimberley welding plant

VAE SA'S WELDING PLANT in Kimberley is now officially open. The R16 million project was necessitated by the increasing future demands in the supply of perway material for infrastructural development by Spoornet.

The upgrade of the welding plant has not only increased the capacity of the plant, which will meet the demand, but has also streamlined the sorting and welding of new and refurbished rail of different lengths.

Sound planning at the start of the project has resulted in increased productivity while care was taken to follow and apply thorough safety, health and environmental standards.

Up to now, the process of handling 60 m rail lengths and then welding them into 240 m rail lengths was laborious and outdated and created an unsafe working environment. The new plant can efficiently handle and load rails on special rail trains and complies with the latest safety standards.

The upgrade of the welding plant has not only increased the capacity of the plant, but has also streamlined the sorting and welding of rail of different lengths. Sound planning at the start of the project has resulted in increased productivity while care was taken to follow and apply thorough safety, health and environmental standards

But the main focus of the new investment has been to facilitate the loading of these extremely long welded rails (14 tons each) onto Spoornet's newly acquired special rail train in Kimberley and unloading them at their destination. For the railway industry this means major savings during rail replacement and maintenance programmes.

In addition, new facilities have been installed for the processing and refurbishment of used rails to be re-used in sidings or on other lines with less traffic or lower axle loads.

The new, upgraded Northern Cape facility is viewed as a strategic asset. Location-wise it is considered an easy access point to South Africa's major cities, harbours and airports. □

Compiled by **Dawie Botha**
Executive Director
SAICE

Pioneering railway

WILLIAM GEORGE BROUNGER was born at Hackney on 26 June 1820. He was educated at Totteridge and London University School and subsequently became a pupil of Mr Charles Fox, who later became Sir Charles Fox. Brounger was first employed on the construction of the London and Birmingham Railway. In Messrs Fox and Henderson, where he was employed at the time, he was tasked with setting out the Exhibition Centre, which later became known as the Crystal Palace. In his *Encyclopaedia of Architecture*, Joseph Gwilt wrote: 'The symmetry and strength of this vast building depended upon the accuracy with which the simple plan was drawn out, and much credit is due to Mr Brounger, who superintended this work.'

Brounger was then deployed to work in Denmark on the layout and construction of the Zeeland Railway from Roskilde to Körsor. It was said that he executed this work 'in such substantial and excellent style as to bear favourable comparison to the best works in England'.

In 1845 The Cape of Good Hope Western Railway Company was founded in London. At the time there was great emphasis on road building in the Cape, however, and the company did not achieve any success with its ideas to build railways in the Cape, because of a lack of a funding. In 1853 a new company called the Cape Town Railway and Dock Company was established and Sir Charles Fox was appointed as consulting engineer.

Severe difficulties once more delayed plans to build railways at the Cape. Although civil engineer Captain Pilkington presented his report to the select committee of the Cape Colony Parliament in 1857, the CTR&D Company lost out to another powerful railway proponent by the name of John Scott Tucker, an experienced railway engineer who had trained under Brunel, because they did not present a detailed survey. The Cape Parliament eventually approved the building of a railway line from Cape Town to Wellington, but then Tucker was unable to form a company to execute the work. This lost him the advantage, since the CTR&D Company immediately decided to survey the project. Sir Charles Fox recommended that his former pupil William Brounger be appointed to execute the proposed works. Brounger arrived in Cape Town in October 1857. He proceeded to execute a detailed survey that was completed in April 1858.

A contract between the government and the company was signed in May on the basis of this survey and the work was to be completed in April 1861. It was agreed that the company had to transfer this line to the government after 20 years, that mail was to be carried free of charge, and that the government had the right to add branch lines. The government also agreed to guarantee the 6% interest charge on the contract sum of £400 000. It was furthermore agreed that this railway line would be a 4 feet 8½ inch and would as such be following the British system.

The company then proceeded to employ the services of contractor E Pickering to do the work. Although the contract was from the outset plagued by many problems – often related to the fact that there were now two separate contracts and three parties involved – construction started with a grand opening party complete with fireworks in spite of bad weather. Construction of this, the first inter-town railway line in South Africa, was off to a good start.

In 1859 John Tucker returned to the Cape and was appointed Colonial Engineer. He effectively had the last say in the project.

Problems arose in the form of instructions from Tucker to increase the earthworks by 66% as well as instructing that the railway should be extended to Cape Town city centre from its originally planned starting point in Woodstock. Brounger was very worried about these developments and his contention that the extension was in fact a separate contract was eventually agreed to by Parliament.

Brounger faced immense challenges in the sense that he had to import labour, materials and equipment, which caused him many frustrations. The men who were brought in often also proved to be less than the experienced specialists they were said to be.

The management of the contract from the government's side proved to be fraught with problems. This eventually resulted in the fact that John Tucker was relieved of his supervisory role and temporarily replaced by the Surveyor General, Mr Charles Bell. This arrangement, however, became permanent. Mr Bell played a prominent role in the success of the railway line owing to his strict quality control measures and changing several specifications in order to provide for a more durable product. He had some substantial differences with Brounger but nevertheless had considerable respect for him.

The contractor Mr Pickering did not satisfy Mr Bell's requirements and criticism was the order of the day. By the agreed completion date there still was no part of the line in operation and this resulted in severe tension. The Cape Town–Stellenbosch section of the line was opened as an interim measure, but problems continued.

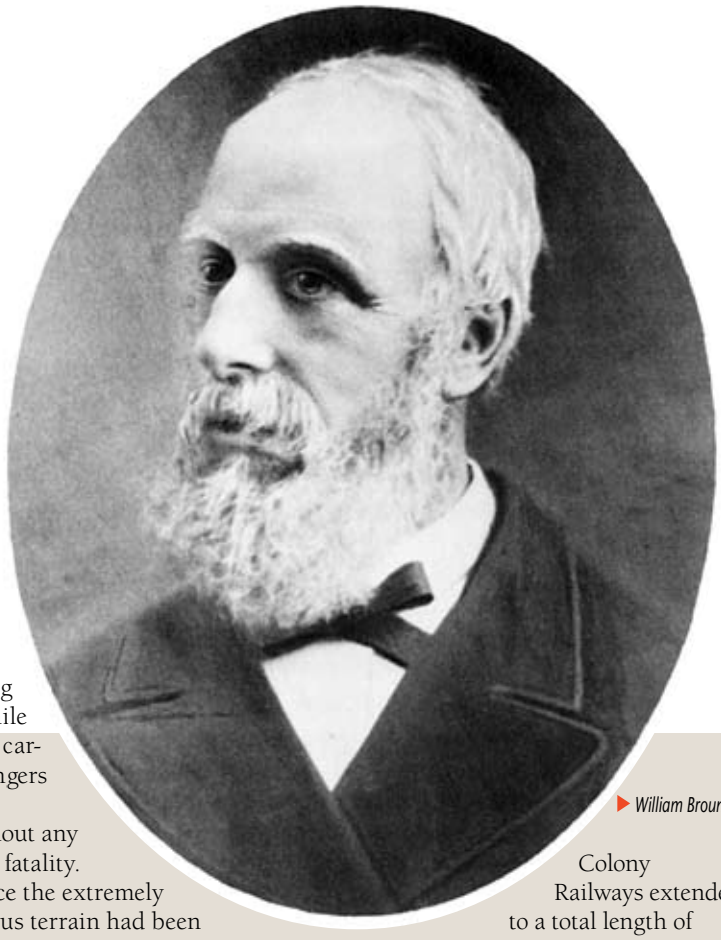
The decision of the government to terminate the construction contract eventually resulted in labour unrest and in obstructive damage to property by the contractor. In the process the company locomotive was even derailed at one stage.

A settlement with Mr Pickering ultimately freed William Brounger to progress with the building of the line much quicker than before, although he had to face what was most probably the first labour strike ever experienced in South Africa on a formal engineering contract. Brounger completed the line, and the first train that travelled from Cape Town arrived in Wellington with its 400 passengers at 12:40 on 4 November 1863 after a journey of three hours and ten minutes. On board was the Governor of the Cape, Sir Philip Woodhouse.

By that time Brounger had already acquainted himself with the terrain towards Worcester that would be the route of the line when it was extended northwards to the hinterland. A decision about this section was delayed, however, and eventually in July 1864 Brounger returned to England since the company could not afford to retain him for a longer period in spite of his popularity and the ultimate success with the Cape Town–Wellington line.

