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SPECIAL ISSUE

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ON THE COVER

Yet another Green Star rated building is underway at Intaprop's busy Oxford Parks precinct in Rosebank, Johannesburg, with black-owned contractor Concor working with construction materials leader AfriSam on 5 Parks Boulevard. Concor has been active on this mixed-use precinct for many years, where the modern structure at 5 Parks Boulevard is now its seventh project. The company's focus has been to ensure the completion of environmentally sustainable buildings on time, and in line with the stringent requirements of the Green Buildings Council South Africa (GBCSA).

The cover shows Concor working with construction materials leader AfriSam on 5 Parks Boulevard.

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Some of Crown Publications' staff at the Best Projects awards in Sandton. From left: Wilhelm du Plessis (Editor - Construction World); ***Shaun Smith (Digital Editions); Karen Grant (Publisher – Crown Publications); Karen Smith (IT Manager – Crown Publications) and Erna Oosthuizen (Advertising Manager -*** Construction World).

COMMENT

Welcome to the Best Projects 2022 issue. In the issue you will not only find overviews of the projects that earned accolades in the recent Best Projects awards, but also see which projects were entered for the awards. As such, this issue represents the best the South African built environment has to offer and emphasises that, no matter what the economic climate, excellence always triumphs.

In the 13 years I have project managed Best Projects, we have only had three changes in judges, which speaks to consistency. In addition, Best Projects has been held for 21 consecutive years – even in 2020, a year fraught with uncertainty. I have seen how the number of entries in the Civil Engineering Contractors went from 20 to nothing two years ago. The awards mimic what is happening the South African construction industry, albeit with a lag of about a year.

Up until eight years ago, we had a category for Public-Private Partnerships (PPP) – something that has, for the most part, come to a halt in South Africa. The National Development Plan states that infrastructure investment as a percentage of GDP needs to grow from 21% in 2015 to 30% by 2030. This requires the public and private sectors to work together to fund and build infrastructure. It indicates how vital PPPs are for South Africa's development and I hope that the complicating factors for such projects in the past – such as the inhibiting red tape – will become less.

This year we had 64 entries in five categories and had a healthy number of entries in the Civil Engineering Contractors category – an indication that government is coming to the realisation that infrastructure development is fundamental to the economic development of the country.

What is still outstanding are the massive infrastructure projects of a decade ago when airports, stadiums and major freeways were constructed.

Even though a few R1b+-projects were entered, projects were smaller while the Building Contractors category was dominated by WBHO. This is by no means an indication that there are no other significant building projects – it is indicative that smaller contractors do not feel that their projects can be entered or will stand a chance. Excellence does not equate to the value of a project and I want to encourage contractors to enter deserving projects as this is a way for Best Projects to become a barometer of the South African built industry – more than it already is.

Enjoy this display of excellence.
Wilhelm du Plessis
Editor

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The office block will comprise four basement levels and five office levels.

AFRISAM CREATING CONCRETE POSSIBILITIES AT CONCOR'S 7TH OXFORD PARKS BUILDING

Yet another Green Star rated building is underway at Intaprop's busy Oxford Parks precinct in Rosebank, Johannesburg, with black-owned contractor Concor working with construction materials leader AfriSam on 5 Parks Boulevard.

Concor has been active on this mixed-use precinct for many years, where the modern structure at 5 Parks Boulevard is now its seventh project. The company's focus has been to ensure the completion of environmentally sustainable buildings on time and in line with the stringent requirements of the Green Buildings Council South Africa (GBCSA).

Overseeing the project is Concor contract manager Martin Muller, who explains that the team has been on site since July 2022 – taking the process from the bulk earthworks contractor on four platforms with about 80 piles. The elegant office block – which combines a glazed and stone façade for enhancing the use of natural light – will comprise four basement levels and five office levels. It will provide about 7 300 m^2 of gross leasable area (GLA).

"The design includes a triple-volume atrium in the reception area, extending from the ground floor through to the second floor," he says. "There is also a double-volume area on the third and fourth floors."

The basic structure will comprise conventional reinforced concrete slabs from the basements to the roof, with a lift core to accommodate three lifts down to the lowest basement. Each level of slab consumes between 150 m^3 and 250 m^3 of 25 MPa readymix concrete, with the bulk supply of all readymix concrete being provided by AfriSam. The slab on each level is placed in four pours, and the schedule calls for about two pours a week. Higher strengths of concrete – ranging from 35 MPa to 60 MPa – are used for the columns and verticals.

"As a Green Star building, all the concrete mix designs are Green Star approved," he says. "This ensures that the produced cement content reduces the overall CO_2 footprint of the structure."

The cement content in the various strengths of concrete is reduced through the use of 70-30 Green Star mixes, which allows 30% less cement by augmenting the mix with fly ash.

"With its advanced concrete technology and extensive R&D, AfriSam is certainly one of the leading readymix suppliers in the industry," he says. "Our experience is that their concrete strength over the curing period is very consistent, which reflects the quality of their mixes."

In addition to the quality assurance testing that AfriSam conducts, Concor conducts its own cube tests through an external company after every concrete pour. For the conventional slabs, these cubes are crushed to test their strength after seven days, 14 days and 28 days.

"The consistency of AfriSam's concrete strengths at each interval – which align with South African National Standards (SANS) – allows us to timeously de-stress the slab and recycle formwork to the next level," he says. "This is particularly

Left: Each level of slab consumes between 150 m³ and 250 m³ 25 MPa readymix concrete. Middle: With its advanced concrete technology and extensive R&D, AfriSam is one of the leading readymix suppliers in the industry. Right: About 80 piles are being constructed for the project.

important on fast track projects like this, as it allows us to speed up our cycle times."

The consistent mix results mean that the normal recycling time of 11 days for each slab pour can be reduced to nine or 10 days. This will support the building programme's intention to top out the structure before the builders' break in December 2022.

Among the distinguishing features of 5 Parks Boulevard is a shaped concrete apron running around the building between the first and second floors, and a large terrace on the fourth floor. The green design will include photovoltaic panels on the roof, which will generate renewable energy for up to 90% of the tenants' needs.

Muller highlights that the choice of glass windows – about half of which will be double-glazed – has been made to support the energy efficiency requirements of the Green Star rating. Thin-glazed glass will be mainly used on the atrium side, with punch windows being installed for the rest of the building.

One tower crane facilitates the quick pace of construction, moving material for the wet trades and other functions including the placement of plant on the upper levels as building progresses. It also assists with placing concrete for the vertical elements – while concrete for horizontal elements is pumped.

In compliance with the Green Star rating criteria, the building process is conducted within the confines of an environmental management plan and waste management plan. Concor's ISO 14001 environmental certification calls for the project's suppliers and subcontractors are sourced where possible within 40 km of the site to reduce the CO_2 footprint.

The development of small enterprises in the supply chain remains a focus in the 5 Parks Boulevard contract, as it does with all Concor's other construction activity.

Muller notes that the company's way of working with subcontractors ensures not only that they hone their business and technical skills, but that they deliver quality performance as a result. This, he says, raises their game and makes them inherently more sustainable, while not compromising the broader project in any way.

"Space on the site is fairly constrained, so basements will be used to store some of the materials and equipment," he says. "This includes items like tiles, as well as heating, ventilation and cooling plant which is ordered well in advance."

He highlights Concor's focus on safety and close supervision as key elements of successful construction projects. This project will see the total headcount on site rise to about 400 at peak times, which Concor manages with its compact professional team.

