The business magazine for the construction industry

DECEMBER 2016

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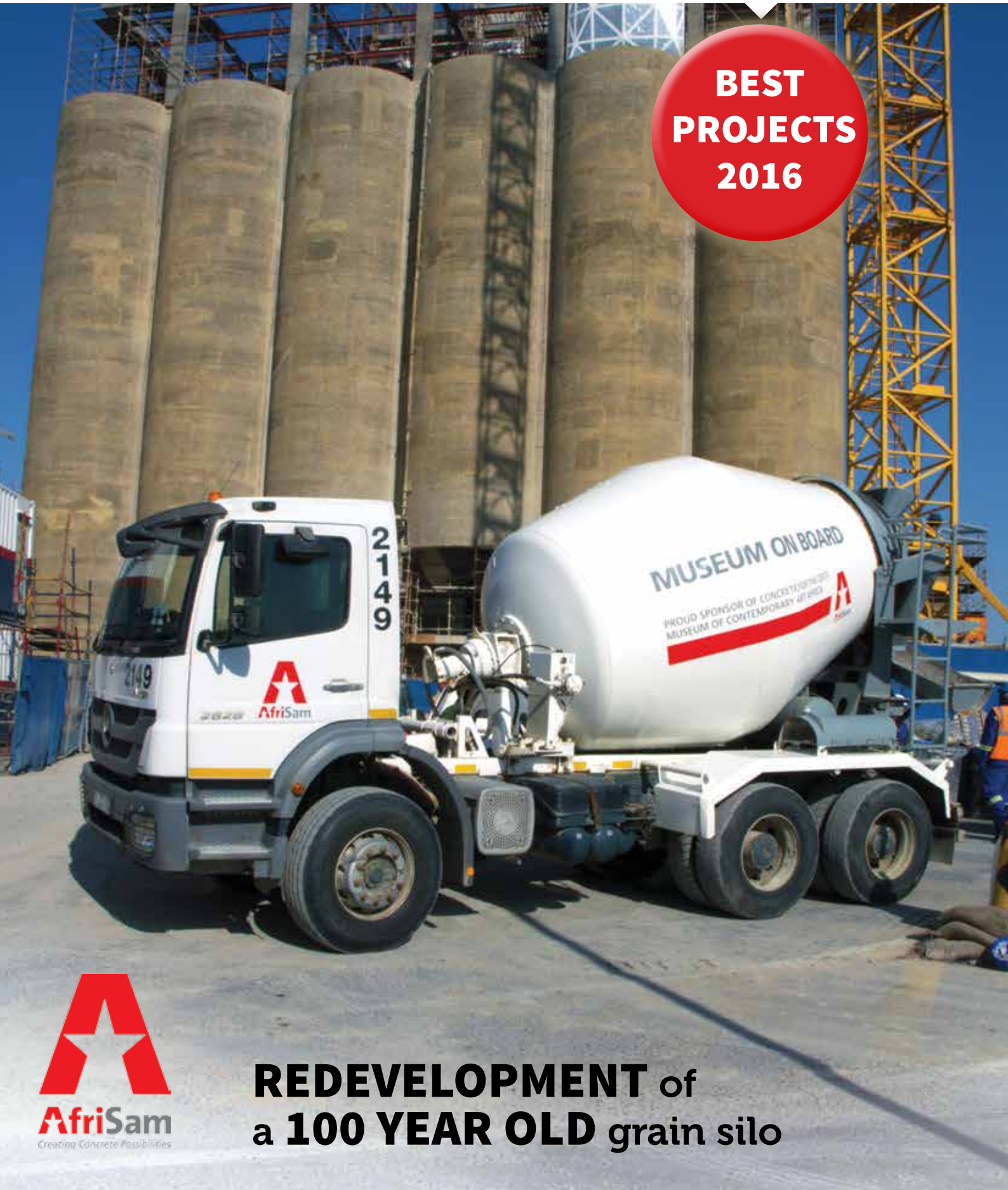
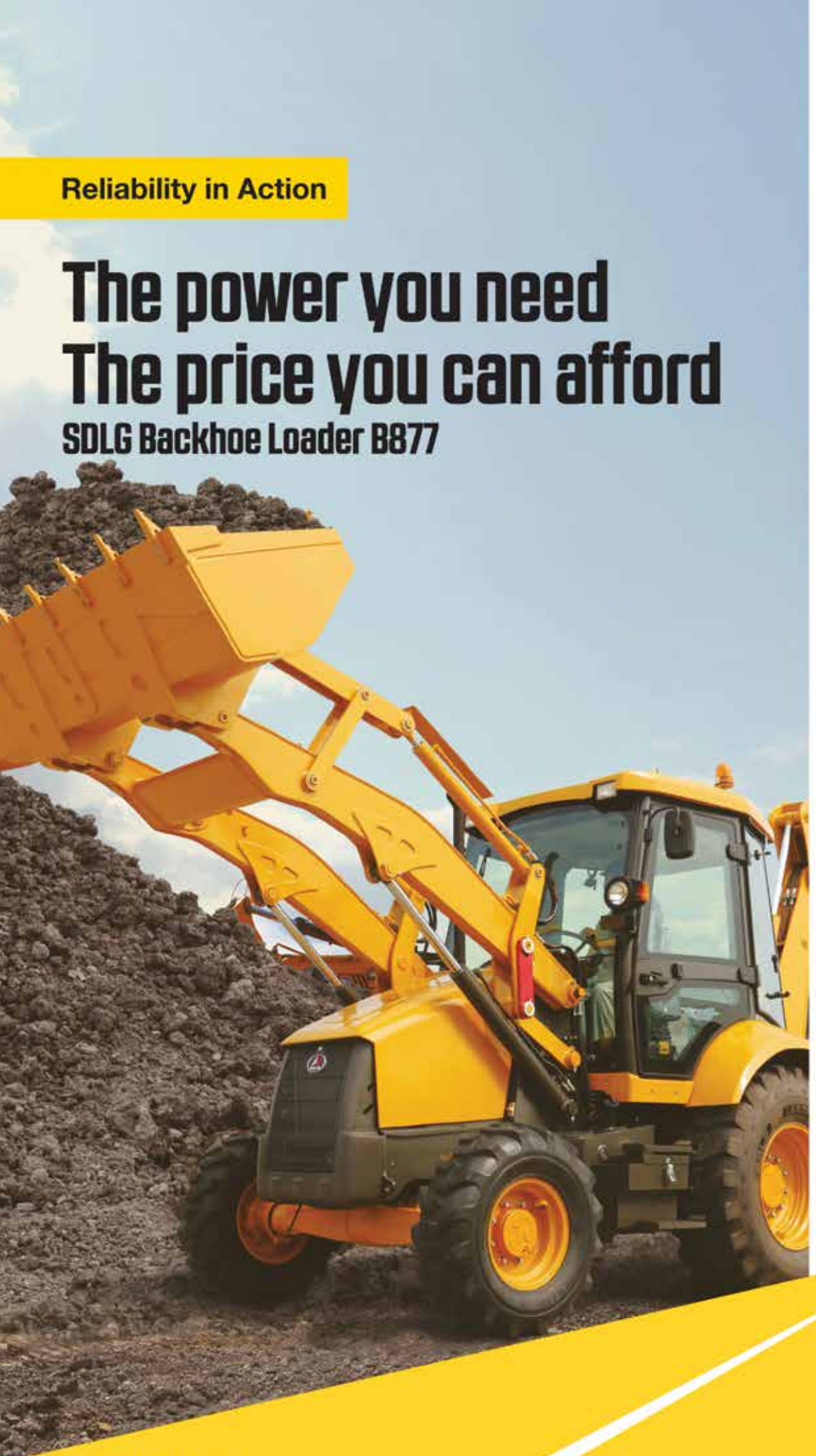
Construction WORLD

SPECIAL ISSUE



REDEVELOPMENT of a 100 YEAR OLD grain silo

AfriSam
Creating Concrete Possibilities



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EDITOR'S COMMENT

The December issue of *Construction World* has become an overview of construction in the preceding 12 months. Even though the number of entries in the civil engineering and building categories remained fairly low (four and six respectively), the number of entries in the specialist contractors or suppliers category increased to 24 (out of the 58 entries the competition received).

One of the three judges, Nico Maas – himself a specialist contractor – offered a simple explanation for this dramatic increase. According to him, major construction companies now outsource most contracting jobs and become more like project managers. The spectrum of specialist contractors and suppliers of specialist products was impressive: from the supplier of admixtures to a windfarm, to innovative formwork for unusual structures, to a prefabricated school erected in a few days, to some very impressive piling.

The entries in the professional services category, once dominated by consulting engineers, received various entries by architects. This is a good sign: architects are increasingly supporting the forum created by Best Projects and by doing so, are breaking down the division that exists between contractors/consulting engineers and architects.

Two projects were major winners this year. The rehabilitation of Bruma Lake received a highly commended award in the 'civil engineering' category while it won the 'AfriSam innovation award for sustainable construction'. The second big winner was MultiChoice City which was a joint winner in the 'professional services' category while it received a highly commended award in the 'AfriSam innovation award for sustainable construction' category.

Theprojects – which could not be more different – are indicative of the entries this year: diverse but still innovative and excellent. I hope you enjoy the 'overview' of the 2015/2016 construction world.

Wilhelm du Plessis

Editor

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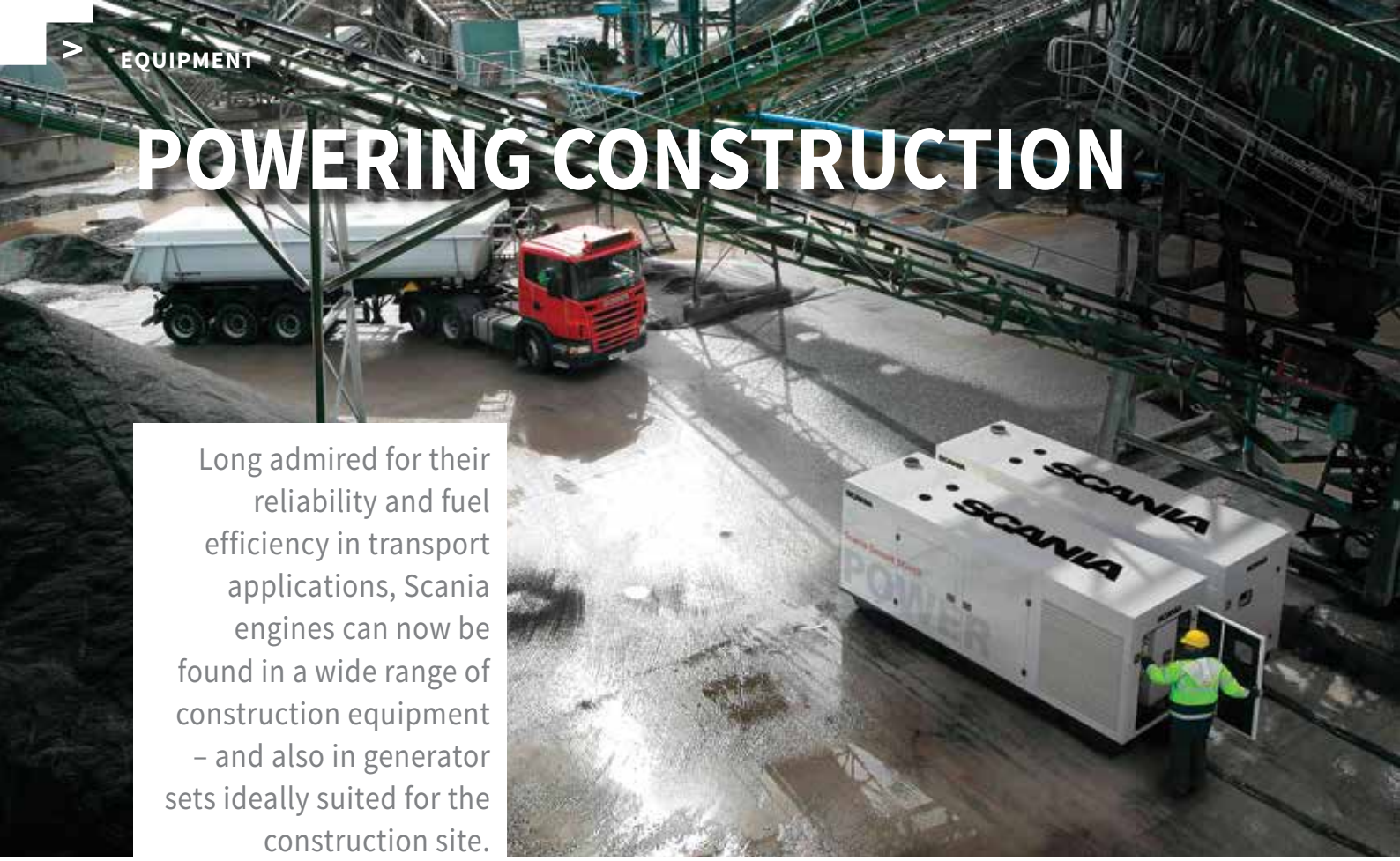

Long admired for their reliability and fuel efficiency in transport applications, Scania engines can now be found in a wide range of construction equipment – and also in generator sets ideally suited for the construction site.

By Paul Crankshaw

According to Rune Walter, export sales manager for Scania Engines and Gensets, a wide range of the company's engines are today found in construction equipment from dump trucks and wheel loaders, to stone crushers and screens. "Original equipment manufacturers across the globe look for engines that will complement their own products, and add further value to what they offer their customers," says Walter. "Our century-old reputation as an engine designer and manufacturer assures them of quality, and our service network gives them the comfort of constant support."

He says fuel savings reported by customers in construction-related industrial applications averaged from 5% to 20% – adding substantially to users' bottom line profits. The engines are also in common use in marine applications, and in power generation.

"With the growing demand for prime power and standby power, we have evolved a range of gensets that are reliable, fuel-efficient and cost-effective – with ratings from 250-750 kVA at 50 Hz, or 280-800 kVA at 60 Hz," he says. "Each genset is built around the latest generation of Scania engines – proven in all kinds of climates and environments."

The units are based on Scania's modular product system, so they share many of the design features and components of engines used in the company's transportation or industrial segments. This streamlines the expertise and stock-holding necessary in the group's global service network – which is available to every Scania customer irrespective of product.

"There is of course a special benefit to our construction customers who already use Scania products like our tipper trucks," he says, "as the engines share the same modular design and often the same parts, and can be worked on by the same trained technicians."

The gensets come in three engine sizes: the 9-litre, 13-litre and 16-litre displacements. While the 9-litre and 13-litre engines are in-line with five or six cylinders, the 16-litre engine is a V8 configuration.

"In addition to ensuring customers fuel efficiency and hassle-free operation – which is vital on remote sites or contractor's villages – we also make sure that they get exactly the specifications they need for their particular application," says Walter. "We test and document every aspect of our gensets' performance, so we can specify according to torque, revs per minute, fuel consumption, horsepower, and every other relevant factor before a final choice is made."

This allows the genset to deliver optimal results on-site while avoiding unscheduled maintenance or repairs.

"Communication between a Scania genset and its owners or operators is also a valuable option, especially on remote construction sites," he explains. "A communicator device with a SIM-card can simply be plugged into the controller to allow an engine's vital signs to be conveyed over the internet to a computer; this helps protect the asset, and ensure that performance is in line with expectation."

This functionality extends beyond monitoring to include control functions, which allow a remote operator to shut down and restart the unit.

"Fast-evolving technology also allows the gensets to communicate directly with the nearest Scania agent or even suppliers," maintains Walter. "On one of our remote genset sites, the diesel supplier is automatically alerted when the fuel levels reach a certain point – so that a tanker can be dispatched to refill the on-site fuel tanks."

The engines also store the last 1 000 hours of performance data, to give technicians insight into any variability in the unit's operation. While diesel remains the most widely-used fuel for industrial and genset engines, Scania has also developed its own range of gas-powered units – boosting global efforts to use alternative and more sustainable fuels, as well as to further raise efficiency levels. These engines run on compressed natural gas (CNG), liquefied natural gas (LNG) and biogas; their lower fuel consumption is matched by reduced carbon emissions and less noise.

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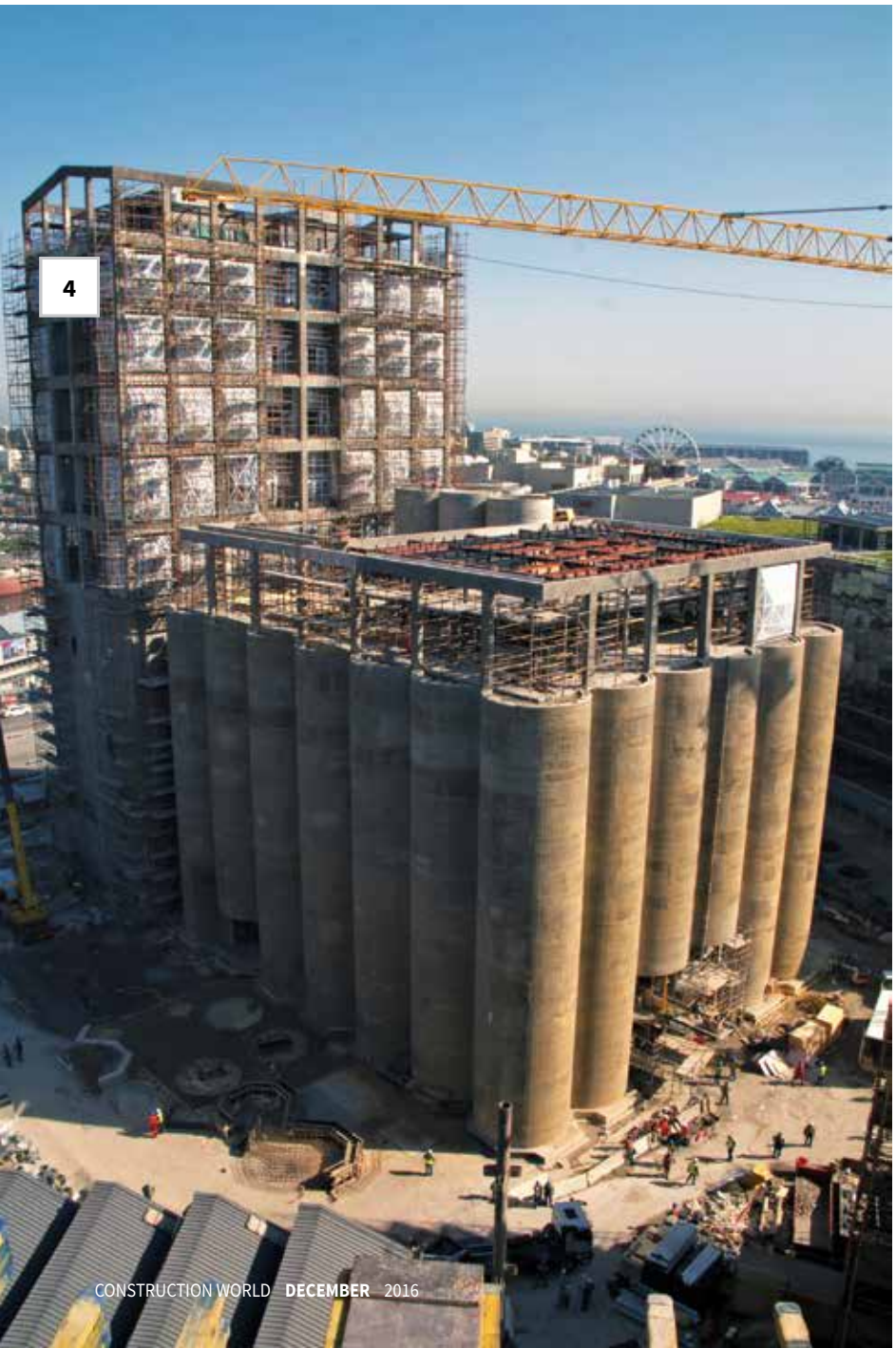
SCANIA

AFRISAM and WBHO carve a niche for the

Accommodating specialised project requirements is one of the strengths that AfriSam brings to its customer partnerships. An excellent example is its ongoing involvement in the V&A Silo District project where specialised readymix concrete is being supplied to the historic Grain Silo Project.

AfriSam is supplying specialised readymix concrete to the historic Grain Silo Project which is being constructed by WBHO.



WBHO is making steady progress on the redevelopment of the 100 year old Grain Silo which will house the Zeitz Museum of Contemporary Art Africa (Zeitz MOCAA). Once completed, it will be a flagship project for the building contractor, which was also involved in the prestigious Clock Tower, and later, the highly acclaimed No 1 Silo and No 2 Silo developments.

Associated with the V&A Waterfront development from the outset, WBHO has remained the building contractor of choice for this development for a number of reasons. This includes the work it performed at the challenging No 1 Silo and No 2 Silo projects, as well as the super basement that supports mixed use No 3 Silo, No 4 Silo and No 5 Silo developments.

However, Bruce Keytel, WBHO contracts manager responsible for the Grain Silo project, believes it is the contractor's hands-on approach on all its building projects that has played a very important role in the company's long legacy in the precinct.

"We are known for our ability to undertake complex structural projects, whilst being able to meet the expectations that we have created for our clients," Keytel says.

An intimate understanding

An intimate understanding of the V&A Waterfront working environment also bodes well for WBHO and has certainly given it a significant head-start in executing acclaimed architect Thomas Heatherwick's unique vision for the Grain Silo, the most challenging of all the builds in the precinct. In executing Heatherwick's design, WBHO has carved away sections of the internal silo bins to form a large oval shaped cavity that will comprise the atrium of the structure. It resembles a large grain of corn that will connect the completed asset to its historical past.

This unique space is surrounded by the galleries of the Zeitz MOCAA museum, which is also being built inside the silo bins on the perimeter of the structure. The majority of the inner silo bins have been removed in their entirety to create these unique internal spaces.

Keytel says one of the biggest challenges on this project is the extensive demolition and deconstruction activities, which commenced shortly after the contractor took ownership of the site in April 2014. Top-down and bottom-up demolition activities have continued unabated even while the main concrete cutting and shaping of the atrium, as well as other works, are underway.

The original concrete façades of the elevator building were demolished from the roof level down to the top of the silo bins, 32 metres above sea level. These were replaced with the unique 'pillowed' windows which will dominate the skyline of the silo district and act as a glowing beacon at night for the museum. The roof structure of the elevator building, which has been transformed into the new Silo Hotel, incorporates a roof top bar and swimming pool.

In addition, the core of the structure was dismantled down to the second basement level, more than four metres below sea level, while the existing track shed was also deconstructed and taken away for future refurbishment and reinstatement.

WBHO saved some time with the early removal of the conveyor shed during the No 1 Silo phase of the development. It was removed from site and was dili-

ZEITZ MOCAA

This resleeving process required concrete form work to be specifically constructed to the internal shape of the bins; this was then lowered into the bins by crane and concrete poured from the base up in a number of stages. This process was also required to form the new structure for the atrium in the centre of the building.

gently restored to its original state, and will form part of the new structure. This is in line with Heatherwick's vision to celebrate the industrial history and heritage of the structure.

Structural core

To create the structural core of the elevator building, two parallel activities commenced at the start of the project. Firstly, demolition of the ground floor slab and basement to four metres below sea level to create the structural opening of the new northern and southern cores was started. Simultaneously, a mining project from the top of the silo bins (Level 6) started to cut through the centre of the elevator building to create the space for the cores. This mining task was programmed to reach Level 1 at the same time as the cores, which were by then under construction from the basement up, reached the underside of Level 1 and then continued up through the building to Level 11.

As the cores progressed up through the building the construction team could drop back down and start the process of tying the building into the cores. Once this process was complete the remaining activities could commence, namely the demolition of the remainder of the square bins and the installation of the pillowed façade above Level 6.

The pillowed façades are manufactured in Cape Town from a steel frame and are clad with 54 pieces of triangulated soft coated high performance double glazed units. Each unit weighs approximately 500 kg. There are five different types with the largest being over 20 m^2 in size.

Creating the museum

Before carving and cutting activities could commence to form the atrium and museum, the 42 circular silo bins in the adjacent storage annex had to be thoroughly cleaned. Workers had to physically cut a warren of walkways through the bins to access all areas without damaging any of the bins that were to remain in the finished product.