In the period 1863–1872 the philosophy of engaging contractors to build and operate railway lines made way for a new approach using departmental resources to build and operate railways. In 1872 the government of the Cape finally took over the railway line from the company at a sum

engineer



Source: Jose Burman, *Early railways at the Cape*

William Brounger

of £771 458, after protracted negotiations.

Thus began the era of the Cape Government Railways. The government, in preparation for this, had already made the good decision to request Brounger to return to the Cape, which he did in 1871. His experience of railway engineering as well as the local requirements and issues made him an excellent choice.

At the time the idea to build so-called light rail as cheaper alternative was thoroughly opposed by Brounger. He was of the opinion that the cheaper alternative was more expensive to operate and that the two options were therefore equal in terms of long-term cost. At the same time the success with a narrower gauge of 42 inches elsewhere in the world resulted in the adoption of this alternative as the norm for South Africa in 1873.

In July of 1873 a railway department was formed by the Cape government and Brounger was put in charge. He immediately set about to obtain skilled staff and to employ keen young engineers from England. He also successfully encouraged 200 artisans and 300 'navvies' to immigrate.

Brounger subsequently took part in the debate about whether to employ contractors or whether to utilise government employees to build and maintain railways. His experience with contractors convinced him the latter option was preferable. He was ultimately allowed to follow that principle in extending the lines to the north.

Brounger made use of his young team of engineers to survey the way ahead. But when it came to construction, he turned to Thomas Bain, the builder of mountain passes best remembered in South Africa even today, and son of the equally famous Andrew Geddes Bain. These two men were the two foremost builders of road and rail mountain passes in South Africa over several decades of the 19th century. Many of their works are still in regular use today.

Beyond Worcester and Wellington, several challenges remained in terms of what would constitute viable routes to the high Karoo plateau. Brounger made extensive use of his engineering surveying team to find the correct solutions. He in fact found several viable solutions including shorter routes and utilised short tunnels in spite of the reservations of some of his compatriots of the time.

In 1877 the railway line reached Touws River, on the plateau. In 1877 Brounger announced that during that year the 212-mile railway system had carried 614 190 passengers and trains had run 382 000 miles without any passenger injury or fatality.

Fortunately, once the extremely difficult mountainous terrain had been negotiated, the building of the railway lines into the Karoo proceeded with greater speed and ease.

In 1880 the expanding railway system became too big for one person to handle and a Mr Elliott was appointed as general manager of the three lines that were in operation by then. Brounger was left in charge of the important Western line.

In 1883 the Western line reached De Aar. For a brief period this town was called Brounger Junction. Pressure from the local inhabitants unfortunately resulted in the name being restored to De Aar, the name of the original farm on which the town had been established. The name De Aar was given because of the numerous underground water 'veins' in the area. This source of water was most important for the steam engine era, since the surface water in the semi-desert Karoo was not guaranteed at any time.

In 1884 the first train from Port Elizabeth reached Brounger Junction on its way to Cape Town.

De Aar was a very important and crucial link and remains the junction where the railway lines to Namibia, Port Elizabeth, Cape Town and Johannesburg meet.

William Brounger was an energetic, skilled and diligent engineer. He joined the Institution of Civil Engineers on 4 May 1847 as an associate, was transferred to member on 29 November 1864, and in 1865 received a Telford medal and premium for a paper describing the Cape Government Railways.

During his tenure of office the Cape Colony Railways extended to a total length of 1 500 miles. In 1884 the strenuous demands of his work led to a complete breakdown of his health and he had to retire.

He was a shining example of integrity and moral rectitude, including his contribution to his profession.

He returned to England and lived in Guildford, Surrey, until he passed away on 5 October 1901.

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About the author

The author of this contribution about Brounger grew up in the town of De Aar in what was known as a railway family. His maternal grandfather, Johannes Aucamp, was a fitter and turner who looked after the water pumps on the railway line from De Aar, through the then Bechuanaland Protectorate (now Botswana) and up to the border with the then Rhodesia (now Zimbabwe) until about 1960. Several of Aucamp's sons were employed by the SAR and Pieter Aucamp, who was a mechanical engineer by profession, retired as Divisional Mechanical Engineer in the 1980s. From 1950 until 1966 Pieter Aucamp's sister (the author's mother) was the staff clerk for 150 employees at the De Aar locomotive depot. A railway bursary enabled the author to study civil engineering and he worked as a railway engineer until 1975.

BEE COMPANY DELIVERS THE GOODS

DE AAR-BASED BEE COMPANY Empowa-Grinaker is successfully manufacturing thousands of concrete rail sleepers for Spoornet and Transnet annually. Formed in February 2003 as a 50/50 joint venture between Grinaker-LTA and Empowa Investments, a black-owned company, the company is a major BEE success story.

The De Aar plant employs 87 people and manufactures turnout sleepers and three other sleeper classes: the F4 and P2, used on general freight and main lines; and the FY, for heavy hauling conditions such as Saldana/Sishen line and the Broodsnyerplaas/Richards Bay coal line.

Kobus Burger, Empowa-Grinaker-LTA managing director, says Grinaker-LTA is committed to the whole process of empowerment.

'We believe that skills transfer forms an important part of the process, which is why Empowa director Molefi Madisakwane has been appointed as a full-time marketing executive of Grinaker-LTA subsidiary Infraset,' says Burger.

Madisakwane, who is also an executive director of Empowa-Grinaker, comments that he and his fellow Empowa directors believe that hands-on involvement is crucial to the success of any empowerment initiative. He comments further that Empowa-Grinaker-LTA's BEE credentials have assisted Infraset to maintain its growth path and preferred supplier status with Spoornet and Transnet and has given Empowa a meaningful equity stake in a business which boasts world-class technology.

'Infraset is the largest producer of concrete railway products in Africa and is recognised as an international leader in sleeper technology. Research and development form a major component of Infraset's activities and several pioneering products, such as the Universal sleeper and Infrabolt, have been developed by the company in the past few years. The Universal sleeper is the first of its kind in the world and is being used to replace wooden sleepers on existing turnouts throughout the country,' observes Madisakwane.

Madisakwane says the company has recently improved production by 5% and the plant is currently working at 75% capacity.

A range of Empowa-Grinaker-LTA concrete sleepers await dispatch at the company's De Aar factory

'Based on projected demand from Spoornet, we intend optimising production facilities still further and will soon be adding the 1-in-9 turnout sleeper to our existing range.

'We have also become involved in two community projects. The first has involved converting our single quarters into a care centre for orphaned and neglected children and the second entails a vegetable growing programme, the proceeds of which will be donated to HIV organisations in the area,' comments Madisakwane.

In addition to Madisakwane and Burger, the Empowa-Grinaker-LTA board comprises four additional directors: Caesar Molebatsi (chairman) and Abner Mariri of Empowa; and Garry Steyn and Graham Urry of Infraset.

OIL ANALYSIS BOOSTS MARINE MAINTENANCE

OIL ANALYSIS IS RECOGNISED globally as a valuable condition monitoring tool which reduces maintenance costs, improves productivity and provides peace of mind for organisations operating large fleets in the marine, aviation, earth-moving, road transport and industrial sectors.

Wearcheck Africa – one of the largest oil analysis laboratories in the world, processing more than 400 000 samples annually – started its buoyant marine division for the analysis of oil and filters from ships and quayside marine equipment some years ago.

Today, the company boasts a number of major marine companies as customers – among them Safmarine, Irvin & Johnson, Portnet Marine Services, Sea Harvest, Unicorn Shipping, FFS Bunkers, Atlantic Fishing Enterprises, Smit Marine SA, Lusitania Trawling Service, Viking Fishing Company and De Beers Marine.

'The Wearcheck programme analyses for wear, contamination levels and oil condition in the oil-wetted compartments and oil filters of marine vessels and equipment, and recommends action for proactive maintenance management,' says diagnostic manager John Evans.

'This translates into numerous benefits. Most importantly, oil analysis can be used as a tool to increase the life of vessels and equipment,

enabling management to delay the purchase of expensive major spares. Bearing in mind that much of this is imported, with prices ruled by prevailing exchange rates, this represents a major saving.'

'An often underestimated payoff is that oil analysis provides peace of mind,' says Evans. 'It acts as an early warning system, providing maintenance managers with the security of knowing that most problems will be identified before catastrophic equipment failure occurs.'