"The advantage of being so active at Oxford Parks over an extended period is that our staff and subcontractors have become very familiar with the working environment and standards – so they know what is required of them," he says. "They coordinate their activities well, and our quality and safety systems become second nature. The constructive collaboration with the client's team of consultants is also essential to success."

Concor will take the building to grey box stage, after which the anchor tenant will take beneficial occupation in February 2023 and begin their tenant fit out. They plan to occupy the third and fourth levels of the new building. ■

Consistent mix results has enabled the reduction of recycling time of each slab to nine or 10 days.

WINNERS: 21ST BEST PROJECTS AWARDS

The 21st instalment of Construction World's Best Projects awards was held in Sandton on 9 November. These awards are the only independently judged awards in South Africa to recognise excellence in the built environment.

The main sponsor of the event is AfriSam – it has been the main sponsor of the event since it was started. It was joined by OpenSpace (platinum sponsor), Bostik (bronze sponsor and the sponsor of the Architects category) and associate sponsors Sika and Cement and Concrete Society of South Africa.

This year the awards attracted 64 entries and the judges Trueman Goba, Nico Maas and Uwe Putlitz had the difficult task of selecting those projects that stood out from others.

Some categories – especially the Consulting Engineering category – attracted entries that are all deserving of an award, while the AfriSam Innovation Award for Sustainable Construction had inspiring entries that illustrated the depth of sustainable construction processes in South Africa.

The winners

The Civil Engineering Contractors category had a healthy number of entries after it saw the numbers dwindling in recent years. It was won by the C2KMPI JOINT VENTURE (CIVILS 2000 & GEOCIV) for 'Slope stabilisation of N2 S2 from km 11,2 to 13,2 Sir Lowry's Pass'. The Highly Commended award in the category went to the 'Completion of 100 Mℓ Contermanskloof Reservoir' (CSV Construction) while Zutari received a Special Mention award for its project, 'Rehabilitation of Omaruru River Bridge, Henties Bay, Namibia'.

The Building Contractors category was won by WBHO for the 'Pick n Pay Inland Distribution Centre' while Concor Construction was Highly Commended for its 'Ikusasa (Oxford Parks Precinct)' project.

The Specialist Conctractors or Suppliers category attracted entries that illustrate just how advanced South Africa's cement designs are. CHRYSO Southern Africa won the category with the 'Relocation of 30 Mℓ Khutsong Reservoir Project' while it and Scribante Concrete were Highly Commended for 'Redstone Solar Thermal Power Plant'.

Corestruc received a Special Mention for its contribution to a the 'Senwabarwana-Bochum' project.

The Consulting Engineering category had entries that showed the depth of the South African consulting engineering industry.

It was won by Zutari for 'Golomoti Solar PV and Battery Energy Storage Project, Malawi' while AECOM was Highly Commended for the 'Upgrading of National Route 7 Section 1 from Atlantis south to Kalbaskraal (Phase 2)'. The category had two Special Mention awards: Aspire Consulting Engineers for 'Nike Soweto Shapa' and BVi Consulting Engineers for 'Retreat Low Lift Sewer Pump Station and refurbishment of existing bulk outfall gravity sewer.'

The Architects category was won by dhk Architects for the 'Old Cape Quarter', while GASS Architecture Studios was Highly Commended for 'Green School South Africa'. 'Bushbuckridge Shopping Centre' (Bentel Associates International) received a Special Mention Award.

The AfriSam Innovation Award for Sustainable Construction with its 14 inspiring entries was won by 'The Ridge, Portswood Precinct, V&A Waterfront' (V&A Waterfront Holdings).

The category had two Highly Commended Awards: 'Ikusasa (Oxford Parks Precinct)' – Concor Construction and 'Green School South Africa (GASS Architecture Studions). Zutari received two Special Mention Awards in the category for 'Golomoti Solar PV and Battery Energy Storage Project, Malawi' and 'RMB – 8 Merchant Place'.

TRUEMAN GOBA

- Registered professional engineer since 1983
- Established Goba Maohloli & Associates, which later merged with Keeve Steyn to form what became Goba, now part of Hatch Africa
- President of the SA Academy of Engineering
- Honorary Doctorates in Engineering awarded by the Universities of Stellenbosch, KwaZulu-Natal, and McMaster in Canada

NICO MAAS

- Masters degree in Civil Engineering
- Chairman of Gauteng Piling
- Chairman of Federate Employers Mutual
- Former cidb board member
- Past President of MBA North and MBSA

UWE PUTLITZ

- Professional Architect, Construction Project Manager and fellow of the RICS
- Appointed as CEO of Joint Building Contracts Committee in 2011
- Part-time lecturer and external examiner since 2009 and currently a visiting lecturer at the School for Construction Economics and Management at the University of the Witwatersrand
- Member of SACPCMP's panel that reviews and interviews prospective construction managers and construction project managers for registration.

LUCKY DRAW WINNERS

Annelide Sheraat (Solid Green) won a hamper sponsored by Ngage. *Here she is with Rachel Mekgwe, Senior Account Executive at NGAGE.*

Lizelle McLean (GASS Architecture Studios) won a coffee machine from the Icon Group. *She is with Robin Cartwright from the Icon Group.*

Gerhard Foord (Corestruc) won a toolbox that was sponsored by Spraylock Africa. *He is seen with Carl White Managing Director: Spraylock Africa.*

Hennie Meyer (Coreslab) won a DHP482RFE Impact Driver Drill Kit sponsored by Makita. *Here he is with Erna Oosthuizen, Advertising Manager of Construction World.*

Tinus van der Westhuizen (GASS Architecture Studios) won a toolbox from Spraylock Africa. *He is with Carl White, the Managing Director of Spraylock Africa.*

Keith Willoughby (WBHO) won a luxurious hamper from Concor Construction. *On his left is Martin Muller, Contract Manager at Concor Construction.*

Captions for spread on pages 16 and 17

1. Portswood Precinct
2. Pick n Pay Inland Distribution Centre
3. Slope stabilisation of National Route 2 at Sir Lowry's Pass
4. Golomoti Solar PV and Battery Energy Storage Project
5. Relocation of 30 Mℓ Khutsong Reservoir
6. Old Cape Quarter

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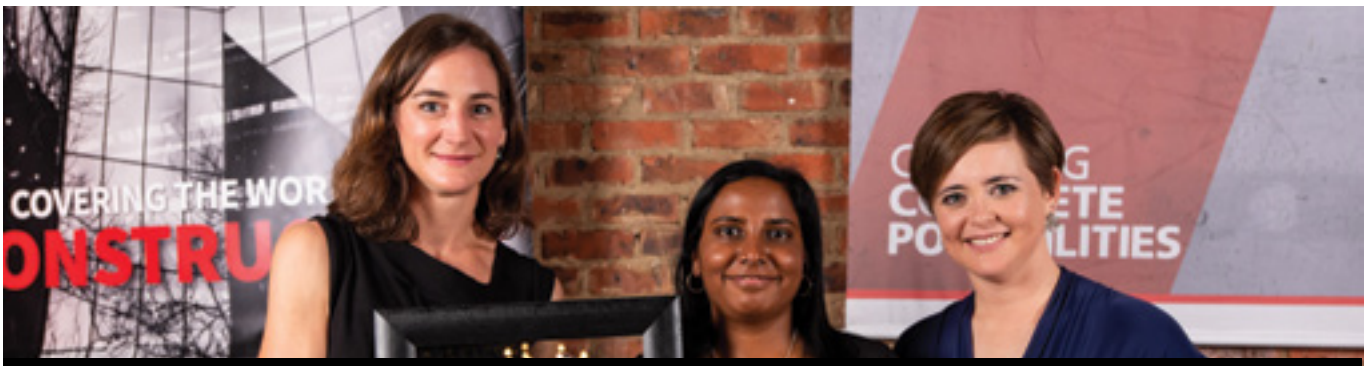
CIVIL ENGINEERING CONTRACTORS: ***Winner – Slope stabilisation of N2 S2 from km 11,2 to 13,2 Sir Lowry's Pass – C2KMPI JOINT VENTURE (CIVILS 2000 & GEOCIV)*** *From left:* ***Werner Rix (GeoCiv), Andre Hansen (C2000), Kelsey White (C2000) and Kevin Daddy (C2000).***

CIVIL ENGINEERING CONTRACTORS: ***Highly Commended – Completion of 100 Mℓ Contermanskloof Reservoir – CSV Construction***
Johan Koegelenberg (left) and Cobus le Roux from CSV Construction.