Once the circular bins had been cleaned and made safe, the process of reinforcing could commence. The structure, being over 90 years old, was designed solely to store grain. The strength of the structure was by virtue of its tubular form and the fact that each tube was connected to the next to form a honeycomb type structure. This gave the building all the vertical reinforcement that it required and only horizontal reinforcement was used when the building was constructed in 1924, principally to withstand the horizontal pressure imposed by the grain within the silo bins.

In order to construct the museum inside the silo bins, a new building had to be constructed within the old. This could only be done once the

5

The pillowed façades are manufactured in Cape Town from a steel frame and are clad with 54 pieces of triangulated soft coated high performance double glazed units. Each unit weighs approximately 500 kg. There are five different types with the largest being over 20 m^2 in size.

WBHO is making steady progress on the redevelopment of the 100 year old Grain Silo which will house the Zeitz Museum of Contemporary Art Africa (Zeitz MOCAA). Once completed, it will be a flagship project for the building contractor.

All photographs by Grant Duncan-Smith of Subiaco Photography.

façade had been retained. This was done by resleeving the old tubes with a new semi-circular concrete structure, 200 mm thick and separated from the old with a spray on insulation. The resleeving process required concrete form work to be specifically constructed to the internal shape of the bins; this was then lowered into the bins by crane and concrete poured from the base up in a number of stages. This process was also required to form the new structure for the atrium in the centre of the building.

This was even more complicated as it required each tube forming part of the future atrium cut to be set out in visual isolation from the next, with the concrete poured to the exact curve of the atrium cut.

This required some major innovation with AfriSam as the tapering edge of the cut in numerous areas was less than 50 mm thick, as well as tapering upwards at the base of the atrium. To set out and pour perfect concrete with these sorts of constraints is no mean feat.

Whilst the resleeving was in process, the base slab was also being cast. This required clearing out the base level of the silos and then undercutting the bins so that they were each sat on a block of concrete about 400 mm wide. The base slabs could then be cast. This slab would act as a major part of the structural design as it tied the base of all the bins together to ensure the vertical loads were passed down directly to the foundations.

Once these works were completed, the demolition of the internal bins could commence. Both in the east, to create the eastern core and museum galleries, and in the west where the new concrete was used as a guide to cut the old to form the atrium itself. This demolition process was undertaken in a number of different ways with the most intricate in the atrium where blocks of concrete were cut by large diamond blades, before being lowered to the floor and carted off site. The silos were literally taken apart piece by piece.

Keytel says the large one square metre blocks were dropped inside the bins and removed by a 20 ton excavator. Once the structures had been cut down to 18 metres, the demolition was quickened by using the 20 ton machine with a breaker attachment.

Once this process had been completed, the carving and the polishing of the atrium shape could commence in earnest. At high level, 30 metres above the ground, these activities were undertaken on special hanging platforms suspended from the top of the silos.

In parallel to the works in the storage annex, the portion of the atrium within the elevator building was also being formed. This did not require any strengthening of the actual bins, but did require the construction of a large transfer beam at Level 6 to span the arch and transfer the load of the hotel above down through the vertical structure.

Another interesting aspect of the structure is the sculpture garden and trafficable skylights on the roof that are being supported on a structural steel frame, as well as the restaurant and event space occupying the last two floors of the building that have been built on a coffer slab.

Trusted supplier

Part of WBHO's success on this project is the reliable service it has received from AfriSam, which is supplying 9 800 m^3 of concrete for the Grain Silo project.

The leading construction materials supplier has nurtured a strong business relationship with the building contractor over many years, and WBHO relies on its extensive experience in concrete mix design and consistent quality production of materials. This was brought to the fore again on this project for the main 30 MPa concrete mix with a nine millimetre stone used for the silo sleeves.

This mix was developed over a period of testing to ensure that it would have the correct consistency. Aggregates were an important factor in the final mix design as the surface finish had to meet the stringent specifications of the architect and also had to comply with the workability requirements.

Each daily pour was a slow discharge because of the workability and the way the complex formwork was positioned inside the silos. This is just one example of the flexibility that AfriSam brings to its customers' unique construction site requirements.

On average, there were two daily pours of 4 m^3 each and discharge time was two hours. Traditionally, offloading should take anything from 45 to 60 minutes.

It is apparent that all involved on this project have an appetite for complex and sophisticated builds that demonstrate the capability of South African built environment professionals. The Grain Silo promises to be one of them.

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Axsys Projects has a Level 1 B-BBEE rating and is currently registered as a Grade 6 contractor with the Construction Industry Development Board (CIDB). The company, founded in 2011, is a strategic enterprise development partner to multidisciplinary construction group Stefanutti Stocks, whereby the group develops high potential businesses within a sustainable model that offers benefits to both parties.

Its project portfolio includes sub-contractor work on Komati Pipeline Project in Mpumalanga, and the North Eastern Waste Water Treatment Works (WWTW) in the Free State. Axsys Projects has also recently completed a roads project in Postmasburg, is working on a housing project in the Eastern Cape, and the mine entrance building work for the Elandsfontein Phosphate Mine project in Saldanha Bay. It is also currently working on two projects in joint venture partnerships with Stefanutti Stocks - these are the award-winning mega-marine Maydon Wharf project for Transnet and the Zuikerbosch Sedimentation Plant for Rand Water.

Axsys Projects, a Level 1 B-BBEE contractor, undertakes structural, civils, roads, earthworks, building and marine infrastructure construction projects across South Africa. Its services extend to the petrochemical, marine, water and heavy industrial sectors.

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A DIVERSE CROP OF AWARD RECIPIENTS

The 15th annual *Construction World* Best Projects Awards were held in Johannesburg on 9 November. These awards recognise excellence in the planning and execution of projects and has become a highlight on the construction industry's calendar.

Attended by representatives from the industry, it is gives peer recognition to winners. This issue of *Construction World* is a special Best Projects issue and ensures that entries and winners get even wider recognition.

Best Projects is only construction award that recognise excellence across the entire South African construction world, from civil engineering and building contractors, to specialist contractors and suppliers to professional services.

This year, 58 entries were received in the seven categories of the competition. Judging took place in October. The three judges, Trueman Goba, Rob Newberry and Nico Maas, who represent ECSA, CIOB and Master Builders said the diverse entries boded well for the local construction industry. One category, 'Specialist contractors or suppliers' received 24 entries – this is an indication that contracting is increasingly outsourced by bigger companies.

This year's entries again demonstrated the ingenuity and innovative nature of construction in South Africa.

The judging

Entries are judged by submission only. Judging took place on 5 October in Greenstone, Johannesburg. The judges scored entries based on the criteria for each category and these scores were adjusted on a weighted average basis to ensure equitability across all entries.

Criteria

Entries were judged according to the criteria for each of the categories as set out in the call for entries. Categories A1, A2, A3, B, C, D and E shared the same criteria which were: (i) Construction innovation technology, (ii) corporate social investment, (iii) design innovation, (iv) environmental impact consideration, (v) health and safety, (vi) quantifiable time, cost and quality, and (vii) risk management.

Category B had four judging criteria: (i) construction innovation technology, (ii) corporate social investment, (iii) environmental impact consideration, and (iv) health and safety.

A1: Civil Engineering Contractors

Winner
Majuba Rail Project
Main contractor: Aveng Grinaker-LTA

Highly Commended
Rehabilitation of Bruma Lake
Main contractor: Basil Read

A2: Building Contractors

Winner
Mall of Africa
Main contractor: WBHO/Group Five Mall of Africa Joint Venture

Highly commended
Western Cape DOD and Military Veterans, Cape Town: the Castle repair and maintenance
Main contractor: GVK-Siya Zama Cape

Special Mention
Mall of the South
Main contractor: Aveng Grinaker-LTA

A3: Civil Engineering and Building Contractors (outside South Africa)

Winner
Kasane-Kasangula Villages Sanitation Project
Aurecon (main contractor Unik Construction Engineering)

Highly Commended
Senqu River Bridge Project
Main contractor: Stefanutti Stocks Lesotho

B: Specialist Contractors or Suppliers

Winner
129 Rivonia Road (Village Walk)
Franki Africa

Highly commended
Chapman's Peak Drive: Re-establishment and upgrade of slope stabilisation and rockfall protection measures
Penny Farthing SA

Special mention
Gouda Wind Farm
Sika

Special mention
Kaalfontein Secondary School
Kwikspace Modular Buildings

C: Professional Services

Joint Winner
Multichoice City
GLH Architects

Joint Winner
PwC Tower
Arup

Highly commended
Acid Mine Drainage Project: Eastern Basin Treatment Plant
AECOM

Special mention
The Ingula Pumped Storage Scheme
Braamhoek Consultants Joint Venture

D: Public Private Partnerships

Special Mention
Savanna City Reservoir
Main contractor: Basil Read

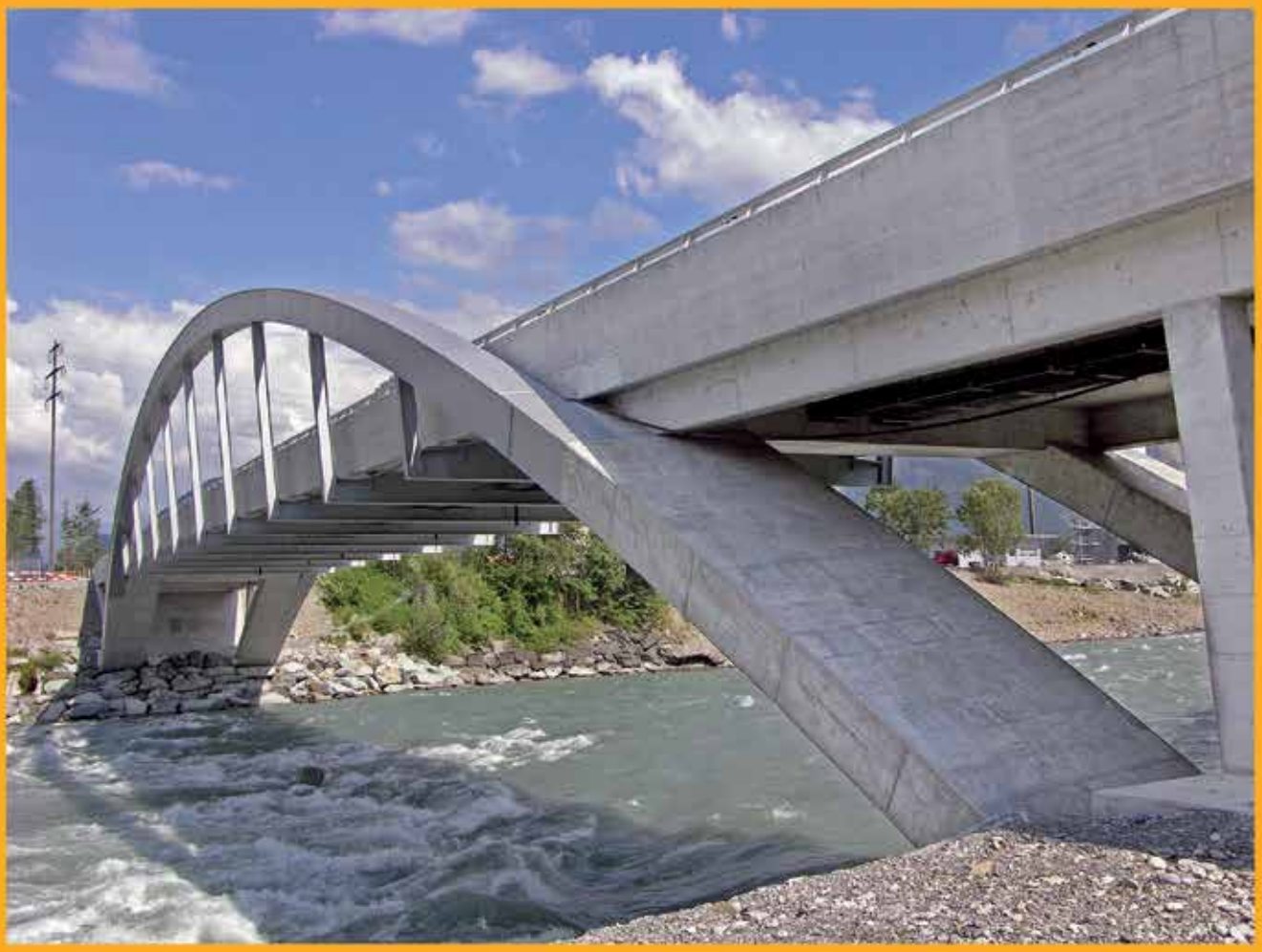
AfriSam Innovation Award for Sustainable Architecture

Winner
Rehabilitation of Bruma Lake
Basil Read

Highly Commended
Multichoice City
GLH Architects

Special Mention
Novartis, Waterfall City
Aurecon

The judges for the Best Projects 2016 Awards were (from left): Nico Maas, Trueman Goba and Rob Newberry.



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Award Winners

A1: Civil Engineering Contractors

Winner: Majuba Rail Project
Main contractor: Aveng Grinaker-LTA
Danie Potgieter, Allan McCormack (both from Aveng Grinaker-LTA) and JJ Fivaz (Reimer SA)

A2: Building Contractors

Winner: Mall of Africa
Main contractor: WBHO/Group Five Mall of Africa Joint Venture
Deon van Riet (Group Five) and Dave Rhodes (WBHO)

B: Specialist Contractors or Suppliers

Winner: 129 Rivonia Road (Village Walk)
Franki Africa
Back: Phinias Zisonga, Nicol Chang, Michael Khoza, and Victor Ferreira. Front: Petrus Motaung, Paulo Alves, Sylvester Dikgale, and Dulce Simões (all from Franki Africa)

Highly commended: Chapman's Peak Drive: Re-establishment and upgrade of slope stabilisation and rockfall protection measures
Penny Farthing SA
Pieter Pretorius, Leon Oosthuysen and Hugo Terblanche (all from Penny Farthing SA)

Special mention: Gouda Wind Farm
Sika
Riaan Oosthuizen, Shaun Saxby, Jacobus Pretorius and Pieter van Eden (all from Sika)

Special mention: Kaalfontein Secondary School
Kwikspace Modular Buildings
Matthys Haasbroek, James Phillips and Roberto Campos (all from Kwikspace)

A3: Civil Engineering and Building Contractors (outside South Africa)

Highly commended: Western Cape DOD and Military Veterans, Cape Town: the Castle repair and maintenance
Main contractor: GVK-Siya Zama Cape
Eben Meyburgh (GVK-Siya Zama) and Averil Webbstock (Den Braven South Africa – this year's bronze sponsor)

Special Mention: Mall of the South
Main contractor: Aveng Grinaker-LTA
Mario Lopes (Aveng Grinaker-LTA)

Winner: Kasane-Kasangula Villages Sanitation Project
Aurecon (main contractor Unik Construction Engineering)
Louwna Joubert (Aurecon)

C: Professional Services

Joint Winner: PwC Tower. *Arup*
Seated: Nikki de Jager (LYT), Richard Lawson (Arup), Jeanne Jordaan (Atterbury). Standing: Warren Stanley (LYT), Pieter de Bod (WSP), Rudolf le Roux (Arup), Craig Tyndall (Arup), Steve Dickinson (WSP), Juan van der Merwe (Arup), Martin Roodt (WSP) and Glyn Jackson (LYT)

Highly Commended: Senqu River Bridge Project
Main contractor: Stefanutti Stocks Lesotho
Giuseppe de Simone (Stefanutti Stocks) and Wilhelm du Plessis (Construction World)

Joint Winner: Multichoice City
GLH Architects
Wishbone Sanyika

Highly commended: Acid Mine Drainage Project: Eastern Basin Treatment Plant
AECOM
Craig Hasenjager and Jabula Nkomo (both from AECOM)

Award Winners

C: Professional Services

Special mention: The Ingula Pumped Storage Scheme
Braamhoek Consultants Joint Venture
Vinnie Naidoo (GIBB), Francis Gibbons (Royal HaskoningDHV), Desigan Padayachee (Eskom), Jacques du Plessis (Eskom), Sheilla de Carvalho (Royal HaskoningDHV) and Avin Maharaj (Eskom).

D: Public Private Partnerships

Special Mention: Savanna City Reservoir
Main contractor: Basil Read
Leslie du Plessis, Leroy Jacobs (both from Basil Read) and Bervesh Bhika (GIBB)

E: AfriSam Innovation Award for Sustainable Architecture

Winner: Rehabilitation of Bruma Lake
Basil Read

(Also received **Highly Commended in Category A1:** Rehabilitation of Bruma Lake)

Chris Booker, Sam Pedlar, Bruce Morton (Basil Read), Celestine Mouton (JDA) and Nathaniel Reddy (LDM)

Highly Commended:
Multichoice City
GLH Architects
David Ackhurst

Special Mention: Novartis, Waterfall City
Aurecon

Jeanne Jordaan (Atterbury), Louwna Joubert (Aurecon), Pieter de Bod (WSP), Megan Ward (LTM Energy), Theo Vermeulen, Martin Roodt (WSP)

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CONTRIBUTING COMPANIES TO 2016's BEST PROJECTS

Pieter Albertyn won a Dolce Gusto coffee machine, sponsored by Ngage. Renay Tandy, Ngage's public relations director presented the prize.

Makita sponsored a DHP482ZJ Impact Driver Drill, x 3.Ah Battery and Fast Charger which was won by Lwazi Mbatha, presented by Erna Oosthuizen, Construction World's *Advertising Manager.*

Tristan McLaren Photography provided the photographs from the event.

Bosch 18 Volt Impact drill/driver with EC brushless motor, won by Martin Roodt.

A1 Civil Engineering Contractors

MAJUBA RAIL

The Majuba Rail project is a component of the Eskom Road-to-Rail Initiative, with the construction of a railway line that links the Majuba Power Station to the main coal railway hub in Ermelo, Mpumalanga.

The 68 km corridor is the first large greenfield freight rail infrastructure project to be carried out in South Africa since 1986 and will be operated by state-owned logistics provider Transnet Freight Rail. The project was designed by Transnet Capital Projects.

Aveng Grinaker-LTA was awarded the contract for construction activities in January 2013. Construction of the line commenced in March 2013, with the completion of the civils portion expected in August 2016.

The objective of the project was to construct an electrified heavy haul rail link line that ultimately links the Transnet Freight Rail export coal line with the existing Majuba Power Station rail yard. The construction of this dedicated railway came about when Eskom launched an initiative to change the mode of transportation of coal to a number of power stations, especially Majuba Power Station, from road trucks to rail transportation, with resultant positive economic, environmental and social benefits.

The rail line forms part of the Majuba Power Station coal supply system and is to transport 21 million tons of coal in 100 jumbo wagon trains per annum.

A major undertaking for the Majuba rail line was the construction of the U-shaped table drains for surface drainage. The scope of work required the construction of 63 km of U-drains in every cut formation, on both sides of the rail line. Aveng (Africa) Limited used three different methodologies for this construction, with the third methodology being the most effective and innovative.

Precast yards were erected at the batch plant sites. Quick release precast moulds were used to manufacture the precast units. The precast units were then transported to site where they were installed where necessary.

The manufacturing of the precast units began in May 2014 and the project produced 30 000 units – enough for approximately 36 000 m – before a decision was made to change the construction methodology. The teams producing the precast were notable to produce enough in order to achieve the intended programme and milestone dates.

Teams continued to manufacture and transport precast units to site, but also incorporated the construction of in situ U-drains. The logic behind this methodology was to place a 1,2 m precast unit, leave a 2,8 m gap and then place another 1,2 m precast unit. The 2,8 m was then cast in situ. A total of 44 000 m was constructed using methodology 1 and 2.

The third methodology involved slip forming of the remaining 19 km of U-drains, using volumetric concrete batching and a power curber. A total of 19 000 m in 6 months (3 165 m/month) was constructed using methodology 3.

Due to rigorous and demanding project milestones, the teams involved in the construction of the U drains were required to think out of the box, hence the change in methodology on numerous occasions.

The methodology involved modern technology by using a Power Curber slip form machine as well as Reimer self-batching volumetric trucks. The introduction of fibre reinforced concrete, although a known concept, had never been used in conjunction with Reimer volumetric batching and slip form on such a large scale before and thus a first in the South African construction industry.

The third methodology involved a substantial amount of pre planning prior to the methodology being approved by the client as well as a massive effort from all teams involved during the execution phase. The site construction teams excelled in many aspects, such as detailed planning, management of logistics and value engineered solutions.

The site also achieved 18 months LTI free and in excess of 4 000 000 hours LTI free, resulting in a LTIFR of zero.

Project information

- Company entering: Aveng (Africa) Limited
- Client: Eskom
- Project start date: March 2013
- Project end date: August 2016
- Main contractor: Aveng Grinaker-LTA
- Project manager: Eskom Capital Projects
- Consulting engineer: Transnet Capital Projects
- Subcontractor: Kwamhlanga
- Subcontractor: Reimer SA
- Project value: R1 925 075 711

MAJUBA COAL SILO 20 RECOVERY PROJECT

Majuba Power Station is in Mpumalanga situated between Volksrust and Amersfoort. It comprises six units, Unit 1-3 each capable of providing 657 MW and unit 4-6 each capable of providing 713 MW. Majuba Power Station has been in operation since 1996 when the first unit was put into commercial operation. It is planned to operate until 2061.

The Majuba Silo Recovery Project was covered under Phase D – 'Permanent Solution'. It involved the materials handling solution for the final stage to be developed in accordance with the results of the Silo 20 structural investigation process as well as the determination of the current conditions of Silo 10 and Silo 30. It was however expected that the plant configuration will return it to its original state.

The project was carried out the Majuba Power Station Site and ongoing operations of the Power Station would take precedence over the construction work. The works included sectional completion in order to ensure that the coal supply to the power station was not disrupted during construction and commissioning of the works.

The foundations, columns, transition slab, benching and 12 m height of existing shell was kept intact. The external face of the remaining existing concrete shell was cleaned (water power wash), checked and shear connectors were epoxied where required. About 1 m of the damaged top edge of the existing 350 thick shell was demolished, leaving the rebar exposed for incorporation in the re-cast benching. A 350 x 600 triangular edge beam had to be cast to the top edge of the benching to accommodate the new shell inside diameter.

Eight new 2 000 mm x 500 mm concrete columns to support the new shell were positioned around the outside circumference of the existing concrete and were excavated and dowelled into the existing foundation and extended to just above the existing openings.

The existing foundations, columns, transition slab, benching, existing shell and concrete roof were kept intact. The external face of the existing concrete shell (350 mm) was cleaned (water power wash), checked and shear connectors epoxied in.

Six new 2 000 mm x 500 mm concrete columns and two composite steel columns, to support the new shell, were positioned around the circumference. The columns were dowelled into the existing foundation and extended to just above the existing openings.

Thereafter a new 50 mm x 20,7 m internal diameter stiffening shell was constructed up to a height of 19 metres above the existing benching line. The shell was bonded to the existing shell by epoxied in shear connectors. A single formed slide technique was used to construct both silo 10 and 30. These were technically challenging as the slide started 12 m from NGL and were completed/finished 11 m below the existing top of silo. The formwork/sliding system during the assembly and stripping sequences were carefully engineered.

The lift shaft is 5,39 x 5,2 m concrete box tower about 70 m high. The remaining portion of the existing lift shaft stub below ground level, was demolished while keeping the existing starter bars intact. Some additional starter bars had to be epoxied into the raft foundation. The 2 m raft foundation had to be excavated to expose the west face to allow the wall to be fixed to and cast against this face.

The collapse of the silo was a significant event with major consequence on the power grid that caused serious power shortages. The successful execution of the project restored the operation of the power generation plant to full capacity. This obviously assists with the current power shortages and the impact it has on the economy. ■

Project information

- Company entering: Stefanutti Stocks Civils Rula Consortium
- Client: Eskom Majuba Power Station
- Start date: 4 January 2016
- Project end date: 10 December 2016
- Main contractor: Stefanutti Stocks Civils Rula Consortium
- Project manager: Eskom
- Consulting engineer: Hatch Goba
- Project value: R114 032 465

OR TAMBO GAUTRAIN PLATFORM EXTENSION

The Gautrain Rapid Rail Link (GRRL) is designed for the rapid movement of commuters between Johannesburg, Pretoria and the OR Tambo International Airport (ORTIA) in Gauteng.