Another major advantage of oil analysis is that it reduces downtime, increasing the availability of equipment.

'When you compare the cost of an oil sample to the potential cost of repairing or replacing equipment, investing in oil analysis delivers a remarkable return on investment,' he says.

Wearcheck holds approved status to carry out marine oil analysis on ships and offshore units for Paris-based Bureau Veritas and UK-based Lloyds Register. The company is also registered for ISO 9001:2000 and ISO 14001:2004.

The company's marine kits are used for the analysis of used oil from ship engines, hydraulics and gearboxes on all marine vessels. The test profile includes wear metals, contaminants, additives and lubricant condition plus Total Base Number (TBN).

Wearcheck's turbine/compressor kits are for the specialised testing of all refrigeration, air-conditioning, gas compressors and turbines, while coolant analysis monitors radiator fluid.

WINNERS OF SUSTAINABLE CONSTRUCTION PROJECTS COMPETITION ANNOUNCED

$1 MILLION IN PRIZE MONEY was awarded to the best sustainable construction projects entered in the first global Holcim Awards competition.

The winners were selected from 15 finalists from all continents, following on from a series of five regional competitions with more than 3 000 submissions from 118 countries.

A project to upgrade and integrate urban infrastructure in the shantytown of San Rafael-Unido in Caracas, Venezuela, was awarded the global Holcim Awards Gold 2006. The winning team from Proyectos Arqui 5 CA, Caracas included Silvia Soonets, Isabel Cecilia Pocaterra, Maria Ines Pocaterra and Victor Gastier.

CKIR Helsinki School of Economics Senior Visiting Fellow, and member of the jury, Kaarin Taipale (Finland), said the project sensitively and skilfully treats a challenging array of environmental, cultural and communal issues: 'The urban integration project not only advances local pride and resourcefulness; it is an ethically responsive and environmentally sensitive approach to minimising extreme socioeconomic hardship,' she said. The project explores innovative ways of integrating building services and infrastructure as part of a broader aim to fittingly unify natural and constructed environments.

Also recipient of the global Holcim Awards Gold 2006 was the design for a new main railway station in Stuttgart, Germany, by Christoph Ingenhoven of Ingenhoven und Partner Architeckten, Düsseldorf.

TEN Arquitectos Principal, member of the Advisory Board of the Holcim Foundation and of the jury, Enrique Norten (Mexico), praised the project for stimulating social pride through a new urban centre: 'This project innovatively incorporates material, structural, and product research into a straightforward and sustainable design for reclaiming urban space,' he said. The new station will link two urban quarters that were divided, promoting social cohesion, and providing new opportunities for leisure activities and interaction among all age groups.

Culmination of a three-year competition cycle

The Holcim Awards aim to promote innovative, future-oriented and tangible sustainable construction projects and reinforce stakeholder awareness of the importance architecture, engineering, and construction have in achieving a more sustainable future. The competition was launched by the Swiss-based Holcim Foundation for Sustainable Construction in collaboration with five of the world's leading technical universities in 2004.

The global Holcim Awards ceremony in Bangkok marked the pinnacle of a three-year competition cycle. At five regional competitions, 46 sustainable construction projects were awarded a total of $1,1 million – not only providing financial benefit to winning entries, but also sharing innovation and promoting sustainable responses to the technological, environmental, socio-economic and cultural issues affecting building and construction.

Seven hundred guests from 50 countries attended the event in Bangkok. In his welcome address, Chairman of Holcim Ltd and of the Advisory Board of the Holcim Foundation, Rolf Soiron (Switzerland), stressed that progress and sustainable development were closely linked to the name Holcim: 'Through the Holcim Foundation the Holcim Group is committed to incorporating the principles of sustainable development into the built environment – learning from innovation, and celebrating new solutions,' he said.

Silver and bronze awards

The Holcim Awards Silver of $250 000 went to a regional masterplan that is a fusion of preservation and innovation aimed at strengthening the economic base of the Mulini Valley in Italy. The project was coordinated by Luigi Centola, Centola & Associati, Roma and Mariagiovanna Riitano, University of Salerno, Fisciano in cooperation with partners from Italy, Spain, the USA and the UK.

Third prize of $150 000 was awarded to a low-cost housing and urban renewal project in Montreal, Canada, that incorporates community involvement and many beneficial technologies for outstanding building performance and efficiency. The project was created by a team lead by Daniel Pearl with Mark Poddubiuk and Bernard Olivier of Montreal-based L'OEUF (L'Office de L'Eclectisme Urbain et Fonctionnel).

Sustainable construction beyond the awards

CEO of Holcim Ltd and Chairman of the Management Board of the Holcim Foundation, Markus Akermann (Switzerland), announced a new global initiative called 'Project Seed Funding' to support sustainable construction projects and research activities. He confirmed the next cycle of the Holcim Awards competition will open for entries in mid-2007.

CONSTRUCTION SECTOR'S GROWTH TO CONTINUE, C&CI REVIEW PREDICTS

THE CONSTRUCTION AND building industry should expect growth of at least 8% this year, the Cement & Concrete Institute (C&CI) predicts in its recently published 2005 *Cement and Concrete Review*.

Review author John Sheath, marketing manager of the C&CI, says the growth prediction is based on the strong foundations created by South Africa's positive economic growth over the past few years, further underpinned by the economy's current buoyant outlook.

C&CI does not expect the residential sector to continue to expand at the 'phenomenal rates' of recent years. 'This sector had to recover from more than a decade of stagnant growth in the 1990s but has now recovered to a more stable and normal investment cycle. The mobilisation of R42 billion for lower income earners by the financial sector will certainly contribute towards the successful completion of many low-income housing developments.'

Sheath says although billions of rands have been committed by government for infrastructure expenditure, issues such as skills shortage, the cost of skills, poor planning and implementation at local government level, and constraints on resources such as the electrical supply, tend to dictate a more cautious outlook regarding the future of the civil engineering sector. 'But, with a conservatively estimated R3–4 billion spending per annum over the next few years, the civil engineering industry should still enjoy a more viable and profitable period.'

The review says the 10,6% growth in sales of cementitious products last year represented 'new highs' for the industry and have necessitated the cement producers' plans to increase production capacity over the next few years.

'Total investment in construction during 2005 is expected to have increased by 9% in real terms, based on 2000 prices, to around R71 billion, or approximately 6,5% of the gross domestic product,' Sheath added.

John Sheath

▶ Copies of C&CI Review:
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Download from www.cnci.org.za

SITE ESTABLISHMENT FOR SISHEN EXPANSION PROJECT COMPLETED

THE GRINAKER-LTA/MURRAY & ROBERTS Joint Venture has completed the site establishment on the Sishen Expansion Project Phase 1. The scope of the work comprises the civils works for three crushers (primary, secondary and tertiary) as well as the stockpile area for the expansion project.

The contract was awarded in August 2005 on the basis of the competitive package offered as well as the joint venture's ability to meet the construction programme. Site establishment was competed in September/October 2005 and Phase 1 is scheduled for completion in October 2006. Some 40 000 m³ of concrete will be used on this project.

Commenting on the scope of this contract, Mike Stevenson, construction director at Murray & Roberts Construction responsible for this project, says the size of the various elements will make it challenging.

Construction on the primary and tertiary crusher bases is currently taking place. The primary base will use 1 800 m³ of concrete, while the tertiary base will use 2 000 m³ of concrete, making them fairly substantial crusher bases.

Earthworks and mass fill for the secondary crusher civils work has also begun, and the foundation is being constructed.

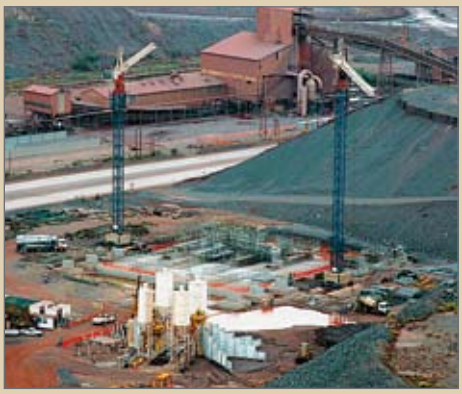
The primary crusher will be fed with ROM (run of mine) ore by truck. From here, material will be taken via conveyor to the secondary crusher and then to the stockpile tunnel. The stockpile tunnel will be fitted with gravity feed chutes and will feed the conveyors, which carry the material to the tertiary crusher.