CIVIL ENGINEERING CONTRACTORS: ***Special Mention – Rehabilitation of Omaruru River Bridge, Henties Bay, Namibia – Zutari***
(From left) ***Dr Gabi Wojtowitz; Salona Naidoo and Louwna Joubert.***

BUILDING CONTRACTORS: ***Winner – Pick n Pay Inland Distribution Centre – WBHO Construction***
(From left) ***Tinie Bonnet (WBHO); Nico van Rensburg (BBA); Matthew Downes (WBHO); Keith Willoughby (WBHO); Christiaan Fourie (WBHO) and Nico Prinsloo (Capital Propfund).***

BUILDING CONTRACTORS: Highly Commended - (also Highly Commended in the AfriSam Award for Sustainable Construction) Ikusasa (Oxford Parks Precinct) - Concor Construction (From left) Louise O'Raw (GLH); Ilze Lombard (Gro2 Consulting); Annelide Sherratt (Solid Green); Warren Mills (Concor Construction); Bain Fowler (Intaprop); Martin Muller (Concor Construction); Rui Santos (Concor Construction) and Ignaz Haarhoff (Concor Construction).

SPECIALIST CONTRACTORS OR SUPPLIERS: Winner -Relocation of 30 Mℓ Khutsong Reservoir Project - CHRYSO Southern Africa (From left) Giben Terblanche (CHRYSO); Carmelicia Leitao (CHRYSO); Neil Van der Wat (Quantibuild); Tina Coetzee (CHRYSO); Greyling Jansen (CHRYSO).

SPECIALIST CONTRACTORS OR SUPPLIERS: Highly Commended - Redstone Solar Thermal Power Plant - CHRYSO Southern Africa & Scribante Concrete(From left) ; Giben Terblanche (CHRYSO); Thinus Oberholser (Scribante) and Greyling Jansen (CHRYSO).

SPECIALIST CONTRACTORS OR SUPPLIERS: Special Mention - Senwabarwana-Bochum - Corestruc (From left) Kobus Kotze; Gerhard Foord; Ivan Badenhorst; Hennie Meyer; Willie de Jager; Mariska de Jager and Dale Schofield.

CONSULTING ENGINEERS: Winner - (also Special Mention in the AfriSam Award for Sustainable Construction) Golomoti Solar PV and Battery Energy Storage Project, Malawi - Zutari (From left) Wayne Smith; Salona Naidoo; Dr Gabi Wojtowitz and Craig Knowles.

CONSULTING ENGINEERS: Highly Commended - Upgrading of National Route 7 Section 1 from Atlantis south to Kalbaskraal (Phase 2) - AECOM (From left) Chris Britz; Kobashen Moodley; Phillip Ronne; Thandiwe Siyakatshana and Denander Maphanga.

CONSULTING ENGINEERS: Special Mention - Nike Soweto Shapa - Aspire Consulting Engineers (From left:) Katlego Mashile; Sifiso Nhlapo; Praveer Parbhoo; Zeenat Ghoor (Karrim) and Ahmed Rajah.

CONSULTING ENGINEERS: Special Mention - Retreat Low Lift Sewer Pump Station and refurbishment of existing bulk outfall gravity sewer - BVi Consulting Engineers (From left) Christoff de Jager (BVi Consulting), Inocent Mbuyane (BVi Consulting) and Cobus le Roux (CSV Construction). (PICTURE ON RIGHT) AFRISAM INNOVATION AWARD FOR SUSTAINABLE CONSTRUCTION: Special Mention - RMB – 8 Merchant Place - Zutari Louwna Joubert (left) and Mary-Anne Fechter

ARCHITECTS: Highly Commended - (also Highly Commended in the AfriSam Award for Sustainable Construction) Green School South Africa - GASS Architecture Studios Green School
(Left) Chris Bakker (Director at GASS Architecture Studios) and Theuna Stoltz (Associate at GASS Architecture Studios).

ARCHITECTS: Special Mention -Bushbuckridge Shopping Centre - Bentel Associates International
(From left) Donovan Elliott; Sara Elliott; Lee-Anne Fletcher; Craig Anavi and Elke Schuyt van Castricum.

AFRISAM INNOVATION AWARD FOR SUSTAINABLE CONSTRUCTION : Winner - The Ridge, Portswood Precinct, V&A Waterfront - V&A Waterfront Holdings (From left) Tessa Brunette – Arup; Mark Nobel – V&A Waterfront and Carla Soudien – StudioMas.

ARCHITECTS: Winner - Old Cape Quarter dhk Architects (From left:) Peter Fehrsen; Claudia Mela and Martin Lardner Burke.

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Captions for this spread on page 7

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THE SLOPE STABILISATION ON NATIONAL ROUTE 2 SECTION 2 FROM KM 11,2 TO KM 13,2 AT SIR LOWRY'S PASS

This civil engineering construction project involved the stabilisation of cut slopes on the eastbound side of the N2, Section 2, between km 12,06 and km 12,31, at Sir Lowry's Pass, near Somerset West in the Western Cape.

The design was undertaken by Zutari's Cape Town geotechnical and highway teams and Naidu Consulting was appointed to oversee the project management and construction monitoring aspects.

Civils 2000 of Cape Town partnered with GeoCiv (formerly Mega Pile Inland) to form the C2KMPI Joint Venture. These teams brought more than 50 years of combined experience to the project.

The scope of works included the stabilisation of 250 m of road cutting on Sir Lowry's Pass. The 13m high cuttings were unstable and there had been many instances of rock falls endangering the passing traffic.

The existing road accommodates two lanes in each direction and was reduced to one lane in each direction to provide working space during the soil nail drilling operations. The work zone was further protected by concrete NJ barriers with access into the work zone strictly controlled by the dedicated traffic management subcontractor.

The initial activities involved the clearance of alien and loose vegetation and debris from the work faces and the barring down of loose boulders and rocks from the cut faces. The drilling and installation of soil nails and small diameter drain pipes followed and was completed by Civils 2000's JV partner, GeoCiv. Once the soil nailing had been completed GeoCiv moved offsite and Civils 2000 continued with the construction of 100 m of 2 m high gabion in Zone A along the toe of the slopes, 90 m of gabion buttresses ranging in height from 11 m to 13 m. GeoCiv installed and grouted 84 15 m long soil nails and 488 10 m soil nails.

Plates were installed as work progressed with the gabions.

The work was completed by the construction of a stone pitched open drain along the top of the slope to intercept runoff, the installation of drainage chutes, channels, and drainage structures and the revegetation of areas damaged by the works.

This project presented several unique challenges in that the existing road width had to be reduced to achieve the drilling and yet traffic flows were to be maintained during the works. In addition, the nature of the work required thinking 'out of the box' to solve the problems of access to high steep slopes and working on the slopes in dangerous elevated positions while eliminating risks to those below, including traffic.