The GRRL was developed as a public private partnership concession and includes a 15-year maintenance and operation period after completion of construction. This concession was awarded to the Bombela Concession Company (BCC).

As part of the maintenance and operation of the Gautrain system, the BCC recognised the need to extend the station at ORTIA in order to allow for better commuter access at this location. The design and construction of the station extension contract for ORTIA was awarded to Stefanutti Stocks in April 2015. Stefanutti Stocks employed SMEC South Africa as their design consultant for the works.

The ORTIA station extension project's scope of works included the detailed design and construction of a length of approximately 55 m of extended station platform. The extension now allows passengers access to four train carriages instead of the previous two carriage access system.

The principal challenge between the new station installation and the previous installation is that the current installation has been constructed and erected whilst the Gautrain remained fully operational. This resulted in numerous challenges for the erection and design team.

The main challenge that was encountered was how to safely lift the 20 t platform slabs a height of 25 m above ground level, over the 25 kV live train line. Various options were considered by the contractor, including the use of various mobile and fixed crane types and even a moving vierendeel gantry frame, which would have required a rail to be installed in the adjacent road.
The adopted solution was to use a fixed in place heavy lift crane (the largest in Africa) which met the load and lever arm requirements for lifting the heavy slabs into place on the southern side of the viaduct.

In order to mitigate the risk associated with working adjacent to a live rail line, the design of the station roof had to be revised so that it could be installed in three sections.

This is because the construction works could only occur over one track at a time after the OHTE had been switched off and removed and safety hoarding had been erected between the two tracks.

Project information

- Company entering: Stefanutti Stocks Civils
- Client: Bombela Concession Company
- Start date: 30 May 2015
- End date: 23 May 2016
- Main contractor: Stefanutti Stocks Civils
- Principal agent: Bombela Concession Company
- Project manager: Turner and Townsend
- Quantity surveyor: Stefanutti Stocks Civils
- Consulting engineer SMEC South Africa
- Subcontractor: Tass Engineering
- Subcontractor: ITAL Concrete
- Project value: R80-million

This allowed one track to remain operational whilst the overhead traction equipment was transferred from an existing mast support to the future roof support position.

During construction the section of catenary from the ORTIA departure building to the second OHTE mast had to be removed. The horizontal tension force in the catenary after the second mast therefore had to be resisted.

One of the goals during the construction period of this station was to complete the project without impacting or changing the environment. Changes in the environment in this project entailed, (a) train traffic schedule, (b) cars and pedestrian working and travelling around the construction site and (c) car users parking for long term periods.

This goal was achieved and the construction was completed without any incident or disruption to the environment. Nightshift engineering work was restricted to minimum noise.

Pollution of dust was not allowed. During the demolitions, concrete walls were soaked with water and protective shield installed to prevent dust pollutions.

This project was executed inside the airport premises, leaving the contractor with just ACSA and the city lodge hotel as the main stakeholders involved.

OR Tambo is a key national point for South Africa. With thousands of passengers from all over the world travelling or transiting through this airport, the aesthetics and quality of finished work was exquisite. ■

A2 Building Contractors

THE MALL OF AFRICA

In order to reduce the construction period and due to the logistical problems on site, it was decided to construct 90% of the façade walls (which were originally detailed as brickwork and plaster) with a lightweight walling system called ETICS (External thermal insulation composite system).

This system had many advantages – installation is a much cleaner operation than normal plastered masonry, with much less wastage. No hoisting plant (teleporters and cranes) was required to install this product and all the required items to construct the façade walls could be man handled with ease.

In order to reduce the footprint of the scaffolding required for the internal work, we installed most of the walls, ceilings, sundry steel, shop fronts, services and finishes from scissors lifts and boom lift machines. At peak there were 306 of these on site.

The central skylight was designed and installed by Novum USA. It consists of a structural steel nodal system with continuously inflated ETFE pillows that could be built as a self-supporting structure (bolted on piece by piece). Not only was this a cost saving solution but it also reduced the construction duration in that no bird cage scaffolding was required, and work below the skylight could carry on concurrently. The insulating properties of the inflatable pillows greatly reduce the air-conditioning requirements by helping to keep the massive atrium at a relatively stable temperature. It also allows an abundance of natural light through which obviously reduces the energy requirement.

All concrete mixed on site as well as the concrete supplied by the ready mix suppliers consisted of a fly ash blend. Considering that over 230 000 m^3 concrete was cast on site, this greatly reduced the carbon footprint of the construction project.

Instead of carting away the rock excavated from the bulk earthworks and foundations it was crushed on site and used as a 300 mm drainage layer under the surface beds. Some 45 000 m^3 rock was crushed and re-used.

In addition to the ETFE roof, a further eight large glass skylights were built. Some of these extend almost the full length of the mall to allow in natural light. The openings in the upper level mall were strategically placed to allow natural sunlight into both the upper and the lower levels of the mall.

The lightweight ETICS walls have excellent insulating properties due to the high density polystyrene used in the construction of these walls. This obviously contributes greatly in reducing the energy requirements for this building.

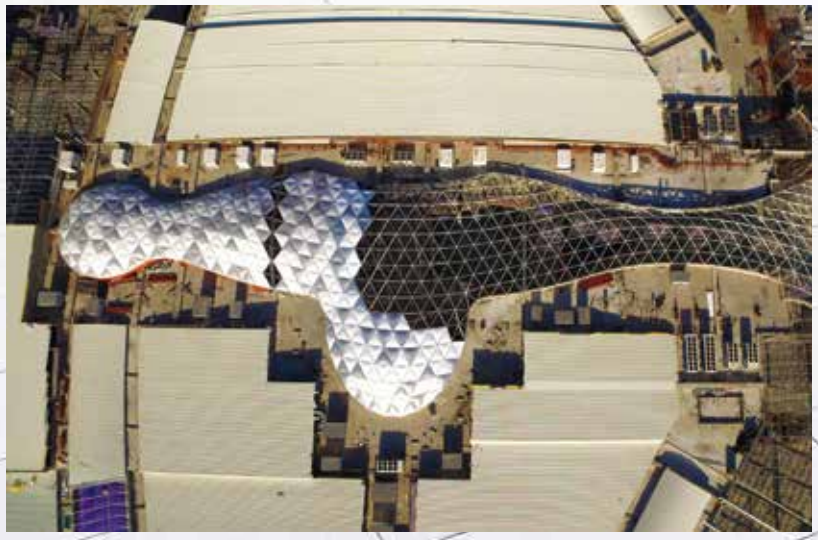
A total of 13 500 000 hours were worked on the project. At peak we had eight full time qualified safety officers on site, managed by a full time senior safety coordinator.

The construction period at tender stage was agreed at 28 working months. The original contractual completion date (28 April 2016) was achieved, even with a considerable increase in the scope of works.

A full time programmer on site monitored the changes to the scope of works and the progress with CCS's Candy software. CCS noted that this was one of the biggest programmes run on their system due to the vast amount of activities.

Motivating facts

- Final contract value: R2,3-billion (inclusive of VAT)
- 28 working months to construct.
- 538 000 m^2 build area with 132 000 m^2 of GLA making it the biggest shopping centre constructed in a single phase in Africa.
- 230 000 m^3 concrete cast, batched on site with a 100 m^3/hour wet batch plant and a 40 m^3/hour dry batch plant. Back up concrete was supplied by ready mix suppliers. We cast in excess of a 1 000 m^3/day for a long period of time.
- A total of 360 000 m^2 suspended slabs were cast at 2 500 m^2/day at peak, with 12 tower cranes and 4 mobile cranes.
- 176 000 m^2 surface beds were cast.
- A total of 12,5 million bricks were laid; this quantity would have been much higher if the façdes had not been constructed with the ETICS lightweight walling system (see below under construction innovation).
- 26 000 m^2 of ETICS façade walls were constructed.
- At peak there were approximately 12 000 construction workers on site.
- The highest value monthly certificate received from the Principal Agent was R173-million inclusive of Vat
- A total of 33 000 m^2 of mall tiling was completed. ■



Project information

- Company entering: WBHO/Group Five Joint Venture
- Client: Atterbury
- Start date: 10 September 2013
- End date: 28 April 2016
- Main contractor: WBHO Construction
- Architect: MDS Architects
- Princpal agent: GHC Africa
- Project manager: GHC Africa
- Quantity surveyor: Norval Wentzel Steinberg
- Consulting engineer: Aurecon
- Contract value: R2,3-billion (including VAT)

A2 Building Contractors

WESTERN CAPE DOD AND MILITARY VETERANS, CAPE TOWN:

THE CASTLE REPAIR AND MAINTENANCE

Repairs and maintenance to the Castle of Good Hope are being carried out by specialists in the construction, renovation and recycling of buildings, GVK-Siya Zama. These are being done under the expert eye of award-winning architect Dr Gabriel Fagan and his wife Dr Gwen Fagan and with the help of Martine Robinson, a long standing staff member. The couple has been involved with the restoration of the Castle and subsequent repair projects since 1968.

GVK-Siya Zama project manager Rupert Rademan says, "The way the team from Gabriel Fagan Architects have communicated the repair and maintenance scope of work to us has been amazing. They share their knowledge and years of research, taking the time to explain the history behind each room we renovate. The Fagans have challenged us to work with materials and methodologies not commonly used in the last 100 years and are well equipped to answer any questions raised by our construction team. Their expertise has enabled us to ensure that all that the history is perfectly captured throughout the building."

According to Gabriel Fagan, "The conservation of a citadel like the Castle is a creative process involving the overwhelming responsibility of intervening in a prime historical artefact."

Regarding the restoration procedures that have taken place over the years, he explains that it was essential for the building to first be assessed for its cultural, architectural and social value. Its rarity value also had to be judged by comparing it with similar buildings both nationally and internationally. This saw the Fagans visiting Mauritius, the Seychelles and Sri Lanka where the history of the fortifications matched that at the Cape.

The building was then examined for further clues to its history. This included an examination of the walls, roofs and ceiling to assess the safety and value of existing structures. The doors, windows and 87 different fireplaces were also measured and recorded to produce accurate plans and schedules.

With numerous additions having been made to the building over the past three centuries, the Fagans were challenged with the decision of what to remove and what to retain.

Items that were demolished included a toilet block in the inner courtyard dating back to the Second World War, derelict saw-tooth buildings used for storage and parking together with a fig tree that almost obscured the famous Castle bell tower and was swallowing historic sentry boxes and blocking the sewers in the front courtyard.

Some elements had to be recreated. For instance, the piers on the gateway leading to the Castle entrance were crowned by lions, with an arched lamp support between them. However, a collapsing flagpole brought the whole lot down, with the lions shattering into small fragments. The remains were boxed to avoid further damage and shipped, along with the pier capitals, to a special workshop where efforts were made to determine the origin of the clay.

Additionally, the gable on the inner side of the entrance, built by Governor Simon van der Stel in 1684, was struck and severely cracked by a lightning bolt. The Earl of Balcarras in Scotland was visited to inspect the notebooks of former Castle resident, Lady Anne Barnard. A panorama done by her in the late 18th century clearly showed the figures of the gods Neptune and Mercury upon the gable. These were reconstructed and the surfaces painted as Lady Anne had depicted them.

One of the most challenging aspects of the repair process has been the refurbishment of the moat which had been filled and turned into a garden early in the 20th century. Another difficulty encountered was the installation of modern requirements, such as the establishment of access points for wheelchair-bound visitors, without impacting on the sensitive environment.

"There are many reasons why we refurbish, recycle or restore old buildings, ranging from economics to simple nostalgia or in the case of the Castle, severe structural deterioration. However, in the long run, the greatest value of old buildings for all of us is that we can identify ourselves through the continuous thread of our communal culture with previous generations and so by better understanding them, reaffirm our own values," concludes Gabriel Fagan. ■

Project information

- Company entering: GVK-Siya Zama Construction Cape
- Client: Department of Public Works
- Start date: 4 December 2014
- End date: 9 September 2016
- Main contractor: GVK-Siya Zama Cape
- Architect: Gabriel Fagan Architect
- Project manager: Department of Public Works
- Quantity surveyor: Van Wyk Consulting QS
- Consulting engineer: CMB

MALL OF THE SOUTH

Mall of the South, located on the corner of Swartkoppies Road and Klipriver Drive, is the new regional mall for the southern Johannesburg area.

The 22 month construction period saw more than 15 km of augured foundation piles, 60 000 m³ of reinforced concrete, 5,1 million bricks and 17 500 m² of Tilt-Up concrete walls being used. The roof and main façade comprises of 1 000 tons of structural steel, 53 000 m² of Saflok sheeting, 3 100 m² of glass façade and over 7 800 m² of detailed aluminium composite panel cladding, resulting in a 200 m wide, curved entrance feature that can be seen from quite a distance away when travelling towards the mall.

The external works, surface parking and landscaping, added to the mall and parking, combined to a total construction area of just less than 275 000 m².

Mall of the South was designed and built using precast Tilt-Up walls around the perimeter of both retail levels. These walls, although not as cost effective as the standard brick and plaster façade build, assisted the programme in enabling us to close the shop envelopes quicker, by erecting twelve to fourteen 11 m high x 10 m wide panels per day. This is in comparison to building 1 430 m² of plastered façade brickwork in a day.

The longevity and low cost maintenance is a further benefit that these Tilt-Up walls offer the client. The good quality off-shutter finish further reduced the amount of painting required in the back of house and delivery yard areas.

The Mall of the South design brief was conceptualised as a double level, enclosed regional mall with specific attention being given to the following areas:

- A continuous skylight running along the entire roof scape of the building.
- Wide walkways and generously sized public areas.
- The unique shape of the mall's layout maximising the extent of the shopfronts.
- Central double volume forecourt which will be used for mall entertainment.
- Main entrances to the mall are made prominent by the large glass façades and architectural design.
- Outward facing shops along the full length of the building's façade.
- Location of banks/ATMs on the exterior edges to minimise security risks.
- Extensive landscaping and green spaces on the upper level parking deck with water features, which are viewed by the restaurant patrons.

The indoor environment receives direct natural sunlight filtering through the skylight in the roof. This results in the diminished use of internal mall lighting during the day. The mall is also equipped with a mechanical air conditioning system that maintains an average temperature of 22,5°C throughout the mall, as well as fresh air ventilation.

This development has been constructed in accordance with SANS Code of Practice 10142 as amended and complies with SANS 204: 2008 Parts 1, 2 & 3 which states a required Maximum Energy Demand of 90 VA/m² and Maximum Energy Demand per annum of 240 kwh/m²/annum.

Taxi bays and taxi drop-off zones were constructed to encourage the use and support of public transport.

The bathroom facilities have low flow electronic taps in the wash basins, dual flush cisterns and electronic actuators on the urinals. All tenants and water consumers have been provided with dedicated water meters which read electronically. A stormwater attenuation pond assists in the irrigation of the landscape.

In order to re-use and recycle material, the use of Portland cement was reviewed in the approved concrete mixes, and all reinforcement steel utilised on site was manufactured and produced from recycled steel.

At its peak the project achieved 5,6 million LTI Free Hours while having more than 4 000 employees on site.

The construction of Mall of the South cost over R1,6-billion, with the building portion making up R860-million of the cost. Construction started at the end of November 2013 and the mall opened on 24 September 2015. This 21 month programme (excluding the December shutdown period) was a major challenge due to high production rate requirements, countered by top-end finishes and high quality expectations. ■

Project information

- Company entering Aveng Grinaker-LTA
- Client: Zenprop
- Start date: November 2013
- End date: September 2015
- Main contractor: Aveng Grinaker-LTA
- Architect: Vivid Architects
- Project manager: WT McClatchey Associates
- Consulting engingeer: Sorialis Consulting Engineers
- Project value: R860-million

MR PRICE DISTRIBUTION CENTRE

Stefanutti Stocks Building KZN has constructed a new distribution Centre for Mr Price in Hammersdale, KwaZulu-Natal. The project consisted of two phases which was split into 11 months for construction and 12 months for the mechanical fit out which is not part of the contractor's scope of works.

The distribution centre was just over 55 000 m ^{2} under roof in size, and included 45 000 m^2 of external concrete hardstands. One hundred and sixty wall panels were cast and erected to form 6 000 m^2 of precast walls.

The wall elements was 10 m high and 5 m wide, and was installed as a single element, when the lifting started, vast areas of wall was erected in a day and up to 20 panels a day was achieved, which equates to about 1 000 m^2 a day.

The ancillary buildings that was constructed consisted of a main office and change rooms, two sub-stations, a truckers node, a battery bay, a sprinkler and hydrant pump room, water harvest tanks, a concrete bridge, a perimeter water channel, a guard house, and canopies over the docking bays.

Due to the vast size of the project and the tight programme, the contractor split the distribution centre in half. Constructing it as two separate jobs to effectively shortened the construction time.

The contractor started the structural concrete works in both zones at the same time followed by structural steel and so forth – in essence Stefanutti Stocks were running two projects concurrently on one site, which allowed them to make progress a lot faster than if we treated the distribution centre as one.

What was different about this project was that there were three different sized columns for the entire job, all 10 m high – which aided the programme.

The columns were cast in one lift, using special techniques in concrete segregation and vibrating, this enabled us to get the bolts in very quickly and commenced the next trade which was structural steel.

The high tolerance floors for flatness were cast after the building was enclosed to prevent curling and the FM2 specification in accordance with TR34 was achieved successfully with only 2 m^2 in the whole facility that was 2 mm out of space.

The contractor delivered the project in the 11th month, on time, which had been a mammoth team effort. The project was also delivered within the required budget.

The contractor employed local labour and upskilled them significantly, and further developed the skills by enrolling them into the Master Builders Associations emerging contractor programme where they developed their business acumen and helped them moved their business forward in the construction industry.

The building has reverse curves in the roof for natural light, water harvesting and solar panels. ■

Project information

- Company entering: Stefanutti Stocks Building KZN
- Client: Mr Price Group
- Start date: July 2015.
- End date: June 2016
- Main contractor: Stefanutti Stocks Building KZN
- Architect: Paton Taylor Architects
- Principal agent: Paton Taylor Architects
- Project manager: Paton Taylor Architects
- Quantity surveyor: Edgecombe & Hayes Hill
- Consulting engineer: Arup
- Subcontractor: Avellini-Impact JV
- Subcontractor: Premier Concrete Floors

PROJECT:

Mall of the South

CONSTRUCTING AWARD WINNING PROJECTS

Aveng Grinaker-LTA is a premium multi-disciplinary construction and engineering group anchored in South Africa with a footprint in other African countries. With its end-to-end capability as well as its multi-disciplinary and holistic approach, Aveng Grinaker-LTA provides turnkey solutions in construction and engineering infrastructure from design, development, construction, and project management.

The company offers a comprehensive range of services that cover building, civil engineering, earthworks and roads projects, mechanical and electrical, mining infrastructure and property development.

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PORT ELIZABETH OPERA HOUSE

The oldest theatre on the African continent and in the southern hemisphere, the PE Opera House, has recently undergone intricate renovations and expansions. The building was transformed from a heritage site into a first class facility.

As the only surviving example of a Victorian Theatre in Africa, leading specialists in the construction, renovation and recycling of buildings, GVK-Siya Zama was enlisted to ensure that it would be preserved for future generations to enjoy.

The topography presented the contactor with tight spaces and tricky heights: approximately 10 m x 10 m, on a 12 m slope of more than 45 degrees. Getting big machines into that space for the excavations was a challenge and the stability of the embankment was always a concern. The contractor excavated from the top down first and continuously made sure that the embankment's angle of repose was within reliable limits to ensure that there was no slope failure.

Options were explored to deal with these challenges. External consultants were called in to conduct thorough geotechnical explorations. Borehole extractions measured not only the water table levels but also the condition of the rock.

The contractor decided to dig an additional 1,75 m – more than double foundation depth – and to then build back up again with imported layer works, using soil raft foundation, so that the floor levels of the new and existing building could meet. The foundations were also reinforced to allow for any possible further settlement. Once construction of the new, extended facilities were finished, the project moved inside.

- New staircases and lifts were constructed within the shell of the existing building
- The original staircases had to be cut out and the existing roofs supported while that support structure was gone

As the Opera House is a heritage site, strict regulations were applied to the design and construction work, and the architect received official sign-off before work began.

That said, especially on such an old building, once the contractor starts opening up, there are all kinds of surprises and the team discovered that the drawings simply did not match what they found inside. Despite having designs to start with, many aspects had to be redesigned based on site conditions – and as everyone was working in a tight time frame, there were times when pressure started running high.

As there was insufficient leg-room for theatregoers in the suspended Gallery, it was decided to increase the size of each step but reduce the number of rows. There were no existing plans of the structure, so new plans had to be drawn up.

The size of this upstairs theatre area needed to be increased – however, the rock face is so close to the building that there was simply no room for traditional extension supports. Instead, innovative and modern-looking suspended clip-on boxes were designed to provide additional room. The heavy steel support columns, though, were found to be in the way of the new fire escape, so they had to be shifted around until they were no longer an obstruction. Now in place, they offer a chunky, industrial aesthetic appeal that is in pleasing contrast to the ornate Victorian character of the original building.

It is difficult to get a heritage building to within the Green Star rating requirements, because the origin of material and methods of construction are not clear. However, we are always cognisant of environmental best practice and strived to incorporate the Green Star guidelines in terms of our applications. On the Opera House, the contractor used material such a concrete cement containing extenders like fly ash, to reduce the carbon footprint.

Approximately 30% of the work was allocated to local emerging contractors, particularly start-up construction labour contractors. ■

Project information

- Company entering: GVK-Siya Zama Construction
- Client: Port Elizabth Opera House
- Start date: 24 March 2014
- End date: 20 November 2015
- Main contractor: GVK-Siya Zama Construction
- Architect: The Matrix
- Principal agent: The Matrix
- Quantity surveyor: Markus Burri QS
- Consulting engineer: AfriCoast Consulting Engineers
- Project value: R24 113 559

WINDYBROW HERITAGE HOUSE RESTORATION

Project information

- Company entering: GVK-Siya Zama Construction
- Client: Market Theatre
- Start date: 2 November 2015
- End date: 31 August 2016
- Main contractor: GVK-Siya Zama Construction
- Architect: KMH Architects
- Principal agent: Badat Developments
- Project manager: Badat Developments
- Quantity Surveyor: Thagalang
- Consulting engineer: Bergstan SA

The Windybrow Theatre was originally a family home, built in 1896 by mining engineer Theodore Reunert. It has served as a nursing home and a cultural centre. Despite falling into disrepair, it was declared a national monument in 1996.

GVK Siya Zama was awarded the challenge to restore the Windybrow Heritage House in November 2015. The client's requirements were simple: the heritage status of the house had to be respected and it had to be restored to its original splendour.

The project posted numerous challenges: the building was in a state or disrepair and it had to be made structurallysound without compromising its heritage status. With the assistance of a heritage consultant, the project team proceeded set out to meet the brief while ensuring the integrity of the grand old lady.

All materials used to add structural support were designed to be as true to the original design as possible. Time was taken to ensure that the new and old would meet in a genial amalgamation of technology and old world ingenuity.

Timber features were restored to their original state using 'old school' methods of repair and restoration. This posed challenges and made for great debates on how the carpenters of old managed to create such intricate designs without current technology and timber products. Master carpenters were put through their paces to ensure all timber elements were restored as well as recreated to match the current to the last grain.

Timber floors were restored by re-using existing planks and sourcing additional timber from the same era from timber merchants. Great care was taken to ensure that the flow of the floors was kept intact.

Pressed metal ceilings were restored to their original splendour with the assistance of a local contractor who used the same metal presses that had been used in the 1900s – thus new panels were made using traditional methods.

Innovation and technology was used to enhance heritage aspects of the building. An example of this is the wireless electrical lighting system which was introduced as a way to circumvent the fact that electrical cabling could not be chased into the old walls. The wireless network introduced endless possibilities which otherwise would have been limited in the heritage environment.

GVK-Siya Zama regards this project as a heritage achievement and received thanks and praise from the heritage community and the client on handover in August 2016. ■

A3 Civil Engineering and Building Contractors (outside South Africa)

KASANE-KAZUNGULA VILLAGES SANITATION PROJECT

An innovative vacuum-based system was the highly successful solution for the Kasane-Kazungula Villages' Sanitation Project to improve the sanitation system in this northern part of Botswana, close to the Chobe River and the border with Zambia.