The primary crusher is situated at a depth of about 35 m below the surface level. To facilitate the civils works, a further 6 m was excavated below this when the joint venture took over from the bulk earthworks contractor. Once this additional excavation had been completed, a stabilised fill was put in ranging from 3% to 6%, creating an even platform for the crusher.

The base is being constructed using two tower cranes and a concrete boom placer for efficient placing of the concrete. Most of the concrete will be pumped directly from the batch

View of the primary crusher base under construction

Construction of the secondary crusher base



An overview of the construction of the tertiary crusher base

plant, which is a distance of 150 m from where the base is being constructed. The batch plant consists of two EZA 750/500 pan batch plants feeding into a central wet hopper with the option of a static concrete pump or the use of a ready-mix truck.

'We opted for an alternate design for the primary crusher, which will allow ease of construction as well as afford significant time savings. We'll be using a 100 mm thick concrete plank as the permanent shutter and then using steel members and concrete columns as support. These will have a span of 4,5 m. We felt that the use of conventional staging would not be as efficient,' Stevenson comments.

For the tertiary crusher, a conventional structure is being built with a tunnel concept because this is considered a more efficient operation and will enable the construction of the wall and soffit simultaneously. Use of conventional staging will not be necessary and it will be possible to strip and move a distance of nine metres every fourth day.

'This reduces the need for resources and equipment,' Stevenson says.

Use of this method of construction also allows access for follow-on contractors. A similar batch plant has been set up on the tertiary crusher with two EZA 750/500 pan batch plants and also with the option of a static pump and ready-mix truck.

Again, most of the concrete will be pumped.

The joint venture is striving to meet a target of 70% local community workforce with about 40 personnel sourced from within the ranks of the two companies. 'There are a fair number of skills available in the region and skills transfer will take place where necessary. Training for the local communities includes HIV/Aids awareness,' Stevenson concludes.

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EDDIE DU RAND APPOINTED MANAGING DIRECTOR OF GRINAKER-LTA CONSTRUCTION

EDDIE DU RAND HAS BEEN appointed managing director, Grinaker-LTA Construction following the retirement of Howard Jones at the end of March 2006.

Grinaker-LTA Construction is a subsidiary of Aveng, a JSE-listed company with a multi-disciplinary exposure across the construction value chain through its subsidiaries. Besides Grinaker-LTA Construction, which operates in southern and central Africa, there are McConnell Dowell, a construction company active in Australia, Oceania and Southeast Asia; Moolmans, an opencast mining contractor; and E+ PC, an engineering and project managing company. The group also has extensive activities in steel beneficiation though Trident Steel, in manufacturing services through Steeledale, Infraset, Duraset and Lennings Rail and in cement manufacturing though its associate, Holcim (South Africa).

Eddie du Rand

Du Rand joined the group in 1993 and has headed up Grinaker-LTA's Mechanical and Electrical Engineering Business Unit (M&E) for the past five years. The M&E business operates in sub-Saharan Africa, consists of six core divisions, and has more than 3 000 employees.

He has served on the Grinaker-LTA executive committee since its inception and has played an active role in developing a talent management programme to boost the group's ability to attract and retain skills in the current market.

WSP ACQUIRES ELLMER CONSULTING ENGINEERS

WSP GROUP SA HAS ACQUIRED Ellmer Consulting Engineers (Pty) Ltd, a specialist structural and civil engineering consulting firm.

Arno Ellmer, Jan Grobler and Marius Weyers have been appointed to the board of WSP Africa Civil and Structural Engineers and, together with their team, will join other WSP staff to form the core of a structural and civil services division in Gauteng. The three directors have had extensive experience in their particular fields of specialisation. Ellmer and Grobler are responsible for the structural projects undertaken by the firm, while Weyers is responsible for all civil engineering services.

Ellmer says: 'The firm's directors remain intimately involved throughout every project, from commencement through to completion and beyond, providing an efficient, direct and prompt service to our clients. Because we specialise in structural and civil engineering, we are focused and specialised, which enhances our ability to zoom in on the requirements of a project efficiently and effectively.

'With the additional expertise and resources that we have access to across the WSP Group, we are well positioned to become involved in larger projects, both locally and further afield.'

Above: Arno Ellmer, Jan Grobler and Marius Weyers

The company specialises in commercial civil and structural engineering projects, such as offices, retail, warehouses and residential. It is currently involved in several prestigious projects, including the new head office for Anglo Gold Ashanti in Turbine Square in the Johannesburg CBD, the World Wear shopping centre in Fairlands for RMB properties, and The Emperor luxury apartment building in Sandton.

'We look forward to offering a service enhanced by greater access to national and international resources as well as links with established empowerment companies,' Ellmer adds.

Andrew Mather, the managing director of WSP Group SA, says: 'The acquisition of Ellmer Consulting Engineers serves to enhance the multidisciplinary resources and capabilities of the group, adding a strong commercial component to the civil and structural division.'

GOVERNMENT SUPPORT FOR TOP MINING, CONSTRUCTION, INDUSTRIAL AND POWER GENERATION SHOW

GOVERNMENT HAS AGAIN SHOWN strong support for top mining, construction, industrial and power generation show Electra Mining Africa with the Department of Minerals and Energy (DME) confirming that Mining Week will run concurrently with Electra Mining Africa in 2006.

The DME and other parastatal service providers to the industry will exhibit at Electra Mining Africa and there will be a five-day jewellery workshop where visitors will be able to witness the creation of gold, diamond and platinum jewellery. The DME will also be hosting a co-locating conference, details of which will be available shortly.

Mining in Africa has hit boom times and many mining houses are either developing new ventures or upgrading existing operations in order to keep up with China's apparently insatiable demand for commodities.

'This is good news for general industry, including manufacturers or suppliers of equipment to the mines, from tyres to lubricants, concrete to process plants and all types of mechanised equipment that will help miners recover ore bodies more efficiently and cost-effectively,' says John Kaplan, managing director of Specialised

Exhibitions, organisers of the show.

Growth has also been seen at Electra Mining Africa, where over 85% of available exhibition space has already been taken with 450 exhibitors and 24 729 m^2 of contracted space.

As a value-added service to exhibitors, Specialised Exhibitions is running an awareness campaign to attract visitors from South Africa, Botswana, Lesotho, Zimbabwe, Zambia, Tanzania, Zambia, Namibia, Angola, Mozambique, and West African countries where mining is making an impact on the economies of places such as Mali and Ghana.

Arrangements are already in place to bring in international visitors from Germany, Spain, Austria and China.

Electra Mining Africa 2006 takes place at the Expo Centre, Nasrec, Johannesburg, from 11 to 15 September 2006.

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gcorin@specialised.com

SKYWAYS BUILDING TRANSFORMED

THE TRANSFORMATION OF the Skyways building in East London could be classified as an engineering achievement of note. The Skyways complex was once a dingy, drab-looking structure with badly damaged facilities and poor living quarters. Today, thanks to the Skyview project of Own Haven Housing Association, this quality complex provides an upmarket living environment that offers warmth and security to residents.

Dion Oosthuizen from Sonnekus & Toerien Consulting Engineers recalls that the Skyways assignment began in earnest in 2005. The dilapidated block of flats was so run-down that it almost faced demolition. The basement was nearly waist deep in sewerage, and an in-depth examination delivered shocking results.

'We couldn't believe how bad things were,' says Dion. 'None of the toilets worked and there were broken taps and pipes everywhere. The result was fresh water that was continuously flowing out into the streets and ducts were piled high with sewerage as residents used the bucket system to offer a temporary solution to broken toilets. The situation was horrendous.'

Another severe problem was the level of damp in the building. 'The water table was about 500 mℓ below floor level and it took us a long time to drain. We had to cut off the water supply before we could start the draining process and kept the pumps running for weeks to extract all the sewerage.'

'The project required a great deal of structural work. We did all the earthworks around the building and designed all the services. Servicing was a special challenge, as there were virtually no records of any existing pipes and cables. In most cases, it was a "dig a hole and see what you find" scenario! Paving and graded entrances were an absolute pleasure to design with in Civil Designer because we could

Skyways: before ...