These challenges were met and the project completed very successfully.

The removal of loose boulders from the upper reaches of the slopes presented a challenge because access and the safety concerns. Access was difficult due to the steep terrain and because there are no access tracks above the cutting. An innovative solution was arrived at by employing rope access experts. Establishment of access scaffolding from road level to the upper slopes provided access to the top of the cuttings where abseiling lines were installed. Catch walls with water barriers were installed along the mountain ridge. The climbers were able to hook in to the lines and descend to the cut faces where they dislodged the loose boulders and material. At the bottom of the cuttings the side drains were temporarily filled with gravel, rubber mats were placed on the road shoulder to prevent damage to the existing surface and a continuous line of concrete New Jersey barriers was installed along the edge of the live lane nearest to the slopes. This provided a solid barrier that ensured no boulders or debris made it onto the live carriageway. The climbers were equipped with harnesses and climbers helmets and were able to move freely around the cut faces barring down the boulders.

To enable construction of the stone pitched drains high up the slope we utilised a cargo netting system to transport 2 tons of gabions stone at a time to a height of 36 meters from the road surface and up 20 metres away from crane.

To assist with the requirements of 24-hr traffic management the traffic accommodation team utilised Dashcam video devices to capture a full record of traffic conditions on site at all times.

C2KMPI JV were not required to carry out design of any permanent works. Designs required were for temporary works only although the large access scaffolding was significant and risks from strong winds and falling risks presented some

challenges to the scaffolding supplier.

SANRAL appointed an Environmental Control Officer (ECO) who conducted frequent environmental site audits and monitored the impact of construction activities and compliance with statutory requirements. In addition to these duties the ECO also trained workers on various environmental aspects including environmental impacts (actual or potential) caused by work activities and prevention and mitigation measures.

C2KMPI JV appointed a project Designated Environmental Officer (DEO) from Civils 2000 to monitor environmental impacts and ensure implementation of the requirements of the EMP. The DEO prepared environmental method statements addressing environmental aspects and impacts of the construction work and developed impact prevention or mitigation measures to apply to the construction activities.

The DEO then ensured controls were in place for waste generated by the construction activities and site offices, use of construction water, the impacts of vehicles and construction plant, erosion following site clearance and excavation, water pollution from runoff, preparation of an emergency procedure for controlling spills, maintenance of spill containment kits, and monitoring noise and dust from the drilling rigs.

The initial contract duration was extended due to additional work required towards the end of the contract. The critical path for this project initially flowed through the soil nailing operations and subsequently the construction of the gabion buttresses. Projected completion of 29/07/2022 was pushed out slightly to 02/08/2022 due to physical site constraints and the road was fully open by 12/08/2022.

The Civils 2000 quality management system was adopted

by the JV teams and applied to the site works and construction management processes for the project. A Quality Plan was developed for the project and approved by the Engineer. The basic approach involved development of detailed method statements for each activity. Quality control inspections were undertaken and the completed work inspected by the RE for acceptance on behalf of the client.

The project risks were addressed prior to commencement with a full risk assessment and determination of mitigation measures developed. A risk register was prepared and the risks to achieving the required milestones and standards, health, safety, environment and the achievement of the employer's considered by the site team.

With a pre-construction ADT of 14 566 vehicles per day the disruption to and safety of road users was a major risk and the provision of concrete NJ barriers ensured the live lanes were kept clear and vehicles were not at risk of being struck by boulders. Rock falls and debris coming off the slope and endangering the safety of workers and road users or causing damage to vehicles and construction plant.

The stability of the existing slopes was a risk uppermost in the site team's assessment of risks and the Engineers had identified problem areas in three of the five construction zones.

With the N2 to remain open to traffic at all times, albeit with occasional lane closures, the possibility of slips and rock falls from the slopes was a significant hazard and the risk to passing traffic was monitored throughout the project. Working space, particularly for the telehandlers, MEWPs and the soil nailing rig, was a concern however SANRAL permitted a lane drop to provide working space for this particular activity. This caused some traffic delays but these were well managed by the specialist traffic control subcontractor.

The varying nature of the in situ material in the cut slopes also meant that runoff due to heavy rainfall had to be closely managed. This was achieved by cutting temporary interceptor drains along the top of the two cut slopes in the position of proposed permanent concrete and stone-pitched cut-off drains.

The team was lucky with the weather and this risk was not fully realised. Strong winds were a constant issue for the site teams and protocols were enforced to ensure site staff exercised care at all times, especially in exposed positions on the slopes.

Working at heights, particularly when barring down loose material was a significant risk but the installation of life lines and the rope access team meant the risks were mitigated to acceptable levels. ■

PROJECT INFORMATION

- **Company entering:** Civils 2000
- **Client:** SANRAL
- **Start date:** 26 October 2021
- **End date:** 2 August 2022
- **Main Contractor**: C2KMPI Joint Venture
- **Project Manager**: Naidu Consulting
- **Consulting Engineer:** Zutari

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PROJECT INFORMATION

- **Company entering:** CSV Construction
- **Client:** City of Cape Town
- **Start date**: 8 February 2021
- **End date:** 5 August 2022
- **Main Contractor:** CSV Construction
- **Consulting Engineer:** WSP Africa

COMPLETION OF THE 100 Mℓ CONTERMANSKLOOF RESERVOIR AND SERVICES

Nestled within the Contermanskloof and Vissershok valleys, green landscapes and bright yellow canola fields with the seventh wonder of the world in the backgound, lies the mammoth Contermanskloof reservoir. The partially completed reservoir laid dormant from early 2018 until early 2021 when CSV Construction commenced with construction works of the balance of civil water retaining structure, mechanical, electrical, civil pipe, and road infrastructure, landscaping and buildings.

The reservoir design entails a precast hollow core roof slab, supported by post tensioned beams on in-situ concrete walls and columns approximately 9 m high. The reservoir receives water directly from Voëlvlei Dam and deposits water through 900 mm and 1 000 mm pipelines feeding Melkbosstrand and Plattekloof. The water is treated on site for E-coli as it enters the pipelines.

With a 60 week construction period, there was no time to waste. The scope of works consisted of consisted of the excavation of 30 000 m^3 soil, cast 10 000 m^3 concrete of in-situ flat and sloped floor slabs, columns and walls, cleaning and re-using 80 tons reinforcing, 5 500 m joint sealant, 14 500 m^2 precast concrete roof slabs and 108 no precast beams. Works outside the reservoir structure included 2 638 m electrically welded steel pipes with polyurethane coating and concrete lining 900-1 000 mm in diameter, imported filling of 13 600 m^3, re-surfacing existing access roads, new Melkbos tie-in, utility and other building and full electrical installation.

The reservoirs floor slabs are flat and sloping and cast on no-fines blinding concrete. Casting the sloping slabs were quite challenging due to the incline of approximately 22 degrees. This required an innovative approach to achieve durability of the concrete in the Reservoir.

To achieve this CSV Construction designed a formwork system to shutter the sloped slabs to ensure achieving proper compaction and consistent thickness of the placed concrete to slopes. Large sectioned steel beams were welded together to create the same angle as the required sloped slab. These beams extended all the way from the top of the slab to the bottom without interim support. This formed the basis of this formwork system which main purpose was to carry the weight of the girders and shutter panels that created an “inverted” slab shutter. This meant that concrete would not have to be striked off and could be placed and properly compacted without compromise. Pockets of concrete placed strategically in the blinding allowed CSV to place a dywidag bar in the concrete to hold the steel beams in place. Formwork girders were placed in-between the steel beams to create a floating formwork system that was easy to dissemble and re-installed, ensuring a cast every second week.