The existing sanitation services were typically septic tanks or small and inefficient treatment works, which were continually overflowing and contaminating the river, causing health concerns for the estimated 30 000 residents of the villages and over 250 000 tourists a year.

Aurecon was appointed by the Botswana Department of Waste Management and Pollution Control to provide strategic design input including an inception report, preliminary design report, and final design report for a new sanitation system. The company's responsibilities also included preparation of construction drawings and tender documentation.

During the inception report stage, Aurecon mobilised the project by collecting data, producing a detailed programme of the required work and conducted the necessary surveys and investigations. The preliminary design report also involved lengthy consultation with stakeholders to motivate community participation.

The topography of the two villages presented challenges for a traditional gravity line and lift station design. To overcome this, Aurecon developed an innovative vacuum system to collect and transport the sewage. The concept is used in Europe, but the technology is new on the African continent. The final design is believed to be the largest vacuum system of its kind in the world and consists of five vacuum stations and 50 km of vacuum pipe. The system's vacuum pots were designed in Botswana by Aurecon and fabricated in South Africa. Construction used an advanced electrofusion method to weld the vacuum pipelines.

Aurecon's strategic design provided the innovative engineering solution for a hygienic sanitation system to serve the various communities in Botswana's Kasane-Kazungula region. Due to logistical constraints, the contractor was granted a four month extension of time, while all other client deadlines were met on time and the project completed within budget.

Originality and engineering excellence was displayed both in the design of the new sanitation system and its construction methodology.

Various sanitation system options were considered including the more traditional pumped waste transportation. Despite the lack of experience in Africa with vacuum-based systems, Aurecon designed an innovative combined gravity and vacuum solution that was more economical and practical for the topography and required transportation distances in the project footprint.

Supply of a system from Europe was ruled out on the basis of cost. Therefore, Aurecon undertook the design and arranged for the local manufacture and procurement of all components.

The existing sanitation system was inadequate for this tourism hub and commercial transport link with Zambia, resulting in frequent contamination of the Chobe River and causing significant health concerns among local communities. The project's vacuum-based collection and transportation system is working flawlessly and has achieved the objective of creating a significantly healthier local environment.

To eliminate the potential for sewage odours from vacuum stations and collection chambers, simple bio-filters were designed and installed using a bed of stones and eucalyptus chips. Indigenous trees were used to screen system installations. A preferred pipeline route was also replanned to bypass a large baobab tree.

The stations in the new scheme are fully automated and transport the sewage in a closed system with minimal risk of spillages into the Chobe River. Protecting such an ecologically sensitive area, by designing the highest quality sanitation scheme, will ensure the sustainability of all ecosystems.

Initiated in March 2012, practical completion of the project was achieved by 5 October 2015. Ground rehabilitation and general aesthetics was completed by subcontractors in April 2016. This was a noteworthy accomplishment for a unique project carried out in a challenging remote location. The main contractual deadline was met in spite of a legal land dispute delaying establishment of the project's lift station for six months and the contractor having a four-month delay as a result of supplier delivery overruns. ■

Project information

- Company entering: Aurecon
- Client: Botswana Department of Wast Management and Pollution Control
- Start date: 20 March 2012
- End date: 5 October 2015
- Main contractor: Unik Construction Engineering
- Geotechnical subcontractor: Material Investigation Centre
- Project manager: Aurecon
- Consulting engineer: Aurecon
- Mechanical subcontractor: Pumpco
- Electrical subcontractor: Chronos
- Project value: R586-million (approximately)

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SENQU RIVER BRIDGE PROJECT

The Senqu River Bridge Project involved the construction of a four span, 140-metre-long composite steel and concrete bridge over the Senqu River in the Quthing district of Lesotho, near the town of Mount Moorosi. Two kilometres of approach roads linking the Phamong and Quthing districts were also constructed as part of the project.

The Phamong district is situated in a very rural, isolated area in the southern regions of Lesotho. For many years the only access for the people of Phamong to the bustling business district of Quthing was to cross the Senqu River by ferry or on foot.

When the mighty river is in flood, which can be for up to four or five months of the year, there is little or no access. The building of this facility was therefore essential to give the people of Phamong access to vitally needed goods and services from the Quthing district.

The Senqu River at the project's location is approximately 150 m wide and has a large sand bed up to 25 m deep in some places. When the river is in full flood, up to 2 500 m^3 of water hurtles down between the river banks. For this particular reason, the design of the bridge dictated a solution which required the launching of large steel girder truss sections across the river, followed by the casting of a 250 mm in-situ thick concrete deck with New Jersey parapets. The four spans of the bridge vary in length between 30 m and 40 m.

The bridge substructure consists of two abutments situated on the banks of the river and three piers up to 15 m in height situated within the river bed. The substructure is founded on 1 100 mm diameter oscillator piles which vary in depth between 8 m and 22 m which are socketed into the bedrock. The bridge has four spans varying in length between 30 m and 40 m.

In order to execute the piling and construct the piers, a temporary rock fill causeway was constructed across the river, which allowed the dry season river flow to pass through unabated. Access to the pier foundations for piling and construction equipment was via this causeway. Due to the large seasonal floods which occur in the wet season, it was essential that the pier foundations were constructed during the dry season.

The bridge deck consists of three 2 m deep steel girders laced together with cross bracing and a 250 mm thick, 12 m wide in-situ concrete slab cast on top of the beams with in-situ New Jersey parapets constructed on the sides of the deck.

Twenty metre sections of the three steel girders were pre-assembled on the launching platform situated behind the eastern abutment and launched in phases across the river. Launching was done with the use of two 150 ton jacks mounted to the east bank abutment with 20 m being jacked out over the river at a time.

The composite steel and concrete deck structure in combination with the elongated T section piers set against the back drop of the vast Lesotho mountain range makes for a visually appealing landscape.

The 2 km of approach roads have a surfaced width of 9 metres with the layer works generally consisting of a G7 lower and upper subgrade, a cement stabilized G5 subbase and a G2 crushed stone base. The Cape seal surfacing consists of a 13,2 mm aggregate seal and fine slurry.

Local labour working on the project were employed from the areas around Mount Moorosi and Phamong.

Employees were also educated on life skills, HIV awareness and environmental awareness. Once the project is complete, all employees will be issued with a certificate confirming there involvement in the project and the exposure and training in the above mentioned areas.

Some 38 000 shifts have been recorded with no lost time injuries. Given the location of the project and the limited construction knowledge of the local community working on the project, this is a remarkable achievement. ■

Project information

- Company entering: Stefanutti Stocks
- Client: Lesotho Roads Directorate
- Start date: 20 March 2012
- Project end date: 5 October 2015
- Main contractor: Stefanutti Stocks Lesotho
- Consulting engineers: SMEC Consulting Engineers in association with Elite Consulting
- Subcontractor: Pennyfarther Engineering
- Cost of project: M150-million (Lesotho Maloti)

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129 RIVONIA ROAD (VILLAGE WALK), SANDTON

In June 2014 the decision was taken by Eris Property Group to redevelop the old Village Walk site. The primary phase would support the existing boundary walls with the Balalaika and Protea Hotels, this paving the way for the second phase.

The second and final phase would encompass the excavation and lateral support to the new proposed basement layout, including the demolition and removal of the existing four-basement parking garage. Challenges were numerous, including but not limited to unknown location of services, concrete obstructions covered by soil, a diabase dyke running through the site with the unknown position and extent, retaining neighbouring property structures and basements and the most difficult of all, the time constraints.

Due to the nature of the complex goestrata in the location of the site, the lateral support design had to cater for the constantly varying soil conditions.

In addition, the neighbouring property structures comprising the Balalaika, Protea and Holiday Inn Hotels, the Bull Run Pub and Restaurant, Nedbank Building and the highly traffic-congested Maude Street and Rivonia Road, all depended upon the absolute effectiveness of the lateral support design and installation.

The proximity of the neighbouring property basements provided a further challenge as the required anchor lengths would clash with the existing basement positions. Accurate surveys had to be undertaken to determine the location and depth of these and anchor designs were adjusted accordingly.

Exceptionally long strand anchors were installed along the Maude Street and Rivonia Road faces while exercising extreme care not to drill into neighbouring basements.

A grout design capable of complying with strict quality requirements, but still allowing the tight programme to be met, was implemented and maintained throughout the project execution.

The lateral support was designed using the observational method. Numerous unforeseen challenges were encountered during the lateral support and excavation phase and these had to be accommodated in the specified programme time. The lateral support was also complicated by diabase intrusions which was encountered as water-bearing and often saturated silt and required additional support.

Blasting of hard rock, constituting a third of the overall basement excavation volume, was undertaken with precision and each blast design individually prepared with its own parameters and restrictions. Overall, in excess of 80 blasts were set off without a single problem.

The lateral support structure installed had to provide a safe environment during the earthworks and lateral support contract as well as for the duration that the building contractor would take to construct the basement structure. This period would be in the region of 30 months.

A strict environmental plan was adhered to in order to have as little impact on the daily activities around the site as possible. Being a highly traffic congested area, strict traffic control measures were implemented and maintained throughout the construction phase. Dust control was continuously enforced with the use of water bowsers.

The fine balance between time, cost and safety was respected to ensure that the client benefited from the optimum solution.

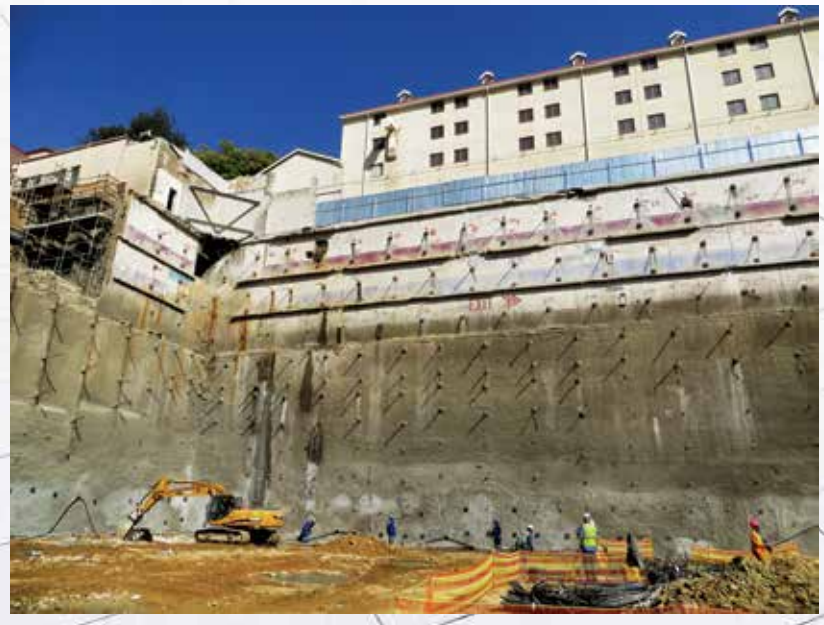
Multi disciplines were running in parallel with the lateral support activities, these including bulk earthworks, blasting, the surgery precision saw cutting of existing beams and slabs as well as the bulk demolition of the existing four basement structure.

All disciplines were planned to a micro level to ensure all contractors could work simultaneously in a crowded and space restricted environment.

The introduction of the building contractor halfway into the lateral support contract further complicated the site logistical challenges. Almost half of the site footprint was handed over to the building contractor, in early November 2015 with six months still left to run on the bulk earthworks and lateral support contract.

Working works were strictly adhered to as the three surrounding hotels with 80% occupancy had an obligation to their guests. Activities were carried out during working hours and Saturdays until 14:00 only, further restricting the overtime facility to catch up on the lost time.

Therefore, from both a technical and management aspect, Franki showcased the optimum solution, bringing the ultimate goal of a successful project to the client that entrusted Franki Africa with this responsibility. ■



Project information

- Company entering: Franki Africa
- Client: Eris Property Group
- Main contractor: Franki Africa
- Architect: Boogertman + Partners
- Principal agent: SIP
- Project manager: SIP
- Quantity surveyor: Aecom
- Consulting engineer: Aurecon
- Subcontractor: Zero Azani
- Subcontractor: Phoenecian Demotlition
- Contract value: R140 000 000

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CHAPMANS PEAK DRIVE:
Re-establishment and upgrade of slope stabilisation and rockfall protection measures

The spectacular Chapman's Peak Drive hugs the near-vertical face of the mountain from Hout Bay to Noordhoek. Carved into the face of the mountain between 1915 and 1922, the road is one of the most scenic drives in the world and a major feat of engineering.

Over the past 20 years, significant rockfall and slope stabilisation measures have been completed on Chapman's Peak Drive to protect motorists and local residents.

In March 2013, under Contact 799, the latest section of slope stabilisation works and rockfall protection measures were completed along the northern end of the drive, by Penny Farthing.

However, on the 15/16th November 2013 an extreme rainfall event triggered a myriad of mud and debris slides which caused extensive infrastructure damage along this section of Chapman's Peak Drive, between SV23 700 and SV24 100, resulting in the closure of the road.

Melis & Du Plessis consulting engineers were appointed by the Transport management Branch of the Department of Transport and Public Works of the Western Cape Government to design and manage the implementation of both the emergency measures, for initially re-opening Chapman's Peak Road and thereafter for the stabilisation and protection works for the permanent safe operation of the road.

The initial emergency measures did not entail specialised measures and the required clearing up and traffic accommodation were undertaken by Haw and Inglis, until such time as a specialist contractor could be appointed. On 10 December 2013 the initial clean up was completed and the west bound lane of the road was re-opened to traffic under single lane traffic conditions.

Since the damage event in November 2013 occurred within the defects liability period of Contract C799, the decision was made in January 2014 to appoint Penny Farthing as the contractor for the repairs and additional stabilisation works.

The start date for the works was February 2014 and the key works items of the contract included:

- Removal of all debris flow material on the slopes above the road and repairs to the damaged roadway and pedestrian walkways.
- The reinstatement/repair/replacement of all structures damaged under Contract C799, which were completed in March 2013.
- The installation of additional slope, landslide and debris flow protection measures on the slopes above the road.

Although Penny Farthing had completed specialised anchor drilling at height on several past projects, at the Chapmans Peak site, with drilling on slopes up to 45 degrees, at heights of up to 120 m above the road, in variable collapsible talus and colluvium materials while keeping to the precise location and drilling angles, a new and unchartered challenge was set for the team. This drove the need for innovation and developments.

Penny Farthing used their custom designed lightweight hydraulically operated drilling rigs, with up to five teams working at any one time. The specifically designed hydraulic control tables allowed the teams to drill the 89 mm anchor holes, some up to 14 m deep, through the collapsible talus and colluvium upper strata and into rock with the compressors and hydraulic packs being located on the road below.

Each debris flow fence required in the order of 40 wire rope anchors to be drilled, each with an exact level and allowable orientation into the slope to match the design requirements of the fence support ropes and structures.

Due to the limited allowance for road closures and also the risk in terms of weather delays, cranes and helicopters could not be used. Therefore, all fence components, some weighing in excess of 250 kg, were manually carried up the slopes.

Health and safety was a critical item on the slopes. Overall the high risk factors associated with projects like this include drilling, working at height, slips and trips, manual handling and public safety.

Over the period of eight months, the nine landslide and debris flow fences were ordered, manufactured in Switzerland, with some parts being shipped to Japan to complete the Geobrugg high specification 'ultracoating' galvanising, before being shipped to South Africa and finally installed on the slopes at Chapman's Peak by Penny Farthing.

One of the most influential factors in the delivery of the first landslide and debris flow fences in South Africa, to the required design specification and programme, was the partnering and teamwork approach adopted by the project team of Penny Farthing, Melis & Du Plessis and Geobrugg. ■

Project information

- Company entering: Penny Farthing (SA)
- Project start date: February 2014
- Project end date: April 2016
- Client: Department of Transport and Public Works: Roads Infrastructure
- Main contractor: Penny Farthing (SA)
- Consulting engineer: Melis & Du Plessis Consulting Engineers
- Project team: Penny Farthing, Geobrugg and Melis & Du Plessis
- Project value: R52-million

GOUDA WIND FARM

Consisting of 46 concrete towers, the Gouda Wind Farm, situated in the Cape Winelands District, is one of the largest wind farms in Southern Africa, and the first to use locally produced concrete instead of the usual imported steel towers.

For construction of these 100-metre tall towers vast quantities of Sika products were supplied. Jacques Reinecke, head of renewable energy for Sika SA, spearheaded the specification and installation of the Sika product and instructed on-site training.

Sika products used in large quantities for the construction of the towers included Sikadur-31 CF (one ton per tower), Sealing Backing Cord (22 km) and SikaGrout-295 ZA (30 tons per tower). Each column is comprised of four precast segments that were sealed and grouted together onsite. Due to the extreme height of the towers, each tower comprises four precast concrete columns of 20 m in height, joined on site, one on top of the other. A final column carrying the nacelle brings each of the 46 towers to a height of 100 m each.

Horizontal joints on the tower segments were sealed with Sika EVA Backing Strip. This semi-rigid, closed cell cross-linked construction foam is designed as a tough, flexible and resilient back-up support material for surface seals in load bearing joints. It can also be used as a bedding seal under precast concrete panels and to prevent loss of grout when joining precast concrete components.

Once joined together, the vertical and horizontal joints of the precast segments were sealed with Sikadur-31 CF and Sikadur-31 DW. Both products are moisture tolerant, thixotropic, structural two-part adhesives and repair mortars based on a combination of epoxy resins and special fillers. Easy to mix and apply, they are suitable for both dry and damp concrete surfaces and harden without shrinkage. They provide high initial and ultimate mechanical strength and are impermeable to liquids and water vapour. Sealing Backing Cord was placed into the expansion joints to regulate the depth of seal and to provide a solid backing onto which the sealants were placed.

Mould imperfections of the newly produced towers were repaired with Sika MonoTop-620, a cementitious, polymer modified, one-component pore sealer and leveling mortar containing silica fume. With an adjustable consistency, it can be applied by the wet spray method and provides excellent adhesion with good resistance to water and chloride penetration.

DD Materials, who used local labour trained by Sika's Jacques Reinecke and Anthony Webster, completed the grouting of all vertical cavities using SikaGrout-295 ZA. SikaGrout-295 ZA is a one-component, ultra-high strength, cement based grout, specifically designed for use in the renewable energy field, under metal bases, between concrete segments and to fill cracks, gaps and large voids. Due to its good flow properties this is a pumpable grout that provides rapid strength development.

During the project SikaGrout-295 ZA was sent for fatigue testing and Sika is proud to announce the product is now certified for durability.

DD Materials completed the grouting of all vertical cavities using a local labour team of 24 skilled and semi-skilled applicators, trained by Jacques Reinecke, Head of Renewable Energy, Sika SA, and Anthony Webster, Sika Technical Sales Consultant. In addition to this training there was training on concrete repair, waterproofing and epoxy applications.

The entire project was instrumental in creating an average of 400 jobs, with hikes of up to 800 employees during the construction phase.

In September 2015, the Gouda Wind Farm, owned in partnership by the South African company, Aveng, and the Spanish renewable energy company, Acciona, commenced operations with a generating capability of 423 gigawatt hours of electricity through which 200 000 homes will be powered per annum. It is estimated that the clean energy generated by this wind farm will prevent the emission of 406 million metric tons of carbon dioxide per year.

One of the client's primary requirements was a high local content on products. 100% of all Sika SA products used in the Gouda Wind Farm project were locally produced.

Sika products, tried and tested for their reliability and endurance, have been used in this project, adding to the sustainability value of Gouda Wind Farm.

All PPE requirements were adhered to onsite on a daily basis and each employee underwent induction before commencing work.

Acciona has a well-established and certified corporate Integrated Management System (IMS) incorporating Quality (ISO 9001), Environment (ISO 14001) and Health & Safety (OHSAS 18001). This corporate IMS has been extended to each of Acciona's main business lines, including AE.

Corporate IMS policies are common to all business lines, while operational procedures are tailored as necessary to the needs and characteristics of each business line.

As a final accolade for Sika SA, this project won the coveted Fulton Award for Innovation in Concrete. Since the emphasis on this huge project was to use local content and local labour, it surpassed all expectations, proving local really is best.

Sika SA is proud to have been chosen as one of the major suppliers for this prestigious and groundbreaking project. It looks forward to continuing to supply Sika's innovative and sustainability-enhancing products to many more one of the foremost sustainability projects in South Africa. ■

Project information

- Company entering: Sika
- Client: ACCIONA
- Main contractor: Lowind/DD Materials

KAALFONTEIN SECONDARY SCHOOL

According to a survey commissioned by the Gauteng Department of Education (GDE) in 2015, 533 of the 1 856 schools in the province were overcrowded. To address the urgent requirement for new classrooms, the GDE awarded Kwikspace Modular Buildings a R25-million contract to build a new school for Kaalfontein Secondary School using alternative building methods.

The scope of works consisted of the construction of 32 classrooms, 10 ablutions, an administration building, a nutrition centre and additional landscaping works. Faced with a challenging project deadline and a tight budget, Kwikspace came up with an innovative solution that enabled them to deliver the new school, and accommodate 1 468 learners, in just 109 days – less than 1/3rd of the time that it would take using conventional brick and mortar construction.

An irregular site footprint meant that Kwikspace had to conceptualise an innovative new design to maximise the space available at the school. It was decided that, along with three single storey blocks, a double story building would be required to make efficient use of the space.

To create a sturdy double storey structure it was determined that concrete floors would be required on the ground and first floors – a first for modular construction. First a steel structural frame was assembled, using prefabricated steel components, and then prefabricated concrete blocks were craned into place on the frame to form the ground and first floors. The remaining components were assembled around the frame to form the shell and façade of the new school building. All the components used, including the wall panels, windows, doors, roofs and the frame were prefabricated and transported to Kaalfontein for assembly.

Along with the innovative double story school building, Kwikspace provided three single storey blocks, one of which was approximately 94 m long and held 10 classrooms. In another first for modular construction, the ablutions were incorporated into the classroom block, in the centre, rather than as a separate building, which is the standard design of modular schools.

An adminstrative unit was supplied for members of staff which included a built in strong room, which Kwikspace created using double thick polyurethane wall panels with reinforced bars.

A nutrition building, with a kitchen and storage area, from which school pupils receive one nutritious meal a day.

All of these structures were built using traditional, strong foundations onto which the external façade and roofs were built using modular components. Despite its rapid delivery, this method of construction gives rise to a durable structure that requires little maintenance and has a long lifespan.

The project was split into four phases corresponding to work on each of the four blocks. Following the completion of each phase, pupils were immediately taken out of their old mobile classrooms and shifted into the new buildings. With this in mind the contractor had to exercise extreme care to minimise dust, noise and make the area ready after each phase – to ensure a comfortable transition. The old classrooms were in a terrible state of disrepair and moving the children into their new premises as soon as possible was a priority. Despite these challenges, through extensive forward planning and in close consultation with the school, Kwikspace was able to deliver a new school for Kaalfontein, in record time, without disruption to learners.

Creating a design for the school that incorporated all of the new facilities, on the triangular footprint of land was challenging, but it inspired us to develop an ingenuitive new double story solution that we can now roll out on other projects.

Wherever possible, Kwikspace tries to leave a positive impact on the communities that surround its works. During construction 95 local community jobs were created and five local subcontractors were employed to provide paving, plumbing, electrical, security, landscaping and construction support.

The site team realised that, in order to install the school's sewer connection line, they would need to demolish a neighbouring resident's existing corrugated iron home, which was sitting directly on top of the connection. In close consultation with the resident, the team brought down the existing structure quickly and replaced it with a structurally superior modular building with strong traditional foundations. ■

Project information

- Company entering: Kwikspace Modular Buildings (Kwikspace)
- Client: Gauteng Department of Education
- Start date: 1 October 2015
- End date: 1 February 2016
- Main contractor: Kwikspace Modular Buildings
- Principal agent: Gauteng Deparement of Education
- Quantity surveyor: Kwikspace
- Project value: R25-million

27 WALE STREET

Sika's globally acclaimed Concrete Repair and Protection Systems was the first choice for consultants Naylor Naylor and van Schalkwyk for 27 Wale Street, a prominent government building in the city centre of Cape Town. Commissioned by the Department of Transport and Public Works, construction company Indawo began the challenging project in March 2015.