... and after

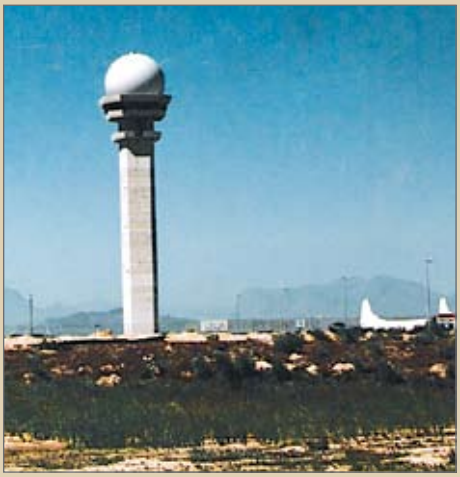
present the end product to less technical people in a visually understandable manner,' explains Dion.

'Another handy feature in the program, especially since stormwater attenuation is becoming a buzzword in today's residential and commercial developments, is that you can design your banks on top of survey data. You can then present your final image in a combined 3D view and then fly through, go back and progress up the ramp in different stages to get an accurate picture,' he says.

'We managed to help rescue the Skyways block and today it offers a beautiful home to many residents. This is one project where you literally have to look at the before and after pictures to truly understand what was done. The project has restored dignity to one of the oldest blocks in the neighbourhood and is an engineering success story that we can all be proud of,' says Dion.

CHRYSO ADMIXTURES FOR NEW CAPE TOWN AIRPORT STRUCTURES

ADMIXTURES SUPPLIED BY Chryso SA's Western Cape branch formed an important part of the concrete mix for two new Cape Town International Airport structures.



Left: Work in progress on a new parking garage for CT International Airport
Above: New concrete radar tower at the airport. Chryso SA provided admixtures for the construction of both structures

Chryso's admixture provided maximum workability to the concrete produced by Murray & Roberts' site batch plant for the construction of the new multi-million rand parking garage, completed recently. Anthony Venier, Chryso Western Cape branch manager, says the company also supplied mould oil and curing compound to M&R for this contract.

Chryso's admixture (from the company's range of plasticisers) also added important workability to the ready-mix concrete supplied by Megamix to the main contractor, Grinaker-LTA Civils, for the recently completed new radar tower at Cape Town International Airport. The tower's 50 m high concrete shaft was slip-formed by Karrena Africa. Chryso also supplied curing compound for the tower contract.

Norman Seymore
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FORUM

RECONSTRUCTION OF N2 BETWEEN WILDERNESS AND SEDGEFIELD

I WAS MOST INTERESTED to read in the February 2006 issue of the magazine that Power Construction received an Excellence Award for civil works carried out on Thesen Islands, Knysna. This was together with a team consisting of Arcus Gibb, CSIR, Nieuwoudt & Hofmeyer and main sub-contractor African Gabions. Well done! A bouquet for all concerned!

Now for a brickbat!

Like many living in this part of the Garden Route we have had to endure unreasonable delays in the reconstruction of the N2 Highway, which is being carried out by Power Construction with the professional team of Element Consulting Engineers.

The distance involved is approximately 21 km and the works commenced in January 2005. Living in Sedgefield, I was able to observe at close hand the slow progress of construction and long delays in traffic flow due to the road blocks. In the early stages the organisation was poor and the staff untrained. Long lines of traffic backed along the N2 for a considerable distance, including commercial vehicles, private vehicles, tourist buses, etc. These delays impacted heavily on local businesses, service stations and the local residents causing, in several cases, great financial loss.

Only at the end of 2005, 11 months later, was the road substantially complete and at that stage road blocks were discontinued over the holiday season from early December to the end of January 2006. The final 'touching up' is still in progress in March 2006 (road markings and minor patching).

However, at the same time, Power Construction were engaged in carrying out the road works for the Garden Route Mall situated on the N2 to the south-east of George. This was a 'fast track' project and the mall was opened to the public in October 2005 with almost all the roads completed in a very short construction period.

In my opinion, there appeared to be a lack of competence, experience and drive in the overall management of the N2 reconstruction contract. Not enough planning had gone into the provision of temporary off-road deviations to prevent excessive traffic delays.

If and when the N2 Knysna Bypass is given the go-ahead, it is hoped that the South African National Road Agency Limited (SANRAL) will ensure that an A Team is appointed to manage the contract and that the best interests of the travelling public and commercial services are taken into account.

G M Janes

RESPONSE FROM SANRAL

THE SOUTH AFRICAN National Roads Agency (SANRAL) agrees with Mr Janes that Power Construction's award for excellence for the work carried out on the Thesen Islands project is a great achievement and we would also like to congratulate the as well as all other parties involved on a job well done.

We further agree with Mr Janes's comments with regard to the relative short period in which the roads and parking areas of the new Garden Route Mall were constructed, again by Power Construction.

However, to draw a comparison between the road repairs of one of the busiest sections of the N2 route and the construction of the roads and parking areas of a shopping mall is unmerited because of the huge difference in standards regarding material quality requirement, construction techniques, traffic accommodation, safety requirements, etc.

We were well aware of the volume of traffic on this section of the N2 and knew that accommodating one-way traffic next to the sections under repair would result in delays to motorists. The alternative was to accommodate two-way traffic on substandard lane widths on the road. The risk of accidents, however, was unacceptably high to us, especially if one considers the general disobedience to road signs by some of the motorists on our roads.

We also made a commitment to assist with the unemployment problem in the areas where we work by employing and training workers from the local communities. This we have done, and Power Construction employed on average some 200 hundred workers from local communities. These workers were trained at the beginning of the contracts and became noticeably more experienced and efficient as the project progressed.

The reason for Power Construction's relatively slow progress during the initial stages of the contract was not a lack of competence, experience and drive in the overall management of the N2 reconstruction contract, but rather the inability of the local suppliers of road-building material to supply material to the required specifications to the project on a continuous basis.

Mr Janes's opinion is therefore regarded as undeserving and, in our opinion, rather based on some degree of ignorance. In the past year we held a number of media information sessions to inform the media and public of the roadworks on the N2 between George and Knysna. We suggest that Mr Janes attend these meetings in order to better understand the project.

Finally, we would like to assure Mr Janes that we are not insensitive to the interests of the travelling public – after all, they are our 'clients'. We welcome justified criticism, as this helps us to improve our service to the travelling public.

J C van der Walt
Regional Manager (WR)

STOP COUNTING US

I AM TIRED OF READING articles lamenting the supposed shortage of engineers, technologists and technicians [see Brad Rutherford's letter in the March issue of *Civil Engineering* – Ed]. It is my belief there is not an overall shortage of engineering professionals but a shortage of practising engineering professionals. The reason for this shortage is the pathetic remuneration packages, which explains why so many have moved to more lucrative careers.

It is unfortunate that those doing the counting have either CEO, MD or Chief after their names and as such are well remunerated and comfortable and do not appear to be aware of the real discontent within the profession. This situation will not change until there is a row of large expensive cars parked outside the offices of companies offering engineering services. The 'WOW' factor needs to be introduced into the salaries of engineering professionals. Only then will engineering become a career of choice.

Unless the Institution drives this initiative forcefully I believe the situation will get worse in the future when youngsters who have qualified within the last ten years realise they have financially fallen far behind their lawyer, CA, doctor, etc, peers, and start to move out of the profession. The youngsters of today are less likely than their parents to remain in a profession that is financially taking them nowhere.

Just Pay Us

TO: ALL CORPORATE MEMBERS

NOMINATIONS FOR ELECTION OF COUNCIL FOR 2007

NOMINATION FOR ELECTION to Council must be accompanied by a curriculum vitae of the nominee not exceeding 75 words. According to a 2004 Council resolution, candidates are requested to submit a focus statement. (Please see Section C.)

The CV will accompany the ballot form. The format of the CV is shown below:

Section A
Information concerning the nominee's contribution to the Institution
Section B
Information concerning the nominee's career, with special reference to civil engineering positions held, etc
Section C
A brief statement of what the nominee intends to promote / achieve / stand / introduce / contribute or preferred area of interest

Please note: Nominations received without an attached CV will not be considered.

Closing date: 31 July 2006

Acceptable transmission formats – e-mail, fax and ordinary mail. All ballots are treated with due respect of confidentiality

If more than 10 nominees from Corporate Members are received, a ballot will have to be held.

If the ballot is to be held, the closing date for the ballot will be 31 August 2006.