The precast roof was a combined effort of CSV Construction and Cape Concrete. 108 number Post tensioned precast I-beams, weighing 13 tons each were placed using a 440 ton mobile crane.

Working from outside the reservoir was challenging, one of only two 440 ton mobile cranes in South Africa with a reach of 65 m that were capable of lifting these precast beams into place.

The contractor and design team had utilised the Autodesk BIM 360 Field for coordination, quality control and record keeping of project communication. At least 14 000 documents were uploaded or tickets raised within the BIM 360 cloud system during the construction period. Documentation includes all quality control documents, health and safety documentation, drawings control, Request for Information requests, material approvals, method statements, etc. ■

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REHABILITATION OF OMARURU BRIDGE – HENTIES BAY, NAMIBIA

The upgrading and rehabilitating of the Omaruru River Bridge stemmed from the project to upgrade the salt road between Swakopmund and Henties Bay (MR44) to a bituminous paved road. The route forms an important link from the inland communities to the coast. First constructed in 1980, the bridge is a vital structure on the route but, after a mere 12 years, it required comprehensive concrete repairs due to severe concrete damage to the structure. A further 23 years later, in 2015, the bridge was found to have deteriorated again to an extent that greatly compromised its structural integrity.

The deterioration of the Omaruru River Bridge was predominantly the result of the harsh local conditions. Located approximately 2 km from the Atlantic Ocean its poor condition can be attributed to the extremely harsh environmental conditions impacting the bridge. The climate in this area varies from very warm and dry (when the wind blows from the inland of Namibia) to wet, misty and very cold, virtually marine conditions (when the wind blows from the ocean). This results in temperatures ranging from 0°C to 45°C, among the harshest ranges on the planet. In addition to these environmental conditions, the approach road was a salt road, which had been sprayed daily with concentrated salt water. The combination of the harsh environment and salt ingress into the structure created ideal circumstances for the inevitable chloride corrosion of the steel reinforcement and weakening of the concrete.

Roads Authority of Namibia instigated a project to resolve the bridge issue and appointed Zutari, in joint venture with Bicon Namibia for the detailed design, tender documentation, contract management and site supervision services, with Zutari assigned responsibility for the bridge work. ■

PROJECT INFORMATION

- **Company entering:** Zutari
- **Client:** Roads Authority of Namibia
- **Start date:** 2015 (design) and 2019 (construction)
- **End date:** October 2021
- **Main Contractor:** Roads Contractor Company
- **Project Manager:** Zutari/Bicon
- **Consulting Engineer:** Zutari/Bicon
- **Subconsultant:** W Louw & Associates
- **Subconstructor:** Zhongmei Engineering

Rehabilitation of Omaruru River Bridge,
Henties Bay, Namibia

ZHONGMEI ENGINEERING GROUP

ZHONGMEI ENGINEERING GROUP Ltd"(Zhongmei Group"or the"Company"), affiliated to Bureau of Geology of Jiangxi Province, is an large state-owned international enterprise group which bases on Jiangxi Province and faces the whole country and the world as an super grade general contractor for highway engineering & municipal public engineering and one of the world's top 250 international contractors (latest ranking as the 85th) in the Engineering News Records' ("ENR") list. Zhongmei Group overseas strategy is based on international contracts and focus on the foreign aid projects. By actively participating in government framework projects, and gradually deepening cooperation in agricultural development, electricity, mining and energy development, foreign investment, foreign real estate development and other fields, we have made the way to "Big Overseas Market, Big Overseas Achievements".the company has business and branches spreading all over Kenya, Tanzania, Uganda, Ethiopia, Djibouti, Ghana, Togo, Zambia, Namibia, Mozambique, Madagascar, Myanmar, Laos, Uzbekistan, Kazakhstan, Tajikistan, Pakistan, Mongolia, UAE (Dubai) and other more than 20 countries in Asia and Africa. Zhong Mei Engineering Group (Pty) Ltd Namibia Brunch (ZMEG) was registered in Namibia since 2013, with the head office located in Windhoek. ZMEG possesses qualifications in civil engineering, construction of roads, water conservancy, construction of bridge, and mining, etc.

In last decade, ZMEG has successfully implemented and is currently performing a number of projects with significant effects in Namibia such as The Construction of New Head Office for the Ministry of Fisheries and Marine Resources, The Construction of Rundu Abattoir, The Construction of Omedel-Swakopmund Pipeline Replacement and Ancillary Works, The Construction of New Hostel Blocks in University of Namibia, The Upgrading of Road from Oshakati to Ogenga, The Upgrading of Road from Swakopmund to Hentiesbay, The Upgrading of Road from Hentiesbay to Uis, The Construction of Dual-Carriage Freeway from Windhoek to Hosea Kutako International Airport, etc.

CONTACT DETAILS

Zhongmei Engineering Group Ltd / Website: http://www.zm.jxsdjt.cn/ Contact Person: Jiang Chongyuan / Position: Managing Director / Tell: +264 61234617 / E-mail: jxmtnam@gmail.com

ADAMS 10 MW SOLAR PV PLANT

SOLA has officially launched a first-of-its-kind 10 MW solar plant in the Northern Cape three months ahead of schedule, which provides clean energy to Amazon Web Services via the Eskom grid. Energy wheeling, a new model of private energy procurement, allows power to be generated and purchased in geographically distinct locations. The Adams Solar PV project will provide over 28 million kWh of clean electricity to Amazon Web Services annually.

This is the first operational large-scale solar PV wheeling project in South Africa, and the model is futuristic: it uses Eskom's grid to connect private buyers and sellers together making the way for more choice and competition. It's the first step forward in creating grid independence where private buyers and sellers of energy can trade with each other.

This means that the renewable energy plant will provide a low-carbon alternative to coal-fired power for a private offtaker (in this case Amazon Web Services) without needing to be geographically located at the site of use.

How? The solar PV plant comprises over 24 000 bifacial solar modules on single axis trackers, covering an area of 20 hectares. It is situated in the Northern Cape, where the solar resource is one of the best in the world. The solar PV facility tracks the sun throughout the day and absorbs irradiance from both the sky and reflected light from the ground. This design will see over 25 000 tons of carbon emissions being avoided annually – the equivalent of taking 5400 cars off of the road for a year.

This model could also help South Africa significantly in sticking to its carbon emission reductions targets whilst supporting economic growth and a just energy transition.

Amazon, like other large corporate consumers of energy, have committed to aggressive renewable energy procurement targets – in their case, 100% by 2025. But the successful provision of renewable energy can only be provided in an environment that supports it.

This is great news in light of the onslaught of load shedding in South Africa. Power generated from wheeling projects will increase the amount of IPPs and relieve the sole electricity provision burden on Eskom.