Project information

- Company entering: Sika
- Client: Cape Town Department of Transport and Public Works
- Main Contractor: Indawo

The scope of works included structural and spalling repairs, waterproofing and painting of the entire facade of the building.

Spalling repairs involved removal of all concrete and ribs until sound concrete was reached, when a coating of Sika FerroGard-903+ was applied. Designed for use as a surface-applied impregnation of steel reinforced concrete, Sika Ferrogard-903+ is a mixed corrosion inhibitor, based on organic compounds that penetrate the concrete to form a protective monomolecular layer on both cathodic and anodic zones of the reinforcing steel.

This exceptional product with its advanced formulation that delays the onset of chloride-induced corrosion in hardened concrete, meets numerous international standards.

Due to the CBD location of the building and the fact that there were people working inside the building during the renovations, the smallest breaker was used in order to minimise impact and vibrations, as well as keep noise levels as low as possible. After hours applications were carried out using larger breakers when necessary.

Potential pollution to the city was prevented by installing platforms with catch netting which served to catch rubble, product, or any other debris that might fall off the building, due to the work being carried out, and then disposed of in the correct manner.

Health and safety officers from Ingozi Management Safety and Health Consultants were on site daily to ensure proper safety measures were met. External construction work on any building in a central business district (CBD) poses significant environmental and safety issues and when the building is in the centre of Cape Town, one of the world's top tourist destinations, these issues are exacerbated. The safety of all pedestrians, motorists, tenants as well as construction staff was of paramount importance. ■

ALICE LANE PHASE III

Alice Lane Phase III is the third phase of the exciting Alice Lane Precinct, which consists of three distinctive buildings linked by a public piazza. The site is located in the busy heart of Sandton and ideally suited for the inaugural use of PERI's RCS hydraulic self-climbing system – a first for South Africa.

Project information

- Company entering: PERI
- Main contractor: WBHO

Having already successfully completed the first two phases of the Alice Lane Precinct, WBHO was appointed as the main contractor for the next phase of this prestigious project. Intelligent and strategic planning allowed WBHO to select a system that would alleviate the crane time required for construction of critical path elements on the project.

PERI Formwork Scaffolding Engineering South Africa was awarded the contract for the supply of formwork, and used the RCS hydraulic self-climbing platforms on the lift core structures. The lift core structures posed some special challenges, which included: changing door opening levels and locations, varying pour heights and changes in shaft geometry, which varied from closed boxed sections, to open U-section scenic lift arrangements.

To accommodate these challenges, PERI's design and projects teams engineered the following processes:

- Customisation and strategic positioning of the RCS system, to successfully accommodate the scenic lifts.
- Positioning of the RCS rails and climbing shoes in the walls with the door openings. Because of the varying heights of the slab levels, anchor hole locations were pre-drilled to ensure perfect positioning in the header beams.
- Structural changes also influenced the VARIO wall formwork design, as internal shutters had to be designed to accommodate the ground floor shaft openings, due development into scenic lift geometry.
- The flexibility of the RCS platforms ensured that planned in-situ modifications were easily completed once they emerged from the closed shaft formation at ground level. ■

AUAS HILLS RETIREMENT VILLAGE

During the planning stages of the upmarket Auas Hills Retirement Village, situated in Auasblick, Windhoek, it became evident that earth-retaining measures were necessary in order to stabilise the exposed embankments as a result from excavation activities.

Project information

- Company entering: Namwall
- Specialist supplier: Terraforce
- Client: Stefanutti Stocks
- Project start date: 15 May 2014
- Project end date: 1 March 2015
- Main contractor: Stefanutti Stocks
- Project value: NAD2 400 000 000

In addition to the walls inside the property, a river running alongside the retirement village needed erosion control retaining walls, in case of heavy water run-off during the rainy season.

Steffanuti Stocks, the main contractor on site, approached Namwall, a Windhoek-based, Namibian licensee for Terraforce, to provide a design for Terraforce block-retaining walls.

"We consulted with Terrasafe, Terraforce's professional design service, and had a design ready in no time," says Namwall's Chris Schutte. "Most of the proposed rock-face block walls were pretty straightforward, with the higher ones requiring a double skin of L12 blocks for extra reinforcement. In total about 25 000 blocks were installed."

The project was completed with Andre's Landscaping adding the final touches to the walls. ■

BOSJES CHAPEL

The architect met with Frikkie Swanepoel two years ago to dicuss the formwork involved. Based on previous sucsessfull projects of this intricate nature, the architect went ahead with designing his concept.

Project information

- Company entering: PERI
- Client: Longworth & Faul

The intricate chapel roof is 20 m long x 12 m wide and 6 m high at the top apex. It was agreed that a 1:50 quarter concrete demo 'cup' is constructed at the Cape Town demo area. The client, architect, engineer and the whole Bosjes project team were involved and also present when the gunite was done. A lot of detail and input was given with regards to the rebar/steel, spacers and practical application placing the concrete.

It was proven that Gunite was inadequate and the scope changed to shotcrete. This proved again that concrete demo samples be done from the start, which is extremely important when doing these very intricate formwork project.

The formwork erection and concrete placing was programmed for 12 weeks but took much longer due to the spesialised carpentry involved , and the inclement Cape Town winter weather.

PERI Cape Town's Edmund Jenneke and Theo Conradie were involved from the start with the set-out points. PERI formwork proposal and actual solution was to break this structure down to see it as simple as possible. It workshopped this and decided to 'build a ship' and ribs/trusses.

Theo Conradie used Autodesk inventor and designed 584 trusses. PERI procured rooftrusses from a reputable supplier and manufacturer. Trusses were delivered to the Cape Town branch as per construction programme priority sequence. All trusses were properly marked and checked for alignment before delivery to site.

Concrete finish required

- Smooth, and would be skimmed skimmed afterwards.

Sequence of formwork erection

- Shoring towers c/w platforms was erected set-out points and levels plumbed and checked.
- Trusses placed in position from below and from the top
- 38 mm timber battens was fixed horizontally as temporary and false formwork
- Shutterply was fixed in layers, 12 mm + 4 mm final layer

PERI's design capabilities was put to the test and Theo Conradie excelled at designing all the trusses and the full project. There was no crane on site and all formwork, including the timber trusses, were placed by hand.

The construction sequence was not easy. The full project team was involved. PERI initiated the PERI template of involving all parties involved and it created the Architectural Concrete Team template. ■

BURGAN CAPE TERMINALS FUEL STORAGE

Burgan Cape Terminals (BCT) is an independent storage company constituted by VTTI B.V. (Holland). JICARO (RSA) and Thebe Investment Corporation (RSA) to develop a much needed fuel storage facility in the Port of Cape Town.

In 2015 BCT signed a 20 year lease agreement with the Port of Cape Town for the use of the site on the Eastern Mole. The site is a reclaimed area made up of demolition rubble of concrete and the like in a variable soils matrix overlying weak soil horizons to depths of 20 m and more. This presented an engineering challenge to achieve acceptable settlement limits for the proposed large storage tanks.

Project information

- Company entering: Franki Africa
- Client: Burgan Cape Terminals
- Start date: December 2015
- End date: July 2016
- Main contractor: Chemi-Tech
- Subcontractor: Civils 2000
- Project value: R23 100 000

Franki was awarded the contract in October 2015. They commenced with the detailed design and mobilised to site in December 2015 to commence site operations in early January 2016. The foundations project was completed on time in July 2016.

Franki used the Dynamic Compaction technique to compact the in-situ materials to a design depth of 10 m below ground working level. The compaction was carried out in three different phases known as the primary, secondary and ironing phases, in this order. Compaction of the deepest layer is achieved with the primary phase. The secondary phase achieves compaction mainly in the intermediate layers. The ironing phase ensures overlapping of the initial phases by compacting the shallow layers between the initial prints.

Franki employed the services of GETEC, a Keller company, which specialises in vibration and movement/settlement monitoring and recording.

A system was installed on existing tanks which allowed for remote monitoring and reporting. Targets and a total survey station were fixed to the existing tanks with remote references and a predetermined reading timetable was set and readings were taken automatically and transmitted to GETEC in the UK for analysis and reporting. This together with a 3 m deep isolation trench allowed operations to proceed without incident or stress, to the existing nearby storage tanks.

Safety was as always paramount and Franki and their subcontractor Civils 2000 were awarded the BCT Best Company Safety Awareness trophy for 2016. ■

DORMAC QUAY WALL

As part of Dormac's R300-million investment in the Durban Harbour, Dormac Marine and Engineering's new floating dock facility, 'Dormac Dock 1' would go a long way towards meeting the demand for ship repair in South Africa's busiest harbour.

The new facility consists of the state of the art composite floating dock supplied by Ukraine-based Pallada builders and a new 185 m long, 16,9 m high (4 m above and 12 m under water) purpose built quay constructed by Franki Africa.

The scope of work consisted of the construction of the main quay structure, the closing in of the existing slipway, installation of two large diameter mooring dolphins and the excavation and dredging of the fill and in-situ harbour silts in front of the quay wall. The engineering design of all civil and geotechnical work was carried out by Franki Africa's in-house technical team with support from Young and Satharia Consulting Structural and Civil Engineers.

The main quay structure was designed for a total retained height of 16 m under various wave conditions and berthing directions and scenarios. The quay wall consisted of 26 m long, 900 mm diameter continuous flight auger (CFA) piles with gaps between piles sealed with jet grout columns. The soldier pile quay wall was laterally restrained using steel tie-backs anchored to anchor piles behind the wall.

Project information

- Company entering: Franki Africa
- Client: Dormac
- Start date: December 2015
- End date: September 2016
- Main contractor: Franki Africa
- Consulting engineer: Young & Satharia
- Subcontractor: Subtech
- Subcontractor: Leomat
- Project value: R65 948 000

The innovative combination of CFA piling and jet grouting allowed the lead time and construction programme to be reduced to meet the fast-tracked deadlines. The soldier (CFA) piled wall was finished with a continuous capping beam which provided a connection between the soldier piles and the steel tie-back anchors. Precast panels were positioned on the seaward side of the capping beam, which acted both as a wall preventing water ingress as well as the formwork for concreting.

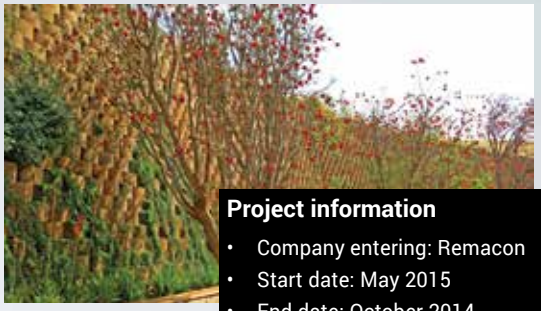
The dock will allow an additional 45 dockings per year.

An extensive environmental impact assessment was carried out prior to the civil works beginning and strict controls with continual monitoring were required throughout construction. As this project is the first in Durban Harbour to involve the removal of land (rather than the reclamation thereof), the majority of the excavated material was uncontaminated harbour silts and could be dumped at specified marine dump sites or at land fill sites.

Both Franki and Dormac pride themselves on exceeding health and safety standards and having amongst the best records in their respective industries. All employees on this project underwent job specific safety training and were subject to regular in-house and external audits ensuring compliance. This contributed to the overall success of the project and resulted in the works being completed with 120 000 injury free man-hours.■

GREEN AND FUNCTIONAL HARD LANDSCAPING FOR SILVERSTAR CASINO

Three concrete retaining block walls have been built at the Silverstar Casino entertainment complex in Krugersdorp using CMA member, Terraforce's L11 blocks. The blocks were supplied by Terraforce licensee and CMA member, ReMaCon Products cc, and the walls were designed by ReMaCon CEO, Silvio Ferarris.



Project information

- Company entering: Remacon
- Start date: May 2015
- End date: October 2014
- Main contractor: WBHO
- Consulting engineer: Remacon Products
- Subcontractor: Powergate Construction

The walls were constructed after an amphitheatre, The Dome, designed and built by Otto Wijnberger of In2Structures, had been added to the site.

Backing onto Roodekrans Ridge, the largest wall is 128 m from end-to-end and tops 6,5 m at its highest point. Running adjacent to the amphitheatre, it was built by Powergate Construction at an angle of 70˚. Backfill, which varies in depth between 3-3,5 m, was reinforced with Kaytech PC 50/50 geofabric at every third block layer.

Wick drains were installed on the cut face at 45˚ every two metres and these channel water into a sub-soil drain. Further drainage is provided by a rain channel which was installed in the backfill behind the top layer of blocks.

Indigenous trees, grasses and shrubs combine with the foreground paving to complement and soften the retaining wall particularly well, while the red soils used for the backfill have stained the grey blocks, resulting in a colour mix that blends in well with the surrounding environment.

The two other walls, one 95 m long and three metres high and the other 91 m long and two metres high, were built to secure embankments on the fringes of two parking areas. Both were built by Powergate Construction using the same L11 block and to the same design specifications as the larger wall.

The Terraforce L11 block has a round face finish which is easily planted. Moreover, the L 11 system is also cost-effective and easily constructed in uniform concave curves.

Terraforce blocks are exclusively manufactured in Gauteng by Remacon Products. ■

MAIZE SILOS AT MASHAMBA,
Democratic Republic of Congo

Project information

- Company entering: Maccaferri Africa
- Start date: January 2016
- End date: March 2017
- Project team: MSJ Geotechnical Consulting Services
- Consulting engineers: MSJ Geotechnical Consulting Services

MSJ Geotechnical Consulting Services were appointed to carry out the foundation design for the New Maize Silos at Mashamba, Democratic Republic of Congo in order to cater for the 322 kPA loading from the strip footing and 180 kPa from the 28 m high maize.

The findings of the geotechnical investigation conducted by MSJ were used to determine representative in situ geotechnical parameters for the geogrid reinforced soil foundation mattress design. The investigation consisted of 11 TLB dug test pits and five rotary cored boreholes. Pocket penetrometer tests, vane shear tests, and point load index tests were carried out in addition to laboratory testing comprising grading analysis, Atterberg limit determination, Mod. AASHTO compaction and CBR tests. The investigation highlighted rock at level between 11 m and 12,7 m below natural ground level and a completely weathered clayey zone between 14,2 m and 16 m below NGL. Moreover, rock level was found between 18,78 m and 20,5 m below NGL. Rock has been found above these levels but there are also completely weathered zones and a relatively thick clayey zone between 12,5 m and 20,5 m.

The combination of high pressure loading and the presence of clay with an undrain shear strength in the range of 50 to 100 kPa for the first 6 to 10 m resulted in failure in bearing capacity resulting in the need for foundation improvement techniques. The remote location of the site has strained and limited the possible solutions as access and the availability of material and equipment would have had to be brought in, delaying the execution of the project.

MSJ and Maccaferri Africa had successfully used basal reinforcement techniques in the past for similar situation and it has been proven to be cost effective with high margin of safety and short installation time.

The proposed solution consisted of excavating the in situ material to a depth of 2 m below the soil mattress level. Two layers of Paralink® 600 are then placed bi-directionally (second layer placed with straps at right angles to the first) onto the in situ material. A separation layer comprising 100 mm graded gravelly sand specially selected from the laterite source, lightly rolled, is placed between the Paralink® 600 in order to enhance the friction between the geogrid and the soil in order to transfer the stresses from the soil. ■

MECHANICALLY STABILISED EARTH WALL for Black Rock Mine expansion project

Project information

- Company entering: Maccaferri Africa
- Client: Assamang
- Start date: October 2015
- End date: December 2015
- Main contractor: Stefanutti Stocks
- Project manager: DRA
- Consulting engineer: DRA

The largest and richest Manganese deposit in the world sits in the Kalahari basin, approximately 80 km North-West of Kuruman, Northern Cape Province. Here, on a small hill called Black Rock, Assmang acquired an ore outcrop in 1940.

Over the years this manganese ore mining operation expanded and today includes three underground mining complexes. The Black Rock Expansion Project was commissioned in 2014 to increase the output of the high-grade Manganese ore products and ensure the mine's sustainable longevity. As part of the Black Rock Expansion Project the mine required four bridge abutments, each 7,5 m in height, to bring heavy trucks over the conveyor system to offload the manganese through the grizzly chutes below.

Soil is strong in compression but weak in tension. By incorporating a tensile element such as a geosynthetic that is strong in tensile resistance within the soil mass, the soil is reinforced and able to sustain higher shear stress.

Geosynthetic-reinforced soil systems can be adapted to a variety of site conditions. They are characterised by allowing one to work even with low quality backfill and are easy and fast to construct as they require no curing or lead time in the operation. The execution of the contract was awarded to the contractor Stefanutti Stocks Road & Earthworks in October 2015. Due to the time constraints Maccaferri SA t/a Maccaferri Africa was approached to propose an alternative solution for the insitu cast cantilever steel reinforced concrete wall originally specified.

Four retaining walls, 7,5 m in height, were required by Black Rock Mine to accommodate tipper trucks dumping material onto conveyor belts for further transportation. Apart from the time and cost constraints, very high loadings and weak founding material had to be overcome in the proposal.

After numerous solutions were discussed and considered in design related meetings between Maccaferri Africa, Stefanutti Stocks and DRA Mineral Resources, the Maccaferri MacRes® T system, with Maccaferri's Paraweb® high strength geosynthetic reinforcement was chosen to satisfy all the requirements of the project. The complete package for the structure (design, mould hire, reinforcement, all accessories and project management assistance) were to the value in of R1-million.

The two true bridge abutments (four walls which amounted to a face area of 850 m²) were constructed in less than three months as required in order for the client to commission the works in December 2015. ■

PILING AND BULK EARTHWORKS AND LATERAL SUPPORT to Kazerne Transit

Project information

- Company entering: Stefanutti Stocks Geotechnical
- Client: Johannesburg Development Agency
- Start date: 15 January 2015
- Project end date: 28 August 2015
- Main contractor: Stefanutti Stocks Geotechnical
- Project manager: Badat Development
- Quantity surveyor: Koor Dindar Mothei QS
- Project value: R56 439 663

The Kazerne project is a Taxi Facility Development to improve the quality of life of commuters and streamline flow of traffic in the inner city of Johannesburg and strengthen the commuting connection with the rail service. The underdeveloped Kazerne Taxi facility close to Park Station provided an opportunity for such a facility. Studies have estimated that in 2014 the inner city had taxi facilities for 4 000 taxis; leaving approximately 1 800 taxis to rank and hold in the streets. This is one of the key reasons for traffic congestion in the inner city.

During the early stage of the project, while installing the permanent lateral support, aggressive mine sands were encountered beneath Harrison Street on the north-eastern boundary of the site. This resulted in severe soil collapses during the drilling for the anchors as well as the perimeter piles; requiring a redesign for the anchors and piles in this section. The perimeter piles were then installed closer together and permanent casings were used in the free-length of the anchors. During the structural piling the general soil profile encountered comprised transported soils; a thick horizon of residual andesite; followed by very soft rock to hard rock andesite. These ranged between 16 to 27 metres below the natural ground level, with the water table at eight metres.

The Stefanutti Stocks Geotechnical design team carried out the analysis followed by the design of the most effective and suitable piling methodology for these soil conditions. Piles drilled under Polymer were identified as the preferred system, and were mainly used on the large diameter piles that were installed to depths of between 18 to 30 metres, to prevent side wall collapses.

During the project a total of 440 piles were installed, including 242 Continuous flight auger (CFA) piles varying from 450 to 750 mm diameter, and installed up to 23 metres deep; and 133 Polymer-technology drilled piles varying from 750 to 1 500 mm diameter and installed up to 30 metres deep as well as 65 Auger cast-in-situ (ACIS) soldier piles varying from 600 to 750 mm diameter installed up to10 metres deep.

Stefanutti Stocks Geotechnical's environmental management system on site was designed, maintained and monitored in accordance with ISO 14001 specifications. These requirement was considered during risk evaluation for each unique operation and recorded as part of our aspect and impact registers. ■

RECONSTRUCTION AND DEEPENING OF MAYDON WHARF: Berths 1-4, 13 & 14 in the Port of Durban

Project information

- Company entering: Stefanutti Stocks Marine
- Name of client: Transnet
- Start date: April 2014
- End date: February 2017
- Main contractor: Stefanutti Stocks Axsys Joint Venture
- Principal agent: Transnet Group Capital
- Consulting engineer: RCE Consultants
- Project value: R760 817 570 (excluding VAT)

The Stefanutti Stocks Axsys Joint Venture (SSA JV) was awarded the contract for the rehabilitation of berths 1-4, 13 and 14 in April 2014, a total of 6 out of 15 berths at Maydon Wharf, the Port of Durban's largest break bulk, edible oils and dry bulk handling precinct.

Maydon Wharf was developed for the then expansion of the Durban harbour, in particular to meet the needs of the growing Witwatersrand. The berths were built of timber, with berths 1-4 and 13 and 14 later rebuilt using steel sheet piles in the 1950s.

As the largest and busiest shipping terminal in Southern Africa, the aged berthing structures require far greater capacity than the original 20 000 DWT vessels it was originally designed for to meet current and future demands.

The reconstruction of Maydon Wharf consists of demolishing the existing quay structure, the removal of old timber piles, installing a new steel combination wall with concrete cope beam and back of quay layer works. Included in the scope of works is the deepening of the seabed by some 4 m to achieve a draft of 14,5 m CD, with the placement of scour rock adjacent to the quay wall, preventing washout by the propellers of the vessels.

The design of a water tight shutter system for the cope beam construction was complex and required rigorous analysis. Initially, a detailed concept of a coffer dam was developed. The coffer dam concept was however discarded due to handling issues that will be caused by the overall weight of the structure (approximately 30 tons) and the large windage area provided by the plating. The effects of wind in the marine environment require thorough consideration in ensuring the safety of our teams and for safe handling of loads.

Another innovative feat was the construction of cope beam. A sound solution came in the design of a hanging shutter.

As South Africa's principal container port generating more than 60% of revenue, the Maydon Wharf infrastructure upgrade will result in much needed increased capacity for the country's economic functioning and growth, and will alleviate the congestion currently experienced.

The SSA JV team is proud to have been part of delivering a key development project for the client and ultimately, the contribution to society, it will make in employment opportunities in Durban.

Great care is taken to ensure zero harm to the little marine life that exists in the port through efforts in using biodegradable grease on sheet pile clutches, and biodegradable shutter oil and foam seals for the shutters. ■

REDDFORD HOUSE SCHOOL

Project information

- Company entering: LCP Roofing
- Client: Reddord House
- Start date: June 2015
- End date: December 2015
- Main contractor: Murray & Dickson
- Architect: Centrury Property Development
- Quantity surveyor: Bain & Heyns Quantity Surveyors and Project Managers
- Consulting engineer: C-Plan
- Contract value: R46 024 231

The newly constructed Reddford House School in Northcliff, Randburg, was capped by an impressive 8 820 m^2 of timber roof trusses of varying styles and configurations by local leader in roof truss technology, LCP Roofing. The exposed timber roof truss work at the school is remarkable. The architectural design and layout of both these main buildings allow for optimal functioning and maximum usage of the space, and upon arrival, the sheer size and aesthetics of the structures make an immediate and profound impact on the viewer.

LCP Roofing was tasked with fabricating and erecting exposed timber feature trusses at the gatehouse, main building entrances, piazzas and the main hall. The client brief called for a number of exposed timber roof trusses in as many viable spaces in the buildings as possible, and even the walkways were to be exposed and supported by laminated pine beams at the eaves. While structural soundness was paramount, the aesthetic value of the project was a prominent consideration for the client.

The architect, Michael Bishop of Century Property Developments, provided detailed sketches of the client's requirements, to which the LCP Roofing team answered with precision, ingenuity and attention to detail. LCP Roofing's design office turned the concept sketches into workable blueprints that allowed the aesthetic components of the project to push boundaries, all while maintaining the highest level of structural integrity, collectively making for an outstanding end result.

The trusses in the main hall proved to be challenging, not only from a design perspective, but from a logistical point of view. With a pitch of 27 degrees over such a span, a one-piece truss with a continuous top and bottom chord would simply be too big to deliver. The solution was to fabricate the trusses in three sections instead of one, using two two-ply half modified scissor trusses and a separate one-ply top hat truss.