Notice of the ballot will be sent out using two formats:

- By e-mail to those Corporate Members whose electronic address appears on the SAICE database, and
- By normal surface mail to those members who have not informed SAICE of an e-mail address

D B BOTHA PrEng
EXECUTIVE DIRECTOR
20 April 2006

THE SOUTH AFRICAN INSTITUTION OF CIVIL ENGINEERING

Nomination for Election of Members of Council for the year 2007 in terms of Clause 3.1 of the By-Laws

IN ACCORDANCE WITH CLAUSE 3.3 of the Constitution, the Council has elected Office Bearers for the Institution for 2007 as follows:

- President Mr N A MacLeod
- President Elect Mr J J de Koker
- Vice President Mr T W McKune
- Vice President Mr C J Campbell
- Vice President Prof E P Kearsley
- Vice President Mr A M Naidu

In terms of Clause 3.2.4 of the Constitution, the following are ipso facto members of the Council for the ensuing year:

- The Retiring President Mr S A S Amod
- The two most recent Past Presidents Mr M R D Deeks
  Mr R B Watermeyer

Clause 3.1.1 of the By-Laws reads as follows:

'Every candidate for election to the Council shall be a Corporate Member and shall be proposed by a Corporate Member and seconded by another Corporate Member.' Nominees accepting nomination are required to sign opposite their names in the last column of the nomination form.

New Fellow

CRAIG ROBERT SUTHERLAND completed a BSc Civil Engineering at UCT in 1987. After two years of national service he spent three years gaining varied experience working for consultants in Cape Town, Gauteng and the UK before starting Sutherland Associates (Pty) Ltd Consulting Engineers together with his late father, Gordon Sutherland, in 1993. Gordon Sutherland's very successful career was tragically cut short at age 57 by cancer in 1997. Craig Sutherland, now aged 39, has built fast-growing Sutherland Associates up to highly successful multidisciplinary practice offering structural, civil, project management and mechanical engineering, employing 60 staff and operating nationally as well as internationally. □

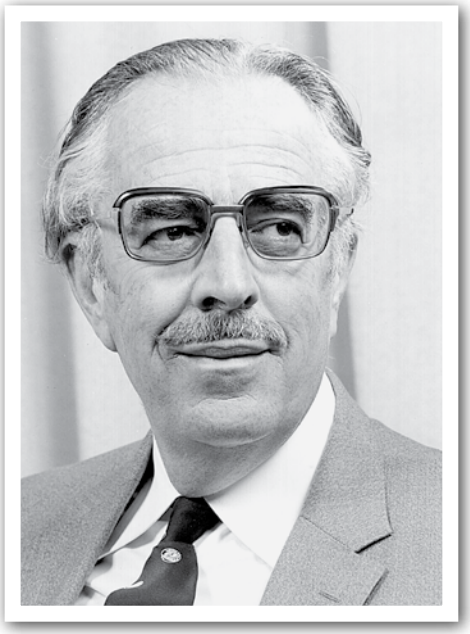
NOMINATION FORM 2007

10 Corporate Members

SURNAME	FIRST NAME(S)	PROPOSER		SECONDER		SIGNATURE OF NOMINEE
		Signature	Name in block letters	Signature	Name in block letters	

Please fax this form, plus the CV of the nominee, back to SAICE National Office, for attention Memory Scheepers, by 31 July 2006
Fax number: 011-805-5971

OBITUARIES



Ray Smith

RAYMOND ANTON Franklin Smith, better known as Ray, passed away on 15 September 2005. Ray was a larger than life transportation professional who made major contributions to the practice of transportation engineering in the RSA and whose influence and example inspired many of today's leading transportation professionals.

EARLY YEARS

Ray was born of South African parents in Blantyre, Malawi, on 10 August 1931. He matriculated from Rondebosch Boys High School in 1947 and obtained his BSc (Civil Engineering) degree from the University of Natal in 1952.

On leaving university, Ray joined the Natal Roads Department where he worked in bridge design, maintenance, construction and planning. He progressed to the positions of Traffic Engineer and Geometric Design Engineer before he was seconded to the National Institute for Road Research in 1963 to study and promote the application of computers in highway authorities in the RSA. Ray bit his teeth in this field using punched paper tape on the ZEBRA computer of the CSIR. The project was taken over by the National Department of Transport in 1964 and Ray then undertook several study tours to the USA and the UK who were, at that time, the word leaders in his field.

Using this background, Ray, with typical drive and energy, furthered the application of computer methods in highway engineering by creating opportunities for young engineers to study this field at a postgraduate level, and by forming and actively leading the Highway Computer Committee, on which all road authorities in the RSA, as well as the then South West Africa and Southern Rhodesia, were represented. These efforts eventually lead to the establishment of CICTRAN (the Computer Information Centre for Transport) at the then National Institute of Road Research at the CSIR. Our profession, who at present use computer technologies in the transport industry as if it has always been this way, owes a great debt of gratitude to Ray for his pioneering efforts in this field.

HIS TIME AT THE UNIVERSITY OF PRETORIA

Ray served as external examiner for the final year theses of civil engineering students at the University of Pretoria since 1969. After his retirement as Deputy Director-General: Roads for Natal, in January 1992, Ray started his second career by joining the staff of the Civil Engineering Department at the University of Pretoria as Associate Professor in Transportation Engineering. After reaching the mandatory retirement age, he was made Extraordinary Professor in Transportation Engineering. He taught postgraduate courses in Urban Transport and in Transport Safety until his final retirement in 2003, a period of eleven years. His many postgraduate students will attest to his enthusiasm for these two fields of transportation. During his last years at the university, Ray acted as the chair of the Northern Centre of Development in Transportation.

RAY AND THE SATC

Ray had a passion for sharing information, and under his guidance as the Director: Urban Transport at the Department of Transport, the SATC (SA Transportation Conference), then called the ATC (Annual Transport Conference), was started in 1981. Ray served on the steering/organising committees of the ATC and SATC since its inception, until his retirement due to ill-health in 2003. During the latter years he served as the chairman of the organising committee of the SATC. He also was the author and co-author of numerous professional papers.

PROFESSIONAL ACTIVITIES AND AWARDS

Ray was the chairman of the Pietermaritzburg Branch of SAICE in 1961 and 1962. He also served on the committees of the Division of Electronic Computation, the Construction Division and the Division of Highways and Traffic Engineering. He was a past chairman of the Committee of State Road Officials, the Committee of Urban Transport Authorities, the SA Division of the Chartered Institute of Transport, the National Transport Policy Steering Committee and the Road Transport Industry Training Board. He served three years as a member of the Civil Engineering Advisory Council. Ray chaired the Road Signs Committee for a period of ten years during which a modern road signing system in South Africa was developed and implemented.

In 1985 Ray was elected the first president of the Institute of Transport in South Africa. In 1986 he received the first annual award for meritorious service from the Division of Transportation Engineering of SAICE, and in 1989 he received a CSIR award in recognition of his support and contributions to research in roads and transport. In 1990 he received a National Road Safety Council award for his dedication to the cause of road safety over the years. In 2001 Ray received a Certificate of Accomplishment from the US-based Who's Who Historical Society, in recognition of his outstanding professional and civic achievements.

PERSONAL DETAILS

Ray was married to Betty and they had four daughters and eleven grandchildren. Over the years he participated in many different sports, from rugby and cricket in his youth to bowls in his later years. Ray was a singer of repute and sang at the weddings of his four daughters.

His voice, which could always be heard above the general noise at an SATC cocktail party, is now silent, but he will be remembered by al of us who had the privilege of serving with and under him.

Piet Jordaan

Reg (Phil) Sweet

IT WAS WITH GREAT SADNESS that we learnt about our member Reg (Phil) Sweet's passing away on 26 December 2005.

Reg was born in Gosport (Hampshire), UK, on 12 December 1953. After completing his military conscription, he graduated at the University of Natal in 1975. He started his career with the then SAR&H as an Assistant Engineer and progressed to the position of District Engineer at the Umbilo Construction Office. During this time he became involved with various New Works projects, the moist noteworthy probably being the construction of the new Durban Station.

In 1984 Reg took up the post of Senior District Engineer (Maintenance) at Ladysmith to oversee the maintenance of the Danskraal–Pietermaritzburg leg of the strategic Durban–Johannesburg rail corridor. In 1990 Reg left the rail industry to join a civil engineering consultancy firm, but his passion drove him to take up a railway consultancy role with W S Atkins in the UK in 1991. He spent the next fourteen years working on projects such as the Channel Tunnel, the Docklands Light Rail, and the Nottingham Light Rail.