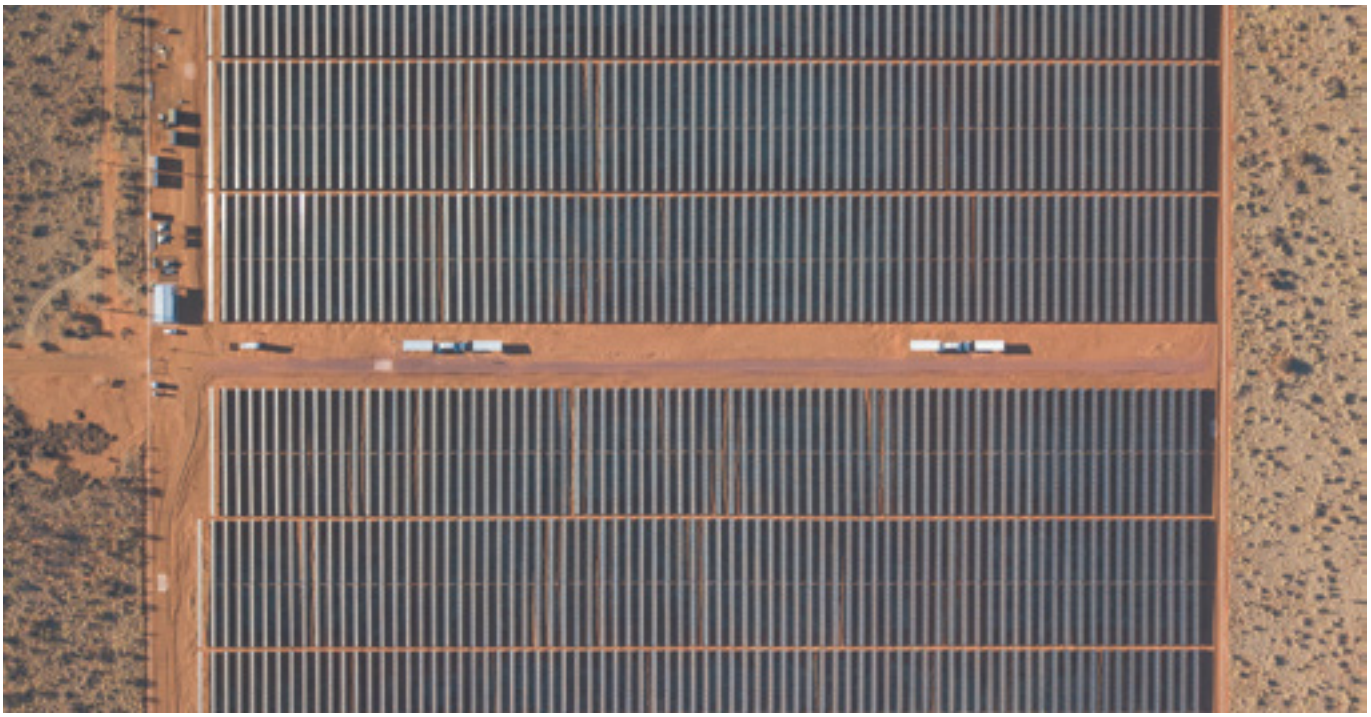
The support of renewable projects means the equal prioritisation of economic and social factors. The Adams project is more than 63% black owned, with investor Mahlako a Phahla Financial Services holding stakes in the project, who are committed to delivering returns for local black investors. SOLA is also 100% South African owned, including a 40% shareholding by black investor African Rainbow Energy and Power.

Renewable energy projects which take into account local development are able to develop South African skills and provide jobs. During construction, the Adams Solar Project created 167 jobs, 63% of them from the local surrounding area, and it will sustain permanent jobs for its lifetime in electrical maintenance, cleaning and security.

Wooden waste generated during construction, including pallets and electrical cable drums, were donated to local furniture businesses and special skills schools, in order to further bolster the SMME contributions of the project. ■

PROJECT INFORMATION

- **Company entering:** SOLA Group
- **Client:** Amazon Web Services
- **Start date:** March 2021
- **End date:** September 2021
- **Main Constractor:** Aurex Construction
- **Architect:** SOLA Group
- **Principal Agent:** SOLA Group
- **Project Manager:** SOLA Group
- **Consulting Engineer:** SOLA Group



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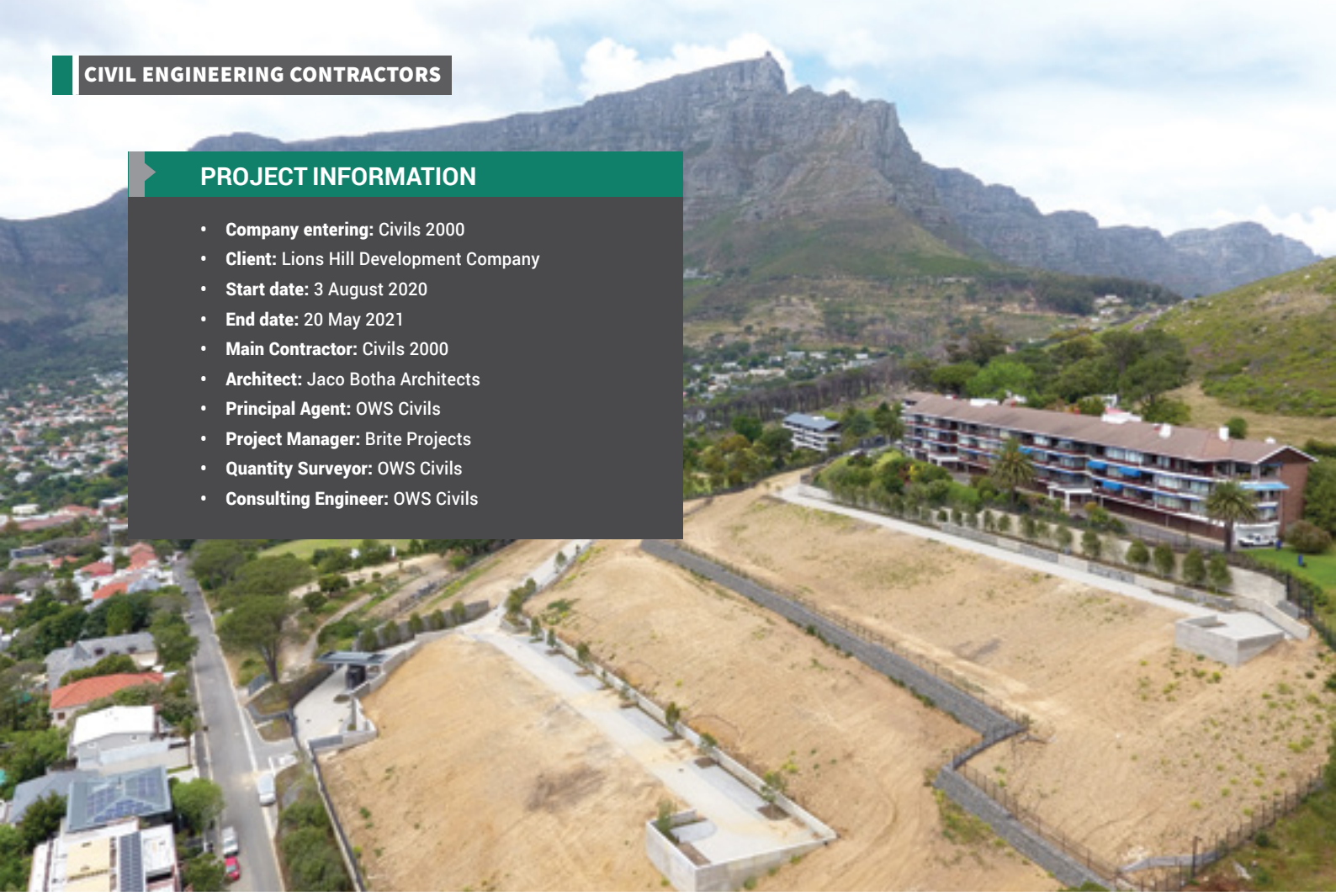

PROJECT INFORMATION

- **Company entering:** Civils 2000
- **Client:** Lions Hill Development Company
- **Start date:** 3 August 2020
- **End date:** 20 May 2021
- **Main Contractor:** Civils 2000
- **Architect:** Jaco Botha Architects
- **Principal Agent:** OWS Civils
- **Project Manager:** Brite Projects
- **Quantity Surveyor:** OWS Civils
- **Consulting Engineer:** OWS Civils

THE CONSTRUCTION OF CIVIL ENGINEERING, ELECTRICAL AND ANCILLARY SERVICES AT ERF 1526, TAMBOERSKLOOF, CAPE TOWN

The Ridge Estate is located high on the slopes of Lions Hill, Tamboerskloof, Cape Town. The location provides panoramic views across Table Bay, Cape Town's CBD, Signal Hill and Table Mountain.