Once completed, the modified design was sent to LCP Roofing's supporting engineers for final specification on the specific fixing, which was ultimately the use of a sliding shoe on the wall plate on one side of the building as well as the necessary bracing details.

Once fabricated and delivered, the scissor trusses had to be assembled on site and the top hat trusses were erected only once the exposed scissor trusses were in place. A mobile crane was required to hoist the 19,5 metre span trusses above the double volume of the hall and then to lower them, one by one, into position. The crane was only available for a limited period of time, so the LCP Roofing team worked as efficiently as possible, using the apron of scaffolding along the side of the walls of the hall provided by the principal contractor. ■

REHABILITATION OF EMMARENTIA DAM SPILLWAY

In 2009 Johannesburg Roads Authority (JRA) identified several issues at Emmarentia Dam (located on the Westdene Spruit, a tributary of the Jukskei River) from the stability of the dam wall to the return channel. On the return channel they discovered erosion of the banks and undermining of existing gabion and concrete walls.

In April 2015 the rehabilitation project was awarded to Endecon Ubuntu for the civil engineering, and King Civil and Lettam Building and Civil were appointed to carry out the work. Maccaferri Africa was appointed as the sole supplier of Gabions and Castoro® Mattresses for the return channel rehabilitation.

The 103 year-old landmark was in need of maintenance following the recent floods, which had damaged the aging infrastructure. While significant improvements to Emmarentia Dam were undertaken in 1988, a recent comprehensive investigation conducted by JRA showed that preventive maintenance and flood-retention protection was required to safeguard the dam's integrity and ensure the safety of residential properties downstream. Furthermore it was discovered that continued erosion could expose the banks and possibly undermine existing municipal roads located next to the return channel. Improving Emmarentia dam's flood-prevention facility, to protect properties located downstream of the dam from flooding, included excavating and repairing the pipework and surrounding soil at the stormwater structures located along the dam. The project scope also included altering outlet structures, repairing the box culvert outlet, widening the control section and constructing a gabion wall on the eastern side of the outlet.

Maccaferri Africa not only supplied the gabions and Castoro® mattresses, but due to the labour intensive solution and the importance of the construction, offered on site in order to ensure installation was carried out according to best practice, which also proved to allow faster installation. Site inspection during the course of the construction ensured the highest quality of the gabions and mattresses. The project was started in April 2015 and was completed in April 2016.

The value of the Maccaferri products was approximately R800 000, with the full value of the contract for the spillway being around R5-million. ■

Project information

- Company entering: Maccaferri Africa
- Client: Johannesburg Road agency
- Start date: April 2015
- End date: January 2016
- Main contractor: King Civil Engineering Contractors
- Consulting engineer: Endecon Ubuntu
- Subcontractor: Lettam Building & Civils

ROCKFALL PROTECTION FOR WESTERN HIGH WALL SJ Pit at Rössing Uranium

Towards the end of 2015, Fairbrother Geotechnical Engineering approached Geobrugg to help them with a design solution at Rio Tinto's Rössing Uranium Mine near Swakopmund in Namibia. The Rössing Uranium Ltd (RUL) operates as a large low-grade open cast uranium mine and is a subsidiary to the Rio Tinto Group of companies. The mine is located some 65 km NE of the town of Swakopmund in Namibia. The request was to address the rock fall hazards on the wall above the Trolley 14 access ramp, an area of 110 m high by 270 m long.

The slope above Trolley 14 was designed to be 15 m high benches with a 10 m catch bench, however in most cases the crest was over-mined due to extensive blast damage caused within the sub-drill area. The resultant rock mass comprised a loose package of jointed blocks hanging precariously along the crest of each bench face, which provided a source for rockfall. The crest area had low capacity on the slope resulting in the rocks landing on the access ramp and posing a threat of both equipment damage and injury risks. Temporary measures to mitigate the risk had been put in place by the mine, but a long term solution to adequately minimise danger posed by the rockfall hazard was required.

Geobrugg visited the site with Fairbrother Geotechnical Engineering and discussed the client's requirements. A drape mesh system was considered the most suitable system as it was the most cost effective and efficient, provided for a long term solution to ensure that the trolley line is protected from rockfall and minimised the safety risks during installation.

The installation process was also a significant factor owing to the surface area under consideration as well as the mines requirement to keep the trolley line open for as much of the construction time as possible.

This project was a first, as the Quarox Plus drape system had not been used in the African Mining operations. Another important point for this project is that the drape mesh installation's CO_2 footprint far exceeds the conventional shotcrete solutions offer added benefits to this project.

The installation of the draping system was managed by Fairbrother Geotechnical Engineering using their own employees and supplemented by seven rope access technicians (RATs) provided by ASC. The proximity of a haul road at the top of the slope allowed for the provision of track mounted crawler rigs to install the anchor system for the drape mesh at the crest of the slope. The project was successfully completed in March of 2016. ■

Project information

- Company entering: Fairbrother Geotechnical Engineering
- Client: Rössing Uranium
- Start date: September 2015
- End date: June 2016
- Main contractor: Fairbrother Geotechnical Engineering
- Project manager: Rössing Uranium
- Project value: NAD8,5-million

SASOL HEAD OFFICE BRIDGE

The unique architectural shape of the new Sasol head office building in Sandton brought with it some interesting and challenging solutions throughout the construction of the project.

One of these included the roof slab (a 15 m span with variously sized downstand and upstand beams) to connect two sections of the building and allowing for the feature inclined glass façade to join into this roof slab from below.

There were essentially two ways of constructing this bridge:

- 45 m high shoring of the entire bridge from ground floor to the roof slab which required tie-backs into the slabs on each side of the building and additional lateral stability – this solution was not possible as it interfered with the façade installation and programme; the metric volume of shoring required was estimated at 9 500 m^3. The cost saving alone in the transport and assembly time became a deciding factor
- PERI proposed solution of creating a false soffit in 40 m height using steel beams to span between the building and then only required another 5 m of shoring which could be safely installed from the false soffit. This solution had no impact on the façade programme and the volume of material required was significantly less with an elegantly engineered solution for the client to erect and dismantle.

HDT Main Beam with inclined HD200 prop assembled as individual frames and lifted into position.

Pre-manufactured 533 I-Beam units were lifted in position on top of the spreader beam and fixed in position

Project information

- Company entering: PERI
- Main contractor: Aveng Grinaker-LTA

Multiprop towers were safely assembled and installed from the I-Beam units and the MRK frames were used as working platforms to safely assemble the slab and beam soffits.
Stripping of the system was done in reverse as descibed alongside – speed and safety of the erection and dismantling in 40 m height made it successful. ■

SERVICE CENTRE IN ORLANDO EAST

In 2015, Lafarge South Africa, one of the country's major cement, concrete and aggregates manufacturers, secured the exclusive sponsorship of the Orlando Stadium, which occupies a special place in the hearts of the local community and all the people of South Africa.

It was a new marketing strategy for the company to have a much stronger and direct focus on reaching the consumers of its products and services. Allied to this was the desire to give back to the local Orlando community through Lafarge South Africa's extensive corporate social investment (CSI) initiatives. It was important to design a sustainable way of doing this.

The company considered that it could provide free advice and a direct technical service to the community on building new homes and improvements, as well as promote the development of business skills, financed sustainably by consolidating the Lafarge brand at grassroots level and creating a stronger demand for its products.

In a first for the local cement industry, Lafarge South Africa opened an innovative Service Centre in Orlando East, Soweto. Contributing to the sustainable development of building expertise and infrastructure in the area, the Centre offers a wide range of services that make the building process far easier, more efficient, and importantly more accessible for customers.

The services cover guidance on planning, design, building regulations, finance, and interior layout and finishes. The Centre also provides information on Lafarge approved building contractors. Emerging entrepreneurs, who partner with Lafarge to provide supplier and contractor services, are offered business skills training, such as cash flow management, selling techniques, and product technical knowledge.
The pilot scheme is stimulating economic development and building the skills pool in this underserved community, which will lead to improving the quality of life for the local people.

The intention is to replicate the Service Centre concept in other similar communities. ■

Project information

- Company entering: Lafarge South Africa
- Client: Lafarge Sotuh Africa

TERRACED RETAINING WALL GARDEN FOR GROVE MALL

The reason why concrete block retaining walls are used so widely is that they offer much more than the stabilisation of earthen embankments. They also give full reign to the creative talents of landscape architects and retaining wall builders.

The Grove Mall, an upmarket shopping precinct developed by Resilient Africa and situated off Lynwood Road in eastern Pretoria, illustrates this point in spectacular fashion. Its 420 m long multi-faceted retaining wall structure on its southern and western boundaries has transformed a six metre high erosion-prone earthen embankment into a terraced wall garden, comprising three, and in one section four, layers of retaining walls interspersed and overhung with abundant plant and flower life.

Despite their eye-catching attributes, public safety rather than aesthetics was the prime motivator for shoring the embankment with terraced walls which were designed, built and engineered by Engineered Interlock Solutions to provide many years of trouble-free service.

According to Engineered Interlock Solutions, owner, Manie Troskie, before the retaining wall option was considered, gabions were the front-running reinforcement solution.

Actual construction was complicated because it commenced while the centre was fully functional. "This meant we had to work in a public space and this restricted our available working area. In addition, a section of the parking basement adjacent to the embankment had to be used for temporary storage of the excavated soil. Moreover, although the soil was sufficiently stable for backfill purposes, there was so much water in one section of the embankment that it ran continuously, and we had to pay particular attention to drainage," said Troskie.

The walls were completed at the end of 2014 and took six months to build. The bulk of the structure comprised three walls, apart from the south western corner where a fourth wall was added.

Detailed logistical planning was required to counter the restricted working space and a ramp, which provided access to the upper wall sections, had to be built. Besides excavating and stockpiling the soil, an existing precast concrete drainage channel, which ran along the bottom of the embankment, had to be temporarily filled in to provide adequate and unimpeded access for building the lower wall. Provisional alternative drainage was installed in this section during construction. Dust was another problem during construction and the on-site water was used to damp down the soil.

To ensure that the walls were structurally sound and well drained, Engineered Interlock Solutions was obliged to use low-fines concrete as the backfill material for the first wall. This wall varied in height between one and three metres and in one three metre section the wall was built around a substantial quantity of rock. The upper walls ran between one and two metres in height.■

Project information

- Company entering: Aveng Infraset
- Client: Resilient Properties
- Start date June 2014
- End date: December 2015
- Main contractor: Engineered Interlock Solutions
- Consulting engineer: Axiom Consulting Engineers
- Retaining wall consulting engineer: TMV Consulting & Design
- Quantity surveyor: BJV Quantity Surveyors
- Contract value: R2,5-million

THE PROVISION OF SAFETY FACILITIES on N2 Section 7 near George

The R61-million project, initiated by the South African National Roads Agency (SANRAL), comprises approximately 8 km walkways, fencing, retaining walls, a pedestrian bridge crossing the railway line, CCTV and lighting along the N2 between the Pacaltsdorp Intersection and the George Mall.

Quite a few fatal accidents were reported on this section of the N2, that runs through a densely populated area, making it crucial to install fenced pathways to ensure the safety of pedestrians on their way to work, school or shopping.

The appointed engineers, SMEC SA, were tasked with designing a safe pedestrian pathway along the highway. With the hilly typography of the region, it was necessary to make use of retaining walls for the cut and fill slope parallel to the highway, to facilitate a stable foundation for the 2 m wide footpath. Some 8 500 m^2 walls were built to hold the paved route, using roughly 90 000 L11 Terraforce retaining blocks with integrated geotextile reinforcement fabric to counter any horizontal and vertical loads. All walls were also placed on a concrete base and each block was reinforced with vertical rebar and a 5% cement mortar mix. A Kayteck filter system was added to accommodate the wet ground conditions typical to this area.

Project information

- Company entering: Mobicast
- Start date: September 2015
- End date: October 2016
- Main contractor: Civils 2000
- Architect: SMEC SA
- Quantity surveyor: Civils 2000

Says Chris van Zyl, owner, Mobicast: "Terraforce is a cost effective alternative to other products. The ease of use together with the special reinforcement makes it superior to other earth retaining solutions. The completed structure is functional and adds aesthetic value to the area. Landscaping will still take by place, by the main contractor, Civils 2000". ■

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2

3

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MULTICHOICE CITY

Multichoice, South Africa's premium broadcast provider, has recently extended its primary campus in the Randburg CBD with a brand new facility boasting a Green Building Council 5 Star Design and As Built Certification.

Grosskopff Lombart Huyberechts and Associates Architects were commissioned to design a building for Multichoice that would capture this spirit and become a landmark to the communication and connectivity that Multichoice represents.

Situated on the corner of Republic Road and Bram Fischer Drive in Randburg, this prime location called for a bold statement building.

Connectivity for staff needed to be considered as Multichoice occupy a number of buildings in the immediate vicinity. A tunnel under Bram Fischer Road and a pedestrian bridge over it create a link that seamlessly tie the existing and extended campus together.

Technology that addresses sustainability has been integrated into all aspects of the building resulting in the project achieving a 5 Star Green Star SA Office Design V1 Certification.

The most prominent of the elements that contributed to this rating are the pixelated glazed blind system on the front facade that is automatically controlled by the movement of the sun and the cutting edge ETFE (Ethylene tetrafluoroethylene) transparent tensioned roof system that spans the multivolume atrium area.

Group Five were the main contractors on the construction of MultiChoice. The 96 000 m^2 building with 60 000 m^2 basement parking and plant rooms with 36 000 m^2 offices and atrium space had the makings of all the challenges for a building to be constructed in the required time.

The state-of-the-art services and multiple colourful finishes required superb planning and management to complete the high quality astatically building in time. Group Five was especially proud of the safety record achieved of over a million incident free working hours and thank all involved, with a special thanks to the people who did the physical work on site. At peak periods there were over 950 men and women working on site.

The use of steel has played a vital role in emphasising the filigree detail that completes the building. The front of the building facing west on Bram Fischer Drive has a very large cantilever 'peak cap' roof that cantilevers out towards the street. This roof has been sculpted to ensure form follows function with a very elegant narrow leading edge.

Entering the building the visitor is immediately greeted by a grand volumetric atrium space with a wonderfully elegant tubular strutted arch structure supporting air inflated ETFE cushions. The strutted arch spans order of 24 metres and its form is ideal for resisting the more dominant uplift wind forces of such a structure whilst being quite slender in form as a result of the very light in mass ETFE cushions.

The fabricator for the two roofs, Tass Engineering, participated in many design workshops to resolve connections together and cranage and access had to be carefully worked out so that the atrium roof could be erected with cranes standing on the ground floor slab below albeit with props by main contractor under the outriggers.

The building layout faces predominately east-west due to the natural orientation of the property, which added to the design challenge. Besides the thermally efficient glazing chosen for the facades and the deep overhangs of the roof which create much-needed shading, integrated blinds which track the sun's movement were specified, to adapt the building to its environment and ensure comfortable working environments within throughout the day. Both greywater and rainwater harvesting systems are employed to minimise the use of potable water for uses like toilet flushing and garden irrigation. Practical specification of finishes including those with low VOC emissions, local sourcing, and reduced resource consumption such as low flow sanitary fittings , low energy use bulbs on movement sensors, solar geysers and gas stoves, were all brought to bear on the detailed design development of the building. The HVAC system makes use of a thermal storage approach which allows the manufacture of coolth at night by freezing thermal storage balls – when loads are low and energy prices are reduced – to use during the day to power the AC when the building is actually at maximum demand. ■

- **5 Star Green Star SA Office Design v1 Certified Building**
- **5 Star Green Star SA Office As Built v1 Certified Building**
- **Winner: Steel Awards 2015 – Architectural and Cladding Category**
- **Winner: Sapoa best corporate building 2016**

Project information

- Company entering: GLH Architects
- Client: Multichoice/NMSCom Properties
- Start date: 2012
- End date: 2015
- Main contractor: Group Five
- Architect: GLH Architects
- Project manager: BTK Pretoria
- Consulting engineer: PURE Consulting
- Project value: R1-billion

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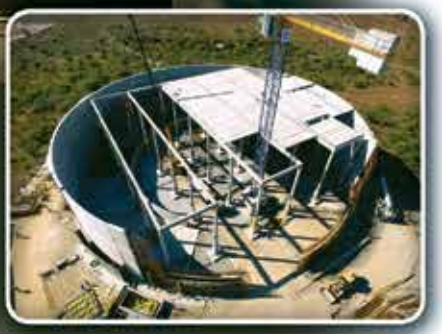


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PwC TOWER

The horizon of Midrand, north of Johannesburg, is set to change forever with the construction of the new high-rise head office for Pricewaterhouse-Coopers (PwC). The R1,5-billion project will be a focal point in the up and coming Waterfall City development and comprises 45 000 m² of modern offices, designed to house 3 500 PwC employees in an efficient and optimally designed workplace.

It is set to become a structure of iconic proportion due to its distinctive twisted form designed by LYT Architecture for Attacq Waterfall Investment Company and their developer Atterbury, and realised through close collaboration with Arup. The structure is a concrete frame with post-tensioned (PT) floor plates and each floor of the 28-storey office tower rotates 1,2 degrees relative to the floor below.

The core of the building was constructed using a method called slip forming, where the concrete is poured continuously within the steel shutters, which moved up at a pace of 2,5 m a day.

The Arup façade engineers worked closely with the façade contractors Geustyn & Horak on a new suite of extrusions specifically for this project, which is the first curtain wall in South Africa with twisted unitised panels.

Parametric modelling can be described as modelling a structure or object in an n-dimensional space, where certain chosen parameters of the structure are adjustable.

The biggest structural challenge was that the spiralling form of the tower causes the gravity loads to create naturally a clockwise torsional load on the building.

The PwC façade is concave and twisting, and knowing the history of high profile cases with problems caused by concentrated solar reflections from buildings (notably those at 20 Fenchurch Street in London – the 'Walkie-Talkie' – where plastic fittings on a Jaguar on the street melted in 2013), the Arup team identified this as a risk and knew this was something that would need careful study for the tower. At the time of design, no software existed for calculating the intensities of solar reflections. Arup therefore scripted its own calculation in parametric software. Using this script, it was able to calculate the magnitude of the solar concentrations in the open areas surrounding the tower and provide feasible and practical solutions to mitigate the impact of the solar reflections. Solutions considered were sunshades on the façade, randomly scattering façade panels and making spandrels non-reflective. In the end, it was decided that the best solution was to use a less reflective glass in the spandrels that was further enhanced by acid etching. Landscape shading addressed any remaining concentrations over limit.

The building is designed to be a Leadership in Energy and Environmental Design (LEED) Silver Green building and the environmental impact due to construction activity is strictly monitored. The building itself will comply with all latest sustainable and energy-efficient requirements in terms of the air-conditioning system, the light fittings and the selection of glass used in the façade. As of 15 September 2016, there has been only one hour of lost time due to injury over 2 260 000 total man hours on this project. ■

Project information

- Company entering: Arup
- Client: Attacq Waterfall Investment Company
- Start date: October 2014
- End date: October 2017
- Main contractor: WBHO
- Architect: LYT Architecture
- Project manager: LYT Architecture
- Quantity surveyor: Brian Heineberg and Associates
- Consulting engineer: Arup
- Steel contractor: Amsteele
- Façade contractor: Geustyn & Horak
- Mechanical engineer: WSP

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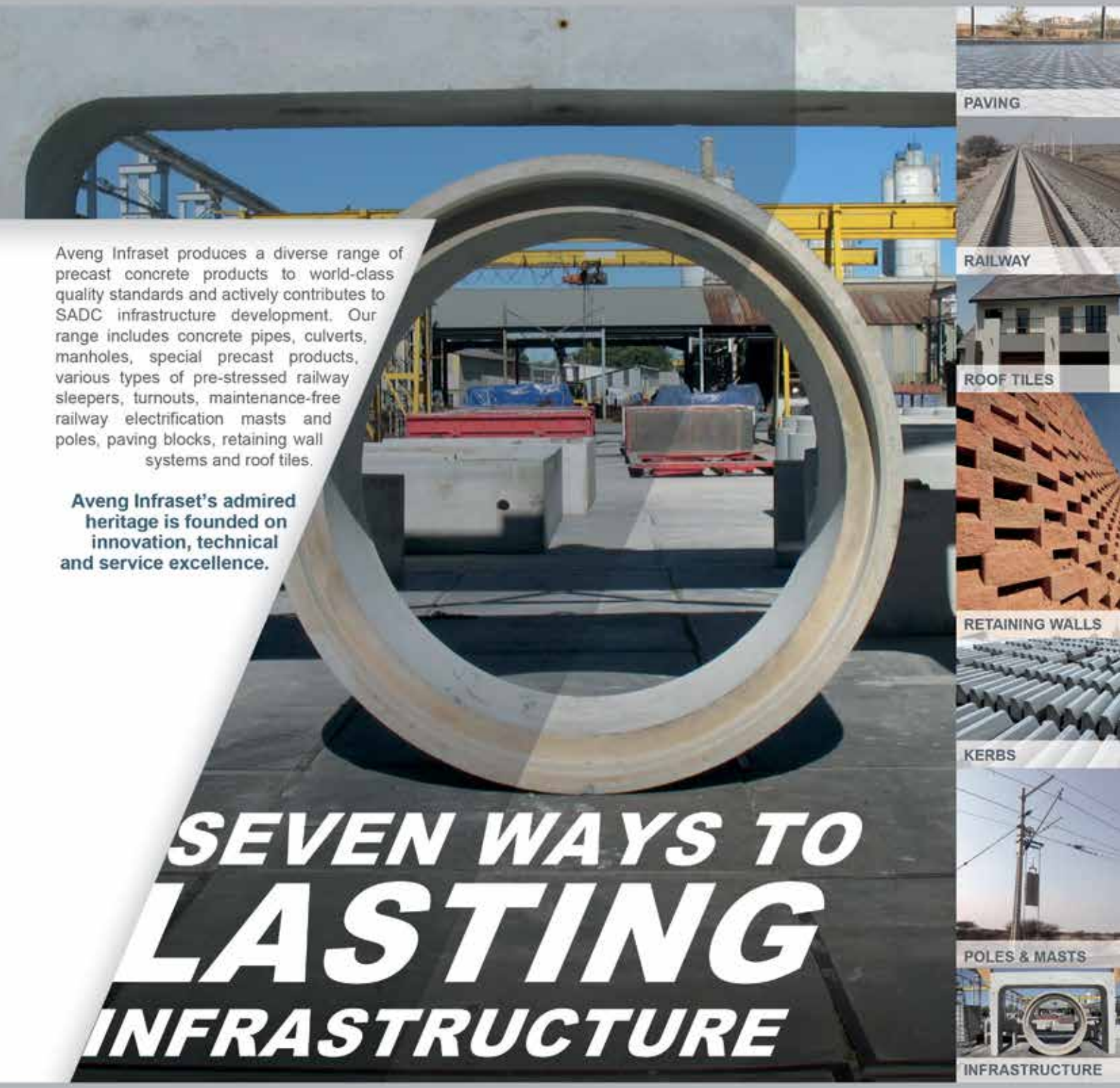

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ACID MINE DRAINAGE PROJECT: EASTERN BASIN TREATMENT PLANT

98% of the gold that has been mined in South Africa has come from the Witwatersrand goldfields. For more than a century, gold was the most important export commodity, but over the past 25-30 years gold production has suffered a drastic decline. In 1970 South Africa was still producing 1 000 tonnes of gold each year, two thirds of world production; but by 2010 this had dropped to just 192 tonnes, a mere 10% of world production.

While operational, large dewatering programmes must be implemented to allow the miners to tunnel, blast and to ultimately extract gold. With the closure of the mines and the turning off of the dewatering pumps, water started accumulating in the old mine workings, leaving deep shafts that provide direct access for water and oxygen to underground rock surfaces.

Through natural oxidation of pyrite bearing rock strata, the water that filters into these empty shafts via recharge and runoff water is characterised by acidity, high metal content and high salinity, and is known as Acid Mine Drainage (AMD).

Decant of AMD started in the West Rand in 2002. Similar decant was anticipated in Central and Eastern Basins. It was imperative that something be done to stop the AMD contaminating the groundwater to a point where it is unsuitable for domestic or other uses.