In 2004 Reg joined Metronet, a rail asset management consortium responsible for some of the London Underground network, as their Track Asset Manager.

I got to know Reg as a fellow AE back in 1976 and during the past thirty years our paths frequently criss-crossed. During the past five years, I was privileged to work fairly closely to Reg and it was only then that I began to appreciate his true character.

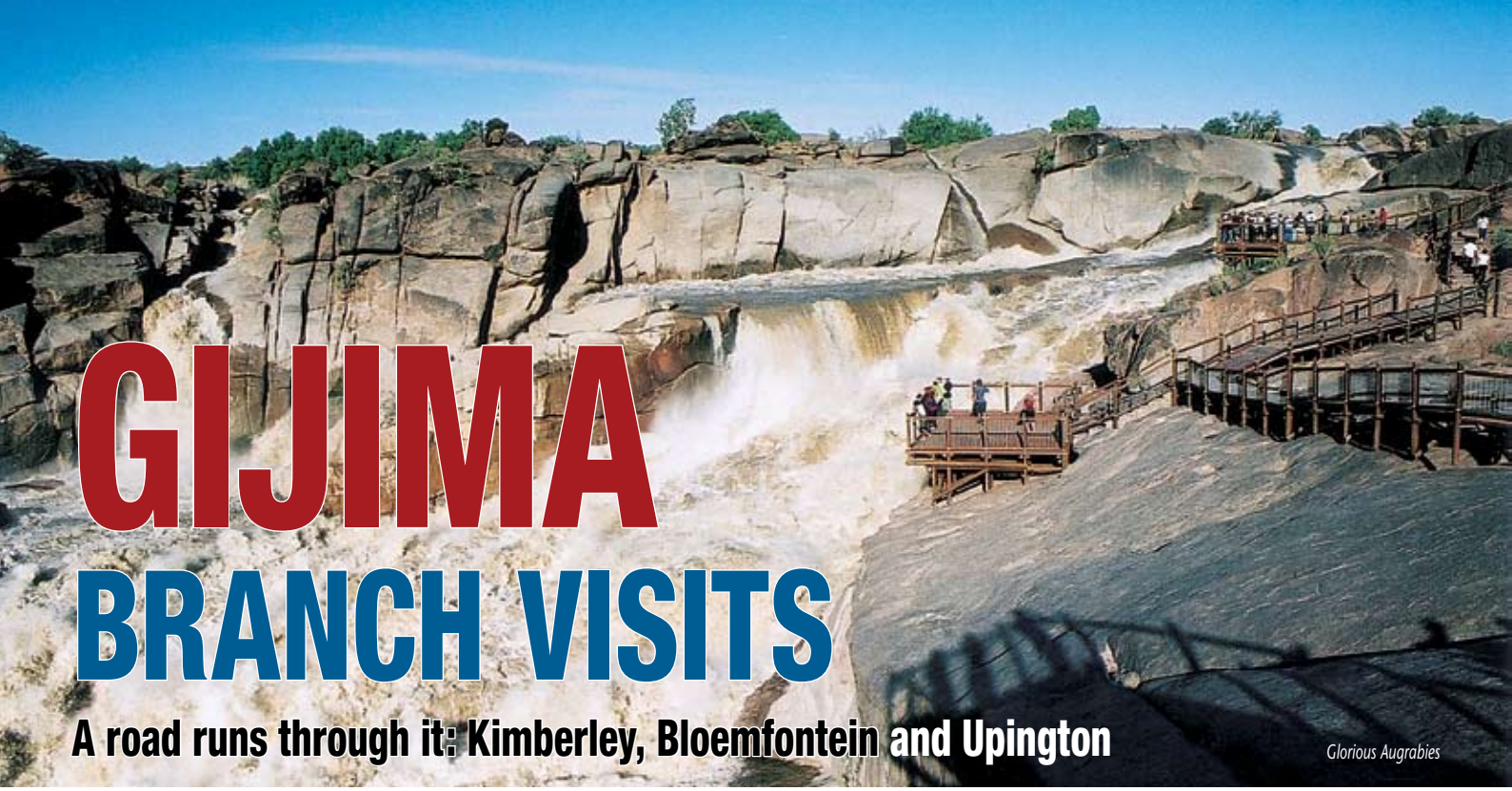
- He was an outgoing man – a man who hated being idle.
- A passionate man – about everything he tackled, both in his private and public life.
- A reliable man – putting the needs of others above his own.
- A positive man – never to hold a grudge and always offering a helping hand to anyone in need.
- A well-balanced man – who managed to keep a balance between his family, work, recreational and spiritual needs.
- A people's man – who loved nothing better than sharing his life with others.
- A man with a good sense of humour – who despite the obstacles he had to face, always saw the sunny side of a situation.
- A man who relished a challenge.

Reg will not want us to grieve for him. He'd want us to appreciate every moment of our lives by not dwelling on the pasty, but to use our experiences as a compass to guide us into the unknown future; he'd want us to appreciate the value of true friendship and to forgive unequivocally; he'd want us to keep our priorities in perspective by ensuring that our public and private relationships, our social responsibilities, our wellbeing and our spiritual needs are all catered for.

Reg has left us with a good road map of how to lead our lives – let us cherish his memory by following it.

He leaves his wife, Margaret, and daughter, Wendy. We trust they will find comfort in the knowledge that Reg was held in such high esteem by so many, both in South Africa and the UK.

Arthur Durham



GIJIMA BRANCH VISITS

A road runs through it: Kimberley, Bloemfontein and Upington

Glorious Augrabies

KIMBERLEY

The city of diamonds is surrounded by a sea of grass dotted with acacias as green as green can be.

Walter Jood survived the onslaught of presidents from SAACE and SAICE and we came away with many new impressions and contacts.

- We met with the head of the Department of Transport Roads and Public Works, Mr Elias Selemela. We witnessed a new wave of determination to deliver and a refreshing display of understanding of the value of good engineering and professionals who hold the diamond-studded key to prosperity.
- Next stop was with Dr Taole, who is heading up the new Institute of Higher Learning. This is a brand-new initiative in the Northern Cape, which we hope will ultimately become a campus where civil engineering would be offered. Currently the institute is exploring links with various universities and universities of technology. SAICE will be sending them our magazine for the next year to facilitate and assist with this venture.
- Hotel rooms are good for two things: to work and to sleep for a couple of hours; our 3Gs helped to keep the e-wolf at bay.
- Then, fulfilling the rainmaker's duty of a SAICE president in Kimberley, Sam obliged.
- Die aand se funksie is goed bygewoon en Webster van SAVRI en ons eie Sam het beide hulle presidentsboodskappe gegee.

Die Lid van die Uitvoerende Komitee vir Plaaslike Regering en Behuising, mnr Boeboe van Wyk, was ook aan die woord. Mnr van Wyk is 'n goed ingeligte politikus. Hy sê hy het die vermoë om aanhoudend te leer en aan te pas. Die toekoms van regering is diamantblink met mense soos hy. 'n Opmerking dat Engels net vir noodgevalle gebruik word in baie plekke van die Noord-Kaap was heel gevat!

Jochie Prinsloo en SAVRI – dankie ook vir julle medewerking.

Above: Jochie Prinsloo (SAACE), Sam Amod, Boeboe van Wyk (MEC for Local Government and Housing), Webster Ndodana (president, SAACE), Graham Pirie (executive director, SAACE), Walter Jood (chair, Kimberley Branch, SAICE), Schalk van der Merwe (chair, Kimberley Branch, SAACE), Dawie Botha
Below: Boeboe van Wyk (MEC)

BLOEMFONTEIN

Die pad na Bloemfontein het verby Modderrivier, Jacobsdal en Koffiefontein geloop.

Herman Schoeman het ons al by Jacobsdal ontmoet – om by die EPWP-projek te draai.

This project has much to offer: the community access road is badly needed; the jobs are more than welcome; the fledgling contractors are eager; and the workers are performing. But the bureaucracy and bureaucratic bumbling and bubbling are unacceptable.

But that was not the end of the story. Next stop was a roadside *entente cordiale* with a bright young lady with a BCom who is another young contractor with another EPWP contract.