This Fixed-Price Contract between Civils 2000 and Lions Hill Development Company for civil works at Erf 1526 below Lions Hill involved the clearance of the site and civil engineering and building works to create the 26-plot exclusive residential security estate.

The work included substantial site clearance and earthworks, some demolition and removal of existing retaining walls, felling trees, removal of stumps, installation of services, construction of roads, parking areas and sidewalks, and laying segmented paving and permeable paving plus road marking and installation of some permanent road signs.

Services installed included the laying of water supply, stormwater and sewer pipelines and services ducts, as well as the connections to existing services networks.

Structural site works and building work included the construction of reinforced concrete retaining walls, gabion retaining walls, construction of lower and upper guardhouses at De Hoop and Quarry Hill roads, gateways, security fences, and landscaping.

The project involved working on very steep topography, with tight deadlines and under the watchful attention of the surrounding residential community to create a stunning residential development for our client.

Civils 2000 embraces the importance of corporate social investment by undertaking its operations in terms of the company Socio-economic Development (SED) and Corporate Social Investment (CSI) Policy and recognises the responsibility as a corporate citizen to our stakeholders and the communities within which we operate.

On this project, with the client not subject to the preferential procurement rules and the site situated in an established residential area close to the Cape Town CBD, corporate social investment opportunities were limited and a community project liaison officer (PLO) was not a requirement of the project. However, Civils 2000 engaged several SMME subcontractors in line with Civils 2000's company Supplier Development programme. The aim of this programme is to support and develop the SMMEs with which we have a relationship. In addition, 26 jobs were identified for the duration of the project and these workers were employed on LDCs.

Civils 2000 were not required to design any permanent works. Temporary works designs were required for scaffolding and dewatering of trenches. ■

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THE BEITBRIDGE BORDER POST UPGRADE

The Beitbridge Border Post Project is located in the Matabeleland South Province in Zimbabwe. The Project is a PPP between the concession holders, Zimborders, Raubex and Government of Zimbabwe.

The project scope is to modernise the border post by dividing the traffic into three traffic streams (freight, bus and light vehicles/pedestrians). Each traffic stream has its own purposely built structures that include, new terminal buildings, warehouse, search facilities, gatehouse, upgraded security measures and ablution units. As part of the social investment into the local community the project will construct a 11,4 Mℓ reservoir with associated pipelines, an oxidation dam and new town fire station. The main risk was to ensure continued operations during the construction period. The project incorporated historically important architectural elements with stone walls resembling the Great Zimbabwean ruins. The buildings were designed to allow natural light and ventilation in common areas with specially designed office areas for Government officials that ensures comfortable working environments during the high summer temperatures. Facilities included breastfeeding cubicles, Baby changing stations and wheelchair friendly access.

Landscaping and stormwater improvements assisted with giving tired travels an oases feel. The improved ICT systems facilitate movement by reducing the manual operational input from the border crossing process in line with the Government of Zimbabwe's anti-corruption drive.

The project was executed on time, budget and to a high quality standard. The Beitbridge Border Post is one of the busiest land ports in Southern Africa.

Trade facilitation is a key point in the revival of the Zimbabwean economy and a corner stone of the Governments 2030 vision. The improvement of the Border Post facilities the movement of people in a more, dignified, safe and purposeful manner. ■

PROJECT INFORMATION

- **Company entering:** Raubex
- **Client:** Zim Borders Mauritius
- **Start:** 26 November 2020
- **End date:** 26 May 2023
- **Main Contractor:** Raubex
- **Architects:** Osmond Lange
- **Principal Agent:** DCC Projects
- **Quantity Surveyor:** TMS Quantity Surveyors
- **Consulting Engineer:** DG Consulting Engineers

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TMS had the privilege to assist in the ongoing implementation of financial discipline in the areas of budget setting, alternative design option costing and preparing the construction documentation of the World Class Border Post.

We would like to congratulate and thank Raubex for the privilege to be involved in this prestigious project.

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PICK N PAY INLAND 2 DC

Capital Propfund are developing a new distribution centre at Eastport Logistics Park in Gauteng to consolidate Pick n Pay's Longmeadow distribution centre and three smaller facilities. This 164 470 m^2 structure will be one of the largest distribution centres on the continent, and it is currently the largest single phase warehousing development in South Africa. The distribution centre will house groceries in an ambient environment of approximately 94 000 m^2 and cold storage facilities of approximately 46 000 m^2.

The balance of the facility includes both incoming and outgoing gatehouses, truck wash, truck maintenance and refuel facilities, an energy centre, management offices and staff facilities and an RRU. External concrete hardstands for truck movements total approximately 147 000 m^2. On completion the Distribution Centre will achieve Edge certification.

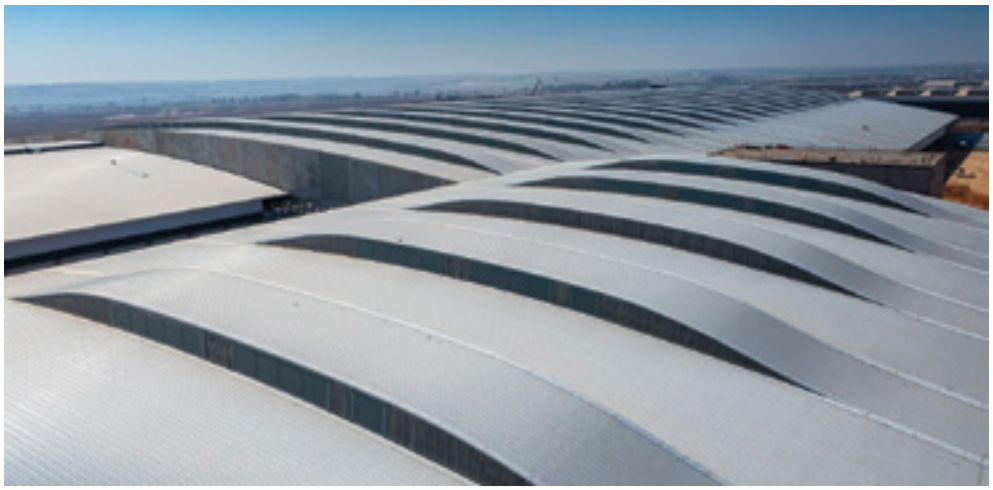
The facility is being built on a site underlain by dolomite requiring a jointless post tensioned floor construction that will measure over 146 000m^2 on completion. The roof structure is considered to have the longest continuous roof sheet in the world with an official world record set at 280 metres for a single rolled sheet.

This ground-breaking technology enabled Macsteel to apply their Novotexi sheet by lifting the roll forming mill to the level of the roof and seamlessly rolling the sheet directly onto the roof.

All internal and external concrete columns and external concrete walls are of a precast tilt – up design that involves the casting of the wall elements in stacks and then lifting them into position. The precast columns were also cast on the ground on casting beds and then lifted into position. Column heights ranged from 8m to 26m high and weighed up to 43 tons each. Meticulous planning was required to minimise craneage costs. This provided a cost effective, low maintenance, fire resistant solution that

allows for a functional, durable and aesthetically pleasing end product.