The Treatment Plant designed by AECOM for the Eastern Basins is a High Density Sludge (HDS) Plant which is treating a maximum of 110 Ml/day of AMD.

The scheme's design followed the typical industry practice as used for water/wastewater treatment works. Some of the aspects of the detailed design were verified using state of the art techniques, used to optimise the detail design, add value to the engineering design and ensure cost savings for the client.

Some of the technology used on the project was tried and tested systems which perhaps were lacking originality, but simply due to the size of the project these are now the largest examples in the world.

An improvement over the typical HDS process was the enhanced sulphate removal system by providing additional retention time in a mixed Gypsum Crystallisation tank.

On commencing with construction, an underwater camera was lowered into the flooded mine shaft to ensure that there were no blockages. A modified sonar was also lowered into the shaft to give a wider field of view to reduce the risk of damage to the abstraction pumps when they were lowered.

The mine shaft used as the AMD abstraction point had been in disuse for some years and had suffered from lack of maintenance and vandalism by illegal miners. Use was made of professional mining rescue teams with the necessary equipment and experience to remove debris and clear obstacles from the mine shafts above the water line.

Constrained by a railway on one side and a wetland on the other, the site was challenging. The plant was designed so that the large thickener recycle pump station excavations (8 m deep from natural ground level and requiring lateral support) were moved as far out of the wetland as possible.

The excavations for the thickeners were still a cause of considerable construction difficulties. The material being excavated was a silty clay that was prone to shear failures. Extreme care had to be taken during excavation.

A number of solutions were considered by the team including drilling with casings and other forms of lateral support. The decision was taken to use self-drilling anchors, which flush the area with grout while drilling occurs, to enable the hole to stay open while voids are grouted and stabilised in the same operation. This solution was successfully executed and the lateral support was successfully installed in the large thickener excavations.

Concern about the environment steered the project as a whole. If the project did not stick rigidly to the programme dates, the AMD in the mining void would rise to a point that it would pollute natural aquifers and potentially decant at surface.

Construction on the Eastern Basin AMD Site occurred within the bounds of the Blesbokspruit, which had previously been registered as a RAMSAR area of natural importance. Detailed measures and processes were put into place to ensure that construction activities did not negatively impact the wetland. ■

Project information

- Company entering: AECOM
- Client: Trans Caledon Tunnel Authority
- Start date: June 2014
- End date: August 2016
- Main contractor: CMC PG Mavundla JV
- Project manager: Trans Caledon Tunnel Authority
- Quantity surveyor: AECOM
- Consulting engineer: AECOM
- Subcontractor: Tecroveer

THE INGULA PUMPED STORAGE SCHEME

The multi-billion Rand Ingula project is a peaking hydro power station. The scheme allows for water to be released from the upper reservoir and delivered to the pump-turbines to produce power, before being captured in the lower reservoir. During off-peak power periods the pump-turbines then pump the water back up to the upper reservoir where it is to be ready for the next peak power occurrence.

It is located about 23 km north-east of van Reenen, within the Little Drakensberg mountain range. The upper reservoir site is located in the Free State province and the lower reservoir in KwaZulu-Natal. The distance between the upper and lower reservoirs is in the order of 6,5 km and the elevation difference is approximately 480 m.

The scheme consists of the following basic components:

- An upper reservoir (Bedford Dam),
- A lower reservoir (Bramhoek Dam),
- An underground powerhouse complex and associated waterways that link the two reservoirs,
- Four pump-turbines coupled directly with motor-generators,
- Surface switching station,
- Ancillary works that include building works, roads, transmission lines and temporary and permanent infrastructure.

The rated generating capacity is 1 332 MW and the energy storage capacity 21 000 MWh (15,8 generating hours). In addition to the normal generation capacity a minimum emergency full load generation reserve of four hours is maintained throughout the normal weekly operating cycle.

The design of the scheme is undeniably complex and sophisticated requiring design inputs from true international experts, each interfacing with each other to yield precise results.

During off-peak periods the reversible pump-turbines use electricity from the national grid to pump water from the lower to the upper reservoir. During periods of emergency peak demands, water is allowed to flow back into the lower reservoir through the pump-turbines to generate electricity.

From initial site investigations it was realised that the geology at Ingula is more complex than might have been expected. State of the art numerical analyses were therefore carried out to design rock excavation support for the large underground caverns in which the main transformers and pump-turbines and motor-generators are housed.

With the project located in the Little Drakensberg escarpment that is recognised for its scenic beauty, the aesthetic value of the engineering design formed the basis for its ultimate environmental approval. In particular the upper reservoir is located in a natural wetland. The layout of the project and the design of engineering elements were treated with great sensitivity towards the environment.

Eskom developed and implemented an Environmental Management System (EMS), which has been ISO 14001 certified since 2011.

The project has stimulated local economic development during construction with over 5 000 persons employed at the peak of construction, in addition to other direct beneficiaries in the education, health and social investments by Eskom and its contractors. ■

Project information

- Company entering: Braamhoek Pumped Storage Scheme JV
- Client: Eskom
- Start date: 2005
- End date: 2017
- Consulting engineer: Braamhoek Consultants Joint Venture (comprising Gibb, Royal HaskoningDHV, Knight Piésold)
- Contractors:
  - Murray & Roberts – exploratory tunnel
  - Grinaker-LTA – access roads
  - CMI JV, comprising CMC di Ravenna, PG Mavundla and Impregilo – underground civil works
  - Afriscan – water supply, sewage treatment, small access roads and building of temporary Eskom offices
  - B&E Quanza Group – aggregate quarry
  - Braamhoek Dams JV, comprising Concor Roads & Earthworks, Wilson Bayly Holmes-Ovcon (WBHO), Edwin Construction and Silver Rock – upper and lower dam contracts
  - Voith Siemens Hydro Power Generation – electromechanical equipment contract
  - ABB – electrical balance of plant (eBoP) solution.
- Project value: R30-billion

90 RIVONIA ROAD:

NEW OFFICES FOR WEBBER WENTZEL

Sited on a prominent corner in the financial hub of Sandton, 90 Rivonia was procured through an RFP process in which the tenant wished to consolidate several disparate business units into a united campus to flexibly accommodate growth and engender collective pride.

The architecture expresses the major tenant's positioning as an African law firm, concerned with transparency, equity, and humanity. The architects focued on the use of contemporary yet timeless design, internationally referential and locally grounded. The core concept creates a place responding to the site specifics, knitting the company into the supporting environment.

It has seven floors of parking – four below and three above ground, balancing sensible urban design with commercial construction realities – fed by multiple accesses at different levels. The E-plan form places a strong spine against the eastern boundary, from which three north-facing fingers stretch out.

The environmental focus was at the forefront of the design, construction, and operational phases of 90 Rivonia. The sustainable design approach with integrated technology realised a reduced carbon footprint, improved working space, and lowered operational costs.

Full utilities backup ensures grid independence and business continuity. Sensor-driven light fittings and thermal storage HVAC flatten the peak load energy demands, and the conservation and re-use of water with water-efficient sanitary fittings reduces the potable water demand. Individual metering of utilities consumption for different zones allows monitoring and response to leaks and inefficient use. 90 Rivonia has a 4-star GBCSA rating.

A number of design innovations are worthy of mention at 90 Rivonia. The commercial reality of accommodating a large number of parking bays in a city centre building often separates the street and the building with above ground parking. At 90 Rivonia, this was mitigated by stepping the parking floors back to create a tilted podium which steps down to the street edge to draw people in to the scheme.

The design of the new building brought together various departments of the tenant who were previously housed in separate buildings, creating new opportunities for learning and working together, and casual exchange.

The façade design combined a number of approaches to glazing, the most innovative of which is the floor-to-ceiling naturally-ventilated double-façade with a 600 mm cavity between an external single glazed jumbo glass panel connected with stainless steel pushers to an internal performance double glazed SIGU.

The cavity's inherent shading prevents radiant heat and maximises daylighting without glare, and the naturally ventilated panels allow air in and out to cool the façade minimising the load on the HVAC system. Set inside the cavity, automated sun-responsive blinds address direct solar angles adjusting for the suns path and cloud cover, and override switches provide individual control for building occupants.

The facade design comprises double facades around cavities, single facades, and mechanically fixed stone and tile panels. The technical and environmental advantages of the double façade system are discussed above, and a further advantage is that the entire façade is designed considering disassembly, improving sustainability and resource management.

The use of these innovative designs and technologies has increased knowledge transfer amongst the construction teams and the asset and facilities management teams.

The client's clear show of confidence in the location in redeveloping 90 Rivonia has contributed to the growth of the Rivonia/Katherine precinct and the implementation of a City Council urban design framework for the area. The construction technology choices and building systems are being adopted in other contemporary developments demonstrating the impression the scheme has made in the community and the industry. The design choice to open the scheme to the street and create a large garden, rare in the CBD, has contributed to the positive perception of the development. ■

Project information

- Company entering: GLH Architects
- Client: Redefine Properties
- Start date: April 2013
- End date: December 2015
- Main contractor: Group Five Building
- Architect: GLH Architects
- Principal agent: SIP Project Managers
- Quantity surveyor: Brian Heineberg and Associates
- Consulting engineer: PURE Consulting

BARN HOUSE

It is always the hardest thing for an architect to design for himself. Mostly because the temptation presents itself to try all the ideas usually not allowed by clients; and to experiment.

Project information

- Company entering: Strey Architects
- Client: Friedrich and Wilna Strey
- Start date: 2006
- End date: 2015
- Main contractor Friedrich Strey
- Architect: Friedrich Strey
- Consulting engineer: Hull Consulting Engineers
- Subcontractor: Clotan Steel
- Subcontractor: Mega Construction

Various site layouts and concepts were considered. It was decided to design a contemporary farmstead, utilising different 'sheds, barns and a silo' on the 1 239 m² stand. A long timber cladded 'barn' had to accommodate the living area and parent-in-law apartment on the ground floor, and the bedrooms on the first floor in the roof or loft space, and the services, storeroom, wine cellar and business office in the basement.

The southern 'shed' had to serve as double garage or double as a steel workshop at ground level, a rentable apartment in the attic space and domestic quarters in the basement. A brick 'silo' serve as stair shaft and serves as a division between the 'public' architect's office space, and the 'private' home and living space, as well as to accommodate a guest bathroom in the basement, and a look-out in the top of the tower.

One of the most important factors in design is the orientation of the building. The most common factor is for the long face of the building to face the sun, but that is not always possible or desirable.

The different structures are placed is such a way that the building 'turns its back' on the cold winter winds from the south-east, while channelling the cool breeze over the pool and through the opposing glass doors of the 'barn' during summer.

As South Africans are blessed with an average of more than 300 days of sunshine per year, it only makes sense to install a solar water heating system to help with the hot water needs, as well as produce electricity with the use of the sun, through the use of photovoltaic panels.

The estate is reticulated with piped natural gas to each stand, so solar heated water could also be supplemented by utilising natural gas to bring the hot water up to the required temperature when needed.

The house is properly insulated, through the use of insulation board in all the roofs, walls and floors.

Clay bricks utilises a lot of energy to be fired, as well as leaving a scar to the earth where the materials are excavated, so recycled clay bricks from sites where buildings were being demolished, were used where bricks were needed.

No artificial heating or cooling was needed as the structure is well insulated all round, passive evaporative cooling mechanisms (the swimming pool) is in place, single deep spaces utilised, well-considered cross ventilation used, etc.

Operable, triangular gable-end windows, right at the top of the ridge of every structure ■

BRIDAL VEIL OVER-PASS BRIDGE, MALL OF AFRICA

Project information

- Company entering: AECOM
- Client: Attacq Waterfall Investment Company (AWIC)
- Project start date: 19 November 2014
- Project end date: 18 March 2016
- Consulting engineer: AECOM
- Contract value: R160-million

In May 2014, the Attacq Waterfall Investment Company (AWIC) appointed AECOM for the design and construction management services relating to the construction of the Bridal Veil Overpass Bridge as part of a link over the N1 to the new Mall of Africa at Waterfall Estate on the southern side of Allandale Interchange.

Developed by leading South African property developer and investor Atterbury, Southern Africa's largest single-phase shopping centre development, Mall of Africa is a new R5-billion, 130 000 m² super-regional mall situated in Waterfall City, with access from Pretoria, Sandton and Johannesburg.

Mall of Africa is in close proximity to the first free-flow intersection of its size in Africa, at the nearby Allandale Road exit from the N1 Highway. This provides ideal access for shoppers travelling from the north and south to this iconic new mall. It is also mere minutes away from the major east, west, north and south highways meeting at the Buccleuch Interchange of the N1, M1 and N3. In addition, the massive road upgrades Atterbury has undertaken as part of the Waterfall City development ensures getting to Mall of Africa is easy for shoppers and improves the infrastructure for all road users.

The new R160-million Bridal Veil Road overpass bridge, developed by Atterbury Property Development, opened at the same time as Mall of Africa, and created a brand-new east-west transport route. The new bridge crosses the N1 Highway south of the Allandale Road Interchange and north of the Buccleuch Interchange. It creates a direct link between Midrand and Waterfall City, with the new R40-million, 1 km-long S-bend dual carriageway extension to Bridal Veil Road, which takes shoppers right to the doors of Mall of Africa.

The bridge's superstructure is 115,8 m long and 22,7 m wide. It carries four lanes of traffic – two in each direction – a pedestrian walkway, a cycle lane and a raised centre median. In addition, road infrastructure was upgraded substantially on Maxwell Drive, to the west of the mall, where increased capacity was created at the intersections. The existing traffic circles were upgraded to signalised intersections at a cost of R17-million.

The conceptual design of the bridge was dictated by the possible positions where piers could be constructed between the north- and south-bound carriageways of the N1 Highway, in addition to the on and off-ramps of the Allandale Interchange, where the bridge crosses.

Accommodation of traffic on the extremely busy N1 between Johannesburg and Pretoria had a major influence on the type of structure that could be built, as well as the aesthetic considerations of the bridge itself.

It was decided that the bridge would follow similar design principles to those applied on the nearby Allandale Interchange bridges. Precast M-beams in a pseudo box-girder arrangement with façade panels were decided on. Multi-column piers with vertical fluting similar to those of the existing bridges were designed, together with reinforced earth abutments with fluted concrete panels. Durable concrete and suitable concrete cover to reinforcement were specified to ensure a 100-year design life for the structure.

The team also received a very good safety rating of more than 80% on the project – this while constructing a bridge over the fully functional N1 freeway in Midrand, with an average of 200 000 vehicles using this stretch of the road network daily, without any recordable injury or construction-related accident on the project. ■

MAJUBA POWER STATION SILO 20 RECOVERY PROJECT

Project information

- Company entering: Hatch
- Client: Eskom
- Project start date: May 2015
- Project end date: December 2016
- Main contractor: Rula/Stefanutti Stocks Consortium

Majuba is a six-unit, coal-fired power station that produces a total of 4 107 MW of electricity. It comprises three dry-cooled units producing 657 MW each, and three wet-cooled units producing 712 MW each. Construction started in 1983, with the first unit connected to the national grid in 1996. The last unit was connected in 2001.

In November 2014, an incident occurred at Majuba, during which the wall of Silo 20 fractured, leading to the collapse of the upper section of the silo. The conveyor transfer house and the coal conveyor gantry sections that were supported by Silo 20 also collapsed, resulting in damage to the head end of the overland conveyors, take up structures and the tail ends of the over-silo link conveyors.

The configuration of the coal plant relies on the distribution of coal to the desired silo from the Transfer House located on top of Silo 20. Due to the structural failure of Silo 20 and the associated conveying infrastructure, no coal supply to any of the silos was possible.

Hatch won a competitive tender to provide engineering services for the permanent solution, consisting of a detailed civil and structural design for the plant, as well as a basic design, for all associated interfacing plant, including Bulk Material Handling (BMH), Electrical, Control and Instrumentation (C&I) and Low Pressure Services (LPS).

The scope of the permanent solution project includes Silo 20 reinstatement, strengthening of Silos 10 and 30 and all supporting systems. During the design phase, the urgent timeframe resulted in Hatch having to shave several weeks off the engineering design schedule. To date the project has been a success. Challenges going forward include conveyor construction, lifting of gantries and the transfer house sections to the top of Silo 20, which include lifts in excess of 40 t, and commissioning at the live power station. The project scope is large and complex, with the main focus being a very tight deadline.

It is an interesting project in that the entire Silo 20 was not demolished. Rather the base and bottom half from the hopper up were incorporated into the new structure. Another engineering design challenge has been to ensure that the plant, which was built originally over 20 years ago, complies with all the latest regulations and requirements, without changing any fundamentals such as the layout. A significant challenge is that the coal feed to the fully functioning power station cannot be interrupted at all, which is why Eskom has phased the project, with a bypass conveyor as an interim solution.

Silo 20 is 65 m high, which presents a challenge in terms of heavy lifts due to the windy conditions at this time of year, as well as significant safety risks to all individuals working at heights to perform these difficult installations.

Another major challenge in terms of the sliding in particular is that the concrete mix has to be precise, an area where Hatch's site engineers paid particular attention to. ■

MTHATHA DAM TOURISM CENTRE AND RECREATIONAL DEVELOPMENT

Mthatha, as the birth place of the former State President of the Republic of South Africa, Nelson Mandela will, in years to come, remain a tourist attraction. The development of the Mthatha Dam Tourism Centre and Recreational Facilities by the Department of Environmental Affairs will be an icon of the rebirth of Mthatha and the development of the precinct will be reflected in the economic benefits inherent in a process of this nature.

The Mthatha Dam project master plan scope entails the design, construction and handing over of a conference centre catering for 100 conference delegates, a restaurant, sunset bar and kitchen facility serving 150 guests, built accommodation to house a total of 100 guests, a camping site with 12 stands each to the maximum carrying capacity of 6 people, a wedding facility to host up to 350 guests, alterations to Luchaba Nature Reserve gate house as well as bulk civil, electrical and ICT infrastructure.

In addition to this, the development of the facility brings with it the improvement of surrounding infrastructure, as is the case with the tarring of the road leading to the facility as well as the construction of a road meandering the natural and man-made amenities presented by the nature reserve. The conference centre and restaurant/kitchen opened for business in December 2015.

The UWP-led team is driving value-adding green and sustainable development initiatives on the project in line with UWP's triple bottom-line (people, planet, profit) sustainability policy.

The project has significant focus on job creation, skills development and community empowerment. To this end a community trust that shares in profits arising from the project has been set up. The trust consists of representatives from each of the thirteen surrounding communities as trustees. Proceeds from the operation of the facilities are shared amongst the thirteen communities through such programmes as financing the education of children from the area and caring for the old and disabled.

Furthermore, the project has created 38 full time jobs to date, of which 34 positions are filled from the local community.

Some 394 community members have received training in various skills related to the operation of the facilities, including seven individuals who have completed training at the Midmar Dam and Hluleka Nature Reserves and are now full time employees operating the nature reserve entrance gatehouse.

To date, from a budget of R66,7-million spent on the project, an amount of R19-3million has been spent on local labour alone. This amount excludes monthly expenditure of R154 550 spent on salaries for permanent employees.

Solar geysers are specified for all accommodation units and wastewater is treated on site through package wastewater treatment plants to decrease the load on the municipal system and allow for grey water recycling for site irrigation. ■

Project information

- Company entering: UWP Consulting
- Client: Department of Environmental affairs
- Start date: 11 March 2013
- End date: 11 March 2017
- Architect: MDA Architects
- Consulting engineers: UWP Consulting
- Project value: R38-million

NEW BUSINESS SCHOOL
for the Nelson Mandela Metropolitan University

The new Business School for the Nelson Mandela Metropolitan University (NMMU) is a the result of a competition winning entry that excels in having a clear intention and physical manifestation – a powerful, self contained and timeless composition that is the new home for a rapidly growing school.

The client's brief called for an approximately 5 500 m^2 'world-class' and 'green' building that would not only enhance the business school's reputation but also that of the Second Avenue Campus. SVA's starting point was to give recognition to the values of the Business School – sustainability, integration, dignity, safety, security and efficiency. From this a primary spatial decision developed of locating the structure in a way that minimised negative impacts.

To achieve this, the building was positioned not on the open playing fields (that was preferred by many) but rather on the already degraded existing parking area. This decision allowed for a range of positive long term benefits and started to align the Campus with its recently approved Development Framework.

As a typology, the courtyard building seemed a naturally urban and advantageous type, allowing for a powerful, sculptural building in the round that responded to its four different sides appropriately and also allowed for a private, controlled outside space in the middle.

Where the exterior is severe and minimal, the interior and courtyard are spatially more diverse, with a variety of volumes, 'space beyond space' and multiple and unusual light sources.

Environmental issues and sustainability have been integrated into the project from the earliest stage in an appropriate and contemporary manner that has resulted in the building being awarded a Green Star 4 rating. Much of this is attended to by passive environmental design decisions including orientations, massing and material choice, but also grey water recycling and a Building Management System.

The design and development of a new world-class Business School Building cannot be seen in isolation from the broader strategy of the NMMU and the strategy of the Business School as captured in its vision, mission and values.

The 'Change Tomorrow' strategy of the Business School should also play an important part in shaping the proposed new building as an instrument in realising institutional strategies.

The following design principles have been observed in the design of the new building:

- Advanced green design to create a balance between people, planet and profits, will be regarded as a very strong design principle.
- Flexibility in the design of spaces to facilitate changes in the use of building space within universities as knowledge institutions. The subdivision and combination of classrooms is but one example of the required flexibility.
- Virtualisation of the activities of the university is a reality and the implications of this will be taken into account in the design of a new building, bearing in mind the needs and capabilities of students and staff, financial constraints, and the institutional strategy.
- Introduce the concept of a 'university hub', which centralises certain facilities such as classrooms, computer labs, restaurants, and study facilities, into the building design.
- The building lay-out should give expression to the various symbiotic relationships that have been identified between the components of the proposed facility. ■

Project information

- Company entering: SVA International
- Client: Nelson Mandela Metropolitan University
- Start date: 2011
- End date: 2014
- Main contractor: WBHO
- Architect: The Workplace/GAPP
- Principal agent: Arup
- Project manager: Arup
- Quantity surveyor: Turner & Townsend
- Consulting engineer: Arup

SOL PLAATJE UNIVERSITY

In May 2014, the University of Witwatersrand appointed AECOM to provide project management services relating to the development of the Sol Plaatje University precinct in Kimberley.

AECOM's first task orders (from 1 July 2014 to 31 March 2016) were completed on time (2016 academic start) and within budget (cumulatively R750-million) for the first three building projects and associated infrastructure. To date, about 12 people from the Construction Services business line have participated in the completed projects. The cumulative value of the programme (all projects completed to date as well as projects currently underway) is standing at approximately R1,5-billion.

The team earned high praise from the client, and AECOM's extended contract up to May 2018 is testimony to the client's satisfaction and faith in the AECOM team. AECOM team's commitment, effort, drive, ability to sort out design issues and getting consultants to commit, being able to assist with the contractors' commitments to deliver, managing socio-economic commitments in a difficult environment, and overall professional conduct while always considering the interest of the programme first on this challenging NEC target cost framework contract all contributed to the overall success.

While a 5 Star Green Rating on the Sol Plaatje Uni Project was not opted for, there were some innovations with regards to environmental considerations. While the design specifications for wet services were not explicit, the main emphasis was on sustainability and best practice.

The initial construction phase consisted of three main buildings, handed over at the beginning of April 2016, with the aim of building several more residence and lecture buildings over the next few years. A centralised services building supplies the residence and academic buildings. It houses the potable water pump set, the grey water treatment system, hot water generation plant and pump set, and chillers for the TABS system.

The arid Northern Cape receives an average of 202 mm of rain a year, which resulted in the specification of two 125 000 litre galvanised sectional steel potable water storage tanks. Adjacent to the services building precinct, the tanks are fed by the municipal potable water supply, before being reticulated around the campus by means of a 150 DN ring main.

Black water is collected in a sump outside the services building and pumped into the municipal sewer line by three submersible macerating pumps. The sump overflow is also directed into the municipal line on Scanlan Street.

PRECINCT, KIMBERLEY

The different types of water and sewer lines posed a significant challenge on the project. Grey water is collected from the showers and basins in the residence buildings and stored in a grey water sump adjacent to the black water sump outside the services building.