Fefe Mabale is so enthusiastic – a model

Koffiefontein's Mrs Wolf with Dawie and Sam

EPWP project, Jacobsdal

Sam in the Cheetahs' den, Bloemfontein

of willpower and perseverance – but again her venture into our world of construction has been strewn with *perdeduiwels* – the type of stuff that was probably last used in the Anglo-Boer War. Only this time the spikes were not made out of iron, but out of paper mountains, lack of coordination, bureaucracy and so on – challenges to a young woman who even encountered personal threats and hardship. However, she smiles and states: 'I will!'

On to Koffiefontein and a meeting with the charming Mrs Wolf, who is the municipal manager. We were offered tea and *koffie*. (By the way, Koffiefontein was a place where die Boere stopped to make *koffie*, hence the name.)

This typical small South African town has no professional civil engineering staff, but Mrs Wolf and her team have to deliver world-class services to the mine and to the people. Clearly, these are deserving situations for the Department of Provincial and Local Government (DPLG) programme to accelerate training and capacity-building in local authorities. I offered to send some career guidance material information for the LA orientation programme and a supply of magazines to assist with decision-making capacity.

Next destination was the City of Roses and, as usual, the eager Central University of Technology staff and students provided a worthy stop. Jurie Vermaak and the team *byt vas*.

After the president 'speeched', questions and answers started slowly, but then took off, and one and a half hours later, we were ushered out. After all, students must also study?

Bloemfontein het nie meer 'n groot gat met 'n rots in nie. Wat verlede jaar 'n misterieuse projek was, word nou 'n R350 miljoen projek met 50 000 m^2 winkels en 4 000 parkeerplekke daar neffens Loch Logan – a Skotse meer in die Vrystaat.

Intussen het voorsitter Herman Schoeman van SAISI weer by ons aangesluit en Gert Fourie van SAVRI neem toe die leisels met die terreinbesoek. *Die Volksblad* was ook daar en Vida Booysen was vasbeslote om te hoor wat beplan word vir die opgradering van strate – vertel ons ons publiek genoeg, vra ek toe ook nog!

In die binneste heiligdomme van Vrystaat Stadion hou ons toe toesprake. Ek was verstom om te sien hoe lank terug mense soos Eben Jansen die rugbyhelde was … Tyd vlieg net soos die Cheetahs soms vlieg …

Hendrik Marx was master of ceremonies (or is it now programme director?). (Are Toastmasters going to change their name to Toast Directors?)

Bloemfontein – anchors away – with your captains Herman and Gert and a loch and so much rain this year. You could easily float a local land-locked joint

DIE SKOOL VIR INGENIEURSWESE van die Universiteit van Pretoria – vroeër die Fakulteit Ingenieurswese – vier vanjaar sy vyftigste bestaansjaar. Die hoogtepunt van die feesvieringe word beplan vir Oktober, waartydens daar onder andere 'n opedag, navorsingseminaar, reünies en 'n dinee aangebied sal word. Alumni van die Skool word aangemoedig om op die alumni-databasis te registreer by www.ee.up.ac.za/50 sodat hulle by die feestelikhede betrek kan word. Kontakbesonderhede kan ook per faks na 012-362-5000 of per e-pos na hanlie@postino.up.ac.za gestuur word.

The School of Engineering of the University of Pretoria – previously the Faculty of Engineering – celebrates its fiftieth jubilee this year. The culmination of the festivities is planned for October during which an open day, research seminar, reunions and a dinner, among others, will be hosted. To be part of the festivities, alumni of the School are encouraged to register on the alumni database at www.ee.up.ac.za/50. Contact details may also be faxed to 012-362-5000 or e-mailed to hanlie@postino.up.ac.za.

company-institution SAIAACE Inc.

But it was not over yet. Upington in the west was calling, so we caught the Bfn–Jnb–Upn early-morning flights. Passing through our hometown, did we feel the stray magnets of home pulling the tired travellers? Hoe sê hulle na sulke besoeke, daar is lood in die voete!

But a fresh team was waiting next to the mighty Orange, this year more than a trickle.

UPINGTON

Die pad na Augrabies loop deur Upington en met die groot Gariep in vloed was die plaaslike komitee gou om te sê – gaan kyk – dis nie iets wat jy elke dag sien nie!

Maar eers was dit SAISI werksake, en soos by die meeste plekke was CPD en die SACPCMP hoog op die agenda. Daar is besluit dat hulle meer wil weet en hoor en ons is weer eens bewus gemaak van die uiters ongelukkige en ontevrede gevoel oor die prosesse rondom die raad wat projekbestuur hanteer.

Daarna het die silwer FordKa die kilometers afgedraf, maar ons moes 'n paar keer lelik rem vir rustige bakkieryers wat wou afdraai. Die moeite was egter die skouspel waardig – Augrabies in sy 1 600-kumek glorie!

Met die bekende Le Must Restaurant volgepak met SAISI Upingtonners was die aand 'n aangename geleentheid. Die president moes 'n bietjie kompeteer met personeel wat opsluit groot blokke ys met oorgawe wou breek vir die koelkaste(?), maar watwou – die boodskap het geland waar hy moes.

Met nog 'n vergadering met die

David Leukes (chair, Upington Branch), Hannes de Kock (vice-chair), Frans Ferreira, Sam

Godfather van SAISI Upington – Frans Ferreira … 'n ou kollega – agter die rug, kon ons moeg maar tevrede terug na Gauteng.

Dankie, David Leukes en jou span (van een?), Hannes de Kock, en vir die volgehoue ondersteuning van julle firma wat SAISI Upington soveel jare al dra. □

Date	Event and CPD validation number	Presenters	Contact details	Where
25–26 May 29–30 May	Highway Capacity Manual (HCM) Course	Prof Ken Courage (Previously from University of Florida)	cpd.sharon@saice.org.za SAICE Transportation Division	Cape Town Gauteng – SAICE House
29 May – 2 June	SCT 30 Concrete Technology Course *SAICEcon06/00007/08*	Cement and Concrete Institute	Zoë zoe@cnci.org.za	Gauteng
30, 31 May – 1 June	Compaction of Road Building Materials *SAICEcons06/00012/08*	Prof Phillip Savage, Mike White, Julian Wise	Angie Wallace sarfuse1@acenet.co.za	Gauteng
1–2 June	Handling Projects in a Consulting Engineer's Practice *SAICEproj06/00003/08*	Wolf Weidemann	Sharon Mugeri cpd.sharon@saice.org.za	Gauteng
5–6 June	Business Finances for Built Environment Professionals *SAICEfin06/00004/08*	Wolf Weidemann	Sharon Mugeri cpd.sharon@saice.org.za	Gauteng
5–15 June	SCT 50 Advanced Concrete Technology	Cement and Concrete Institute	Zoë zoe@cnci.org.za	Gauteng
14 June	Lecture – Professional Registration for Civil Engineers	Carla de Jager & Denver Siebritz	Sharon Mugeri cpd.sharon@saice.org.za	Gauteng
14–15 June 6–7 July	Technical Report Writing Course *SAICEbus06/00014/08*	Insite Training	Sharon Mugeri cpd.sharon@saice.org.za	Durban Gauteng
18–21 June	CIOB Africa – The First Built Environment Conference	Prof J J Smallwood	john.smallwood@nmmu.co.za	Gauteng
19–29 June	SCT 35 Analysis and Design of Concrete Structures *SAICEcon06/00002/08*	Cement and Concrete Institute	Zoë zoe@cnci.org.za	Gauteng
20–22 June	Roads and the Environment	S Ballot	Angie Wallace sarfuse1@acenet.co.za	Gauteng
26–30 June 3–7 July 17–21 July	The Application of Finite Element Methods in Practice *SAICEstr06/00018/08*	Roland Prukl	Dawn Hermanus dhermanus@saice.org.za	Cape Town Gauteng Durban
26–28 June	First International Conference on Advances in Bridge Engineering	www.brunelac.uk/sed/bec2006	Bridgeconf.2006@brunel.ac.uk	Brunel University
28 June	SCT 22 Concrete Road Design and Structures *SAICEcon06/00013/08*	Cement and Concrete Institute	Zoë zoe@cnci.org.za	Gauteng
29 June	SCT 21 Concrete Industrial Floors on the Ground *SAICEcon06/00005/08*	Cement and Concrete Institute	Zoë zoe@cnci.org.za	Gauteng
21–25 May 2007	CIB World Congress: **2007** Construction for Development	Deadline for Abstracts: **30 June 2006** http://www.cib2007.com	Carla de Jager cdejager@saice.org.za Cape Town	Cape Town