Rainwater disposal systems on each of the buildings feature gravity and siphonic drainage discharge.

The building site had shallow levels of hard rock, which made excavation for both structure and services extremely difficult. This was especially challenging when designing and installing the grey water recovery system, which had to fall over long pipe runs. The underground pipe runs were shortened by reticulating in the upper floors as far as possible.

The sewer system consists of a two-pipe system, whereby a black water line connects all the toilets, sinks, and urinals, and a grey water line connects the basins and showers. The black water discharges straight into the municipality connection, which the grey water is pumped through a state-of-the-art purification plant that stores the water in a 108 m^3 sectional tank. The filtered grey water is then used to supply the toilets and urinals.

As principal agent, AECOM utilised its LifeGuard reporting system, which allows anyone on-site to log an occurrence or incident on-line, with an accompanying photograph and any background information.

PJ Carew Consulting was responsible for elements such as the glazing per building, and the paint specification.

Phase I has been delivered within budget and timeframe, and according to client specifications. Such has been the satisfaction of the client, that AECOM's initial contract has initially been extended. Phase I had a total cost of R750-million, while the current total value of the programme is R1,5-billion.

Project information

- Company entering: AECOM
- Client: University of the Witwatersrand
- Contract value: R750-million (Phase I) – R1,5-billion (total programme to date).
- Start date: 1 July 2014
- End date 31 March 2016 (Phase I)
- Contractors:
  - Main building – M&D Construction, Trencon, Qualicon
  - Wet services – Vic Ball Plumbers, Davnic Plumbing
- Owner: Department of Higher Education & Training
- Architect/designer: Activate Architecture, Savage & Dodd, Chris Wilkinson Architects
- Principal agent/project manager: AECOM
- Consulting engineers:
  - Electrical – Civilsense, Aurecon
  - Mechanical – Element
  - Water – Aurecon
  - Civil – Aurecon

SAVANNA CITY RESERVOIR

Savanna City is one of the biggest developments of its kind ever undertaken in South Africa. But sheer size and return on investment were not the core motivations behind the vision for Savanna City and other developments.

In the freedom era the developers wanted to be part of the process of changing the housing landscape in South Africa.

It wanted to create affordable housing that would be attractive to people from diverse cultural backgrounds. Its vision is of creating an environment where people could experience real quality of life in a safe, suburban space.

On final completion it will provide more than 18 000 new homes.

Aligning with its objective to build a sustainable city, Savanna City's water supply and distribution system has been designed using the latest technology, aiming to limit water losses in the system to 10%, which is a very ambitious target.

The reservoir is constructed using a 'self-healing' concrete. The super-absorbent polymers in the concrete expand and fill the crack, preventing any further loss. The concrete regains its liquid tightness and impermeability, so that it remains durable, extending the reservoir's lifetime and minimising maintenance and repair costs.

Water network sectorisation is a very effective method to create a sustainable water system. In order to manage the water system efficiently it is divided into manageable zones, making it possible to monitor consumption of these zones independently. In addition, current leak detection costs are reduced as repair work can be focused in the high non-revenue water affected areas.

Pressure management also limits the potential damage of the water related fittings and devices by reducing the maximum water pressure in the zones from 9 bar to 5 bar, therefore increasing the lifetime of the pipes and all related fittings and devices. Effective sectorisation and pressure management can contribute largely to the reduction of water losses.

The installation of pressure reducing valves (PRVs) within the water distribution network is essential to relieve water pressure on the pipes. The higher or lower the pressure, the higher or lower the leakage. Valves can isolate incidents of pipe breakages and contamination, and limit the risk to the surrounding system. Savanna City opted for the use of automatic pressure reducing valves. These valves that are installed at strategic points in the network to control the water pressure, for example the PRVs will automatically reduce the water pressure during off-peak times and increase pressure at peak times.

The professional team is also investigating the possibility to use the energy developed when the pressure is automatically reduced to generate electricity through a mini turbine system. The electricity developed, which could be regarded as 'clean' electricity, will be utilised for community purposes.

Historically, the pipes used to distribute drinking water were made of plastic, concrete or metal (e.g. galvanised iron or copper). Poor quality pipes shorten the pipe lifetime and result in leaks, bursts and corrosion.

Poor pipe quality may also facilitate the infiltration of chemicals into the drinking water. Upon embarking on this mammoth project Savanna City considered the size of pipes, the composition, the properties and quality of the available materials and technology to ensure an effective sustainable water system for the development, and chose Orientated Polyvinyl Chloride (oPVC) pipes. oPVC, for the main water distribution pipeline, is a world class technology that adheres to international standards. It is manufactured by realigning the PVC molecules through a process of biaxial orientation, which enhances the material properties – around twice the strength and ten times the impact resistance is achieved compared to traditional PVC pipes.

oPVC pipes' wall thickness can be reduced by up to 50% while maintaining the same pressure as that of the traditional PVC pipes. The result is that oPVC has a larger bore, offering greater hydraulic capacity and is more material efficient compared to other pipe options. It is also the most eco-friendly pipe system in the world as it requires less energy to produce than conventional PVC and other pipe materials. Considering the relative low weight, oPVC pipes are strong and durable. It stays strong through a range of temperatures, resulting in fewer burst pipes and is corrosion resistant which makes it ideal for water infrastructure durability.

This initiative will have a major impact on how efficient planning, technology and experience can be combined to develop future sustainable cities.

Project information

- Company entering: Basil Read
- Client: Savanna City Developments on behalf of Midvaal Local Municipality
- Start date: 4 May 2015
- End date: 30 September 2016
- Main contractor: Basil Read
- Project manager: Basil Read
- Quantity surveyor: Basil Read
- Consulting engineer: GIBB
- Subcontractor: Basil Read Civils
- Project value: R37 269 206 (excluding VAT)

The World Bank estimates that Africa will need $93 billion* a year over the next decade to meet its current infrastructure shortfalls, if it is to create meaningful economic growth.

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* World Bank Group Infrastructure Strategy Update FY2017-2019 (Africa will need $93 billion per annum for the next 15 years to fill infrastructure gaps; 2010 to 2025)

REHABILITATION OF BRUMA LAKE

Bruma is a 30 year-old suburb of Johannesburg, South Africa. It is noted for a small (5 hectares) man-made lake which, until the commencement of this project, was being treated to reduce water-borne pollution. The pedestrian bridge crossing the original lake has also played an integral part in facilitating ease of access to the business district, recreational and retail facilities.

The key objectives of the remedial work were to address community problems, in particular the bad odour and aesthetics which characterised the lake. The remedial work aimed to reduce the public health risks and to restore the aesthetics and amenity of the area for the public and the surrounding business community.

Initial land-based surveys were conducted in an attempt to quantify the amount of material that had ultimately silted up the entire lake but these were found to be impractical. The contractor employed the use of Lidar Survey, once draining the lake of surface water, to gain a clearer picture of just how much silt had collected over the years.

This technology also allowed for intermittent aerial photography to judge progress over the duration of the project.

The contractor subsequently procured a drone-mounted camera with which aerial photography and videography could be carried out on an ad hoc basis.

Being a public space, the rehabilitation of Bruma Lake affected both the social aspects of the area as well as public and private business in the area and immediate surrounds.

The architectural design incorporated existing elements of the lake and surrounds into the design of new elements with natural rock components to soften the harsh look and feel existing concrete basin and dam wall. Mounds and soft-rounded slopes ensured attractive flowing greens inviting people into the public space from outside.

Wetlands and hydraulics expert Chris Brooker (cba Expert Engineers) executed the engineering design for the project and also acted as principal agent for the client.

The proposed river bed was intended to replace the existing lake and the meticulous design was specified based on necessary environmental factors and shear forces experienced during worst-case conditions. The recovered silt was used for backfilling the remainder of the lake basin to create a recreational park.

Immediately upstream the Queens Wetland area was rehabilitated. Over and above the wetland rehabilitation, stringent controls were put in place to monitor river conditions both upstream and downstream. This enabled the environmental control officer to determine the impact, if any, that the construction works may have on the quality of water being released downstream.

The start of the project also saw the successful rescue of birds' nests by the contractor with numerous eggs reportedly hatching at a local conservancy.

Inoculation/prophylactic measures were taken for all persons who entered the site due to the initial potential for exposure to hazardous materials. This was a strict prerequisite to anyone who wished to gain entry into the lake basin.

The in-situ soil was treated with limestone lime to aid in the natural breakdown of hazardous inorganics as well as balance the soil PH.

The main scope of the project was completed within time (June 2015), save for the bridge works which were determined to be greater than expected and therefore collected a separate programme due to progressive design and adaptations as well as long lead items, completing March 2016.

Through constant interaction between the contractor, principal agent and the project team numerous cost-saving initiatives were explored to prevent the project from exceeding budget.

Treatment of hazardous material rather than spoiling off site meant that the risk of exposure to same would be limited to the confines of the site.

The construction had a very low impact on surroundings/environment and the end results has proved to have a high impact on public perception and improved quality of life with an equally positive long term impact on environment (treatment of hazardous material, protection of birdlife). Through the rebuilding of the pedestrian bridge the project was able to reinstate safe access to area for the public and local business community. The project may have a direct impact on the revival of Bruma business hub. ■

Project information

- Company entering: Basil Read
- Client: Johannesburg Development Agency (for City of Johannesburg)
- Start date: June 2014
- End date: March 2016
- Main contractor: Basil Read
- Architect: JDLEA
- Principal agent: cba Specialist Engineers
- Project manager: LDM Project Management
- Quantity surveyor: Walker Mare Quantity Survey
- Consulting engineer: cba Specialist Engineers
- Subcontractor: ARQ
- Subcontractor: AfriSam
- Project value: R75-million

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NOVARTIS, WATERFALL CITY, MIDRAND

The new Novartis head office located in Waterfall City was a construction project that encompassed sustainability at its core. The green building consultants, Aurecon worked with the design and construction team to ensure environmentally sustainable design principles and best practices were used from project inception, through the design, construction, operation and commissioning of the project.

The decision to use the LEED (Leadership in Energy and Environmental Design) rating system provided a framework for evaluating, recognising and executing green building design and construction in the project. The internationally-recognised LEED certification process, as stipulated in the LEED reference guide: "seeks to optimise the use of natural resources, promote regenerative and restorative strategies, maximise the positive and minimize the negative environmental and human health consequences of the construction industry, and provide high-quality indoor environments for building occupants."

These LEED goals form the basis of the strategies employed and the final sustainable attributes of the project:

- To reverse contribution to global climate change
- To enhance individual human health and well-being
- To protect and restore water resources
- To protect, enhance, and restore biodiversity and ecosystem services
- To promote sustainable and regenerative material resources cycles
- To build a greener economy
- To enhance social equity, environmental justice, community health, and quality of life

The initial aim for the Novartis head office project was for a LEED silver certification. The projects final achievement of a LEED Gold certification demonstrated the projects strong commitment towards the above mentioned goals.

The LEED process followed and sustainable attributes of the project encapsulates the *AfriSam Innovation Award for Sustainable Construction* criteria. Change and transferability, ethical standards and social equity, ecological quality and energy conservation, economic performance and compatibility, and contextual and aesthetic impact should become apparent in the LEED Design and Construction attributes explained below.

The Novartis building complied with these LEED Minimum Project requirements:

- Complied with applicable federal, state and local environmental laws
- A complete permanent Building or space.
- A reasonable site boundary
- Complied with a minimum floor area requirement of 93 m^3 of gross floor area
- Complied with a minimum occupancy rate of 1 or more Full Time Equivalent (FTE) occupants
- Committed to sharing with the US Green Building Council (USGBC) whole-Building Energy and Water Usage Data
- Complied with a minimum building gross floor area of no less than 2% of the gross land area. ■

Project information

- Company entering: Aurecon
- Client: Developer: Atterbury and building owner: Attacq
- Start date: March 2014
- End date: June 2015
- Main contractor: Group Five
- Architects: Empowered Spaces Architects
- Quantity surveyors: Pentad
- Consulting engineer: WSP Parsons Brinkerhoff Africa
- Project value: R146 585 000 (excluding VAT)

ST JOHANN

Because of the difficulty to build at altitude, harsh weather conditions and being 200 km from the nearest building supply shop, it was decided by Strey Architects to develop a pre-manufactured and modular building system, called Modul8. The ski chalet was designed by Strey Architects to be built in two phases. Phase I consists of three modules containing and entrance/wind break/ future stair shaft, two en-suite bedrooms and a living area with kitchen, dining area and lounge.

All of this was cleverly designed to feel spacious, light and airy, although only 67 m² in size. The ski chalet sits on steel posts to lift it above the flow of a natural stream through the middle of the site. Clear storey windows right round the main bedroom and living area affords views of the mostly clear blue skies and mountain tops, while letting in copious amounts of natural light. Insulated walls, floors and roof together with double glazing and hydronic underfloor heating makes for a comfortable and cosy interior.

Modul8 modular units (a factory manufactured Modular building system) serves as a ski chalet at adventure seekers at Afriski Adventure & Ski Resort, Lesotho. Three Modul8 premanufactured modular units with channel/square/rectangular profiles and cellular beams make up St Johann.

Steel was used to enable the designing and manufacturing of a pre-manufactured, up market and modular system in Gauteng, which could then be transported to a high altitude (3 300 m above sea level) location, where it is not easy to assemble or build projects. The use of tubular steel was a non-brainer for all its good qualities: It is strong compared to its weight, flexible and durable.

The Modul8 unit was built in Gauteng in a controlled environment and then transported to Lesotho and placed on a prepared soil platform as it is much easier and cheaper to conduct the construction in a controlled environment to ensure better quality control.

The biggest challenge with Afriski is the inclement weather conditions, the altitude and the location of the site. Because Afriski is located in a bowl, the days are shorter as the sun rises later over the east ridge and sets earlier over the west ridge.

A steel ring beam at the top and bottom, together with square steel posts act as a rigid frame which can be picked up from the top to load on a truck, transport to site and dropped off on a pre-prepared foundation.

The roof structure was also pre-manufactured in a factory in Gauteng, complete with double glazing and lifting brackets, in order to have minimal work to be done in the harsh weather conditions on site. The roof structure was placed on the Modul8 units by the same crane mounted on the truck horse, after which the 90 mm thick PU foam SIPs were placed on the frames on site as all-in-one roof covering, ceiling and insulation.

Because the Modul8 units are manufactured off site, there is no damage to the site or the surroundings during the construction process, as no construction takes place on site accept for the foundations.

As the building is pre-manufactured off site and then brought to site, the buildings can also be taken away again and the site can be totally rehabilitated.

As the Modul8 units are modular, materials were optimised to their modular size resulting in very little to no cutting, resulting in no waste of materials, labour, equipment, tools or time.

All Modul8 units are properly insulated, made in a controlled environment with strict quality control procedures and of high quality materials and finishes, resulting in less heating and cooling costs, as well as less maintenance.

Low maintenance to no maintenance materials were chosen to reduce maintenance costs in the long run, as well as reducing the materials, cleaning and maintaining agents which will go with maintaining a building.

The ski chalet is lifted off the ground by placing it on the round tubular steel columns, for a few reasons. Firstly there are more than 400 natural water springs on the resort, of which two flow from underneath the position of the ski chalet. By lifting the chalet above the ground, the flow of the water is not restricted to flow downhill, and cause damage to the structure. ■

Project information

- Company entering: Strey Architects
- Client: Johannes Grobbelaar
- End date: 2014
- Main contractor: Modul8
- Architect: Strey Architects
- Consulting engineer: Hull Consulting Engineers
- Subcontractor: Alugro Aluminium & Glass
- Project value: R850 000

WORLD WIDE FUND FOR WILDLIFE, SOUTH AFRICA

The building was initially built in 1905 and it was necessary for the architect to obtain PHRAG approval – a process which took just over eight months to complete at which time Alive Architecture was given the full go-ahead to proceed with complete site demolition. During the eight-month PHRAG process, Alive Architecture changed their design-minds and that of its clients in that it wished to preserve as much of the building as possible while giving the façade an up-to-date modern building that allowed the World Wide Fund for Nature South Africa (WWF-SA).

The site had the usual inner city restraints in that there was very little access to the building to allow full construction works to proceed without hindrance and that the site was the standard area size of 250 m^2. Overall the build process took 15 months to complete.

The primary focus of the design of the building was centered on the maximisation of the site parameters and the creation of large open work spaces for the WWF-SA staff while still allowing a sense of privacy. The ground floor was given over to a reception space and a future volume for the use as an off-street facility by the WWF-SA for the general public wishing to investigate aspects relating to our planet and the work they do to preserve our futures.

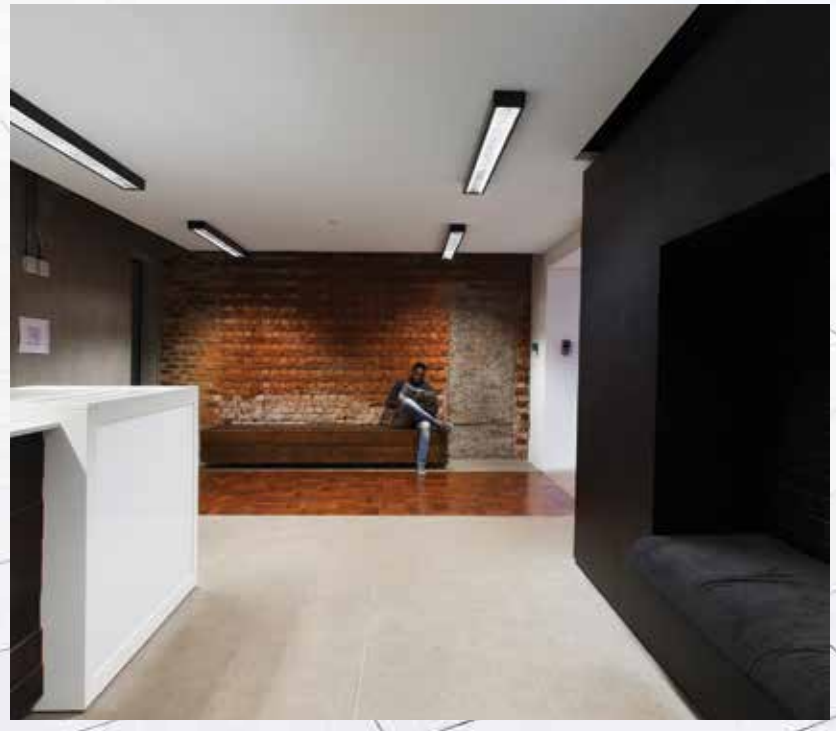
The first and second floors were given over to open-plan office volumes but keeping the workspace numbers down so as to assist in the human feel of the spaces.

Due to the projected requirements of the client – a building which showcased the WWF as a serious green entity – the green features of the building included a waste water treatment plant, natural ventilation to all offices areas with additional forced air changes (no air-conditioning is done), double glazed fenestration, automated blinds and LED lighting linked to a building management system, the collection of all rainwater, solar geyser for the shower and kitchen areas, reclaimed/re-used materials for building and furniture items, no on-site parking, the inclusion of bicycle racks, main-line gas connection for plug-in heating units, the exposure of base materials to allow for building thermal activation and the use of recycled materials for the construction of the concrete slabs within the building.

The feel that the architect wanted to give the end product on the façade treatment, was to showcase the various build-stages of the building over its lifespan. It accordingly removed all the plasterwork, re-grouted all the brick joints, left the old railway sleeper lintels in the walling, relocated the required new openings for the building floors and highlighted them with a plaster band and keystone detail, and finally threw in some plaster and paint to the new concrete and brick segments creating a building which clearly reflects the WWF ethos of re-use and recycle as well as making it an iconic point within the Braamfontein district.

On 11 November 2015 the building received a 6-Star GBCSA Design Rating (75 points out of a 100) making it the first brownfields 6-star rated building in South Africa.

The building has once again become an iconic hotspot within the Braamfontein district with its unique re-use of materials as well as the show-casing the original structure which has been on this site since 1905. The building stands out for its different aesthetic language compared to its immediate surrounding buildings and within the business district as a whole – there is no other building quit like this one in the entire area and this aspect makes it a unique talk-piece and destination pin-point. ■



Project information

- Company entering: Alive Architecture
- Client: WWF-SA
- Start date: November 2013
- End date: January 2015
- Main contractor: Guiricich Brothers Construction
- Architect: Alive Architecture
- Project manager: Bornman & Associates
- Quantity surveyr: Russel Irons & Associates
- Consulting engineer: HDW Consulting Engineers
- Project value: R8,5-million

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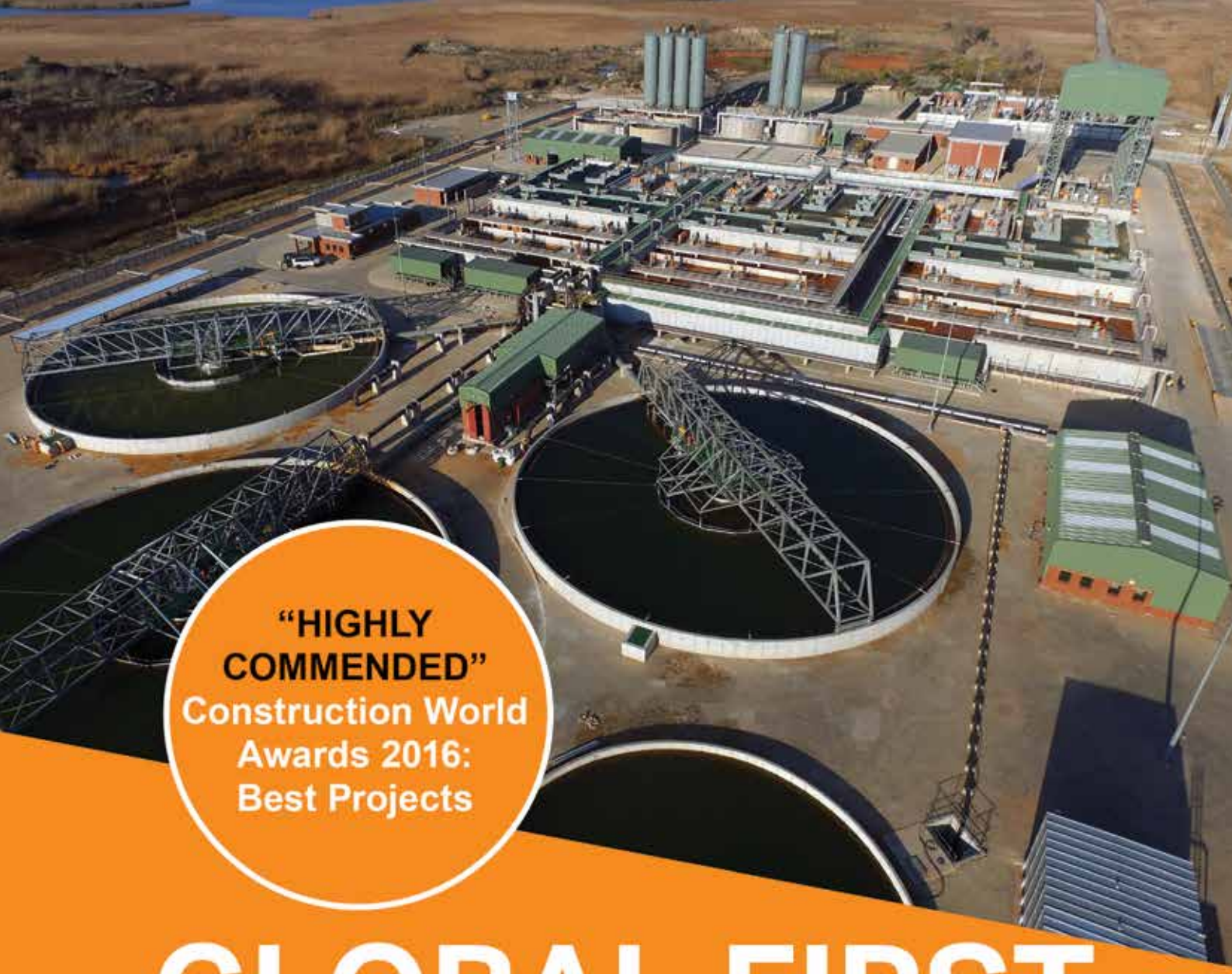

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