The procurement of 3 600 tons of structural steel commenced in August 2021 with installation commencing in the Dry Goods building in mid-November 2021, the RRU in January 2022 and in the Perishables towards the end of January 2022. All three buildings have trusses with shaped top and bottom chords forming a flowing roof from one side of the building to the other. The perishables building



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has a network of walkways and pipe supports to carry the services required for a refrigerated and insulated building.

The lighting system in the facility will consist of LED lighting throughout with a DALI intelligent lighting system with motion sensors and timers on all lighting.

A heat recovery system is being installed to harvest heat from the refrigeration system to heat water used in the crate wash facility. A 3 MW rooftop solar installation is being installed and will consist of 5 500 PV modules and will produce approximately 4 781 000 kWh of electricity.

This will ensure that the facility's base load is powered with solar power. Rainwater is being harvested via an enlarged attenuation pond, treated and stored in a 1m litre underground tank for use in the ablution facilities and for the refrigeration system. The water used in the truck wash facility will be recycled and treated to wash trucks. Waterless urinals, aerated faucets and low water use sanitary fixtures will minimise water usage on site.

Health & safety is always a top priority on any project and WBHO has implemented a strict induction and audit system for all subcontractors engaged on the project.

To date in excess of 1 500 000 man hours have been worked on the project with an LTIFR of zero. The project recently entered and won both the 2022 Regional and National safety competitions for projects valued over R750m run by the Master Builders Association.

The project commenced with bulk earthworks in May 2021 with overall construction completion expected in the first quarter of 2023. WBHO commence with building work on site on 17 September 2021 and the project is on track for completion within 15 months.

Variations added to the contract include an enlarged attenuation pond to add

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a water harvesting capability, a water treatment system to supply the refrigeration plantroom and staff ablutions, an underground treated water tank of 1 000 000 litres, a water filtration system at the truck wash facility and a reinforced concrete boundary wall around the entire site. WBHO is ISO9001:2015 certified and has implemented the quality management system on site along with ASITE which is a digital information management platform.

Local labour for the project is sourced through a full time Community Liaison Officer. In excess of 200 work opportunities have been created for previously unemployed people from the local area. To date the project has also generated in excess of 850 on site construction jobs with many more generated in support services off site. A number of locally based subcontractors have also been engaged on the project undertaking trades such as bricklaying and plastering and working with the appointed selected subcontractors such as electrical, tiling, painting, ceilings and partitions and kerbing. These local subcontractors were also sourced via the CLO.
A project such as this always has a large value of imported component consisting of, amongst others, tiles, electrical equipment, dock levellers and sectional doors, HVAC equipment, lifts, refrigeration equipment and generators, The impact of the COVID-19 pandemic on the manufacturing of imported materials in Europe and the Far East, delays on shipping and customs delays at South African ports have been closely managed to ensure delays are minimised or mitigated to prevent any delays on the project. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Capital Propfund
- **Start date:** 17 September 2021
- **End date:** 1 March 2023
- **Main Constractor:** WBHO Construction
- **Architect:** ICM Architecture
- **Principle Agent:** Barrow Brown & Altini
- **Project Manager:** Barrow Brown & Altini
- **Quantity Surveyor:** Quanticost
- **Consulting Engineer:** Sotiralis Consulting Engineers

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IKUSASA OXFORD PARKS

The striking new Ikusasa building has added to the overall character and appeal of the Oxford Parks precinct in Rosebank, Johannesburg. Constructed by Concor in just 12 months from start of earthworks to handover, this fast track project achieved 'World Leadership' level in green building standards. Construction of the four storey, three and a half basement building began in March 2021 with handover in February 2022.

In its construction and operation, Ikusasa reduces water use, energy consumption, process waste and pollution to a level that earns it 6 Star Green Star SA Office v1.1 green standard in terms of the Green Buildings Council South Africa (GBCSA) certification. Achieving this 6 Star rating meant that Concor applied both its client's sustainable designs and its own stringent quality systems. The company has completed a number of buildings to 5 Star Green Star SA level, and Ikusasa was its first to achieve a 6 Star certification. The building is now occupied by blue chip company Anglo American Global Shared Services, who recognised Concor by awarding a Certificate Award of Excellence to the company.

As a fast-track project, Ikusasa was a complex endeavour requiring an agile approach to construction. Concor's own team of professionals in core disciplines co-ordinated over 70 subcontractors on site. Concor's scope of work included the fit-out of the entire building, coordinating the installation of all fittings and fixtures before handover. Success was achieved through tight control over scheduling, and by prioritising sustainability and zero harm principles. Concor used innovative strategies to fast-track the project – giving the tenant early access in a phased approach. Using value engineered foundation piles eliminated the need for concrete bases or excavating around each pile. Instead, the design allowed the columns to be cast over the piles. Some 115 piles were cast, with columns spaced on an 8,4 metre by 8,4 metre grid to hold the suspended concrete slabs.

Another innovation was to back-prop on just two levels rather than the traditional three levels. This allowed earlier access to the lower floor plate to initiate brickwork and 'first fix' services such as floors, ceilings, electrical supply cables and water pipes.

The same engineering firm was used for both the structure and the façade for the curtain wall. This allowed design and manufacturing of elements for the façade to begin while the contractor was still busy constructing the concrete structure. Accurate dimensioning of the façade was possible using sophisticated software that could model the full façade around the concrete structure. These approaches meant Concor unlocked two long lead materials: the glass and façade tiling.

The façade itself is a unitised system which is less labour intensive to install and does not require a full façade scaffold for installation. This also reduced cost and time.

Design innovation

Concor worked with Ikusasa's developer and team of consultants to push the boundaries of sustainable design and construction. The building achieved a 6 Star Green Star SA Office v1.1 Design and a Net Zero Carbon Level 1 Base Building certification. The project is in the process of submitting the targeted 6 Star Green Star SA Office v1.1 As

Built and 6 Star Green Star SA Interior v1 As Built Ratings – 6 Star Rating is the highest Green Star rating awarded by the GBCSA. Green Star certification is a national and continental recognised quality mark for the design, construction and operation of buildings, interior fitouts and precincts. The 6 Star accolade is recognised as world leadership demonstrating that environmental impact has been significantly minimised in both the construction process and in the building's operation.

Environmental impact consideration

Ikusasa was designed with sustainability features throughout including solar and waterwise sanitary fittings, wet waste composting, recycling and a range of energy efficiency interventions. To earn the Green Star rating, Concor applied a range of processes and features that reduced the building's environmental impact. Three main requirements had to be met before the project commenced with demolition and construction: a Waste Management Plan (WMP), an Environmental Management Plan (EMP) and a Hazardous Waste Management Survey on existing buildings. ■

PROJECT INFORMATION

- **Company entering:** Concor Construction
- **Client:** Intaprop
- **Start date:** 8 March 2021
- **End date:** 15 February 2022
- **Main Contractor:** Concor Construction
- **Architect:** GLH Architects
- **Principal Agent:** Duncan Clark/Morta
- **Project Manager:** Duncan Clart/Morta
- **Quantity Surveyor:** Gro2 Consulting
- **Consulting Engineer:** Pure Consulting

BACCO WINERY

A new Tuscan style wine estate comprising basement storage, ground floor processing tasting room, offices and related site works is Simonsvlei, Paarl.

The entrance doors are framed in spectacular double story class 1 concrete arches that are extenuated by the rustic Tuscan face brick to the remainder of the façades of the building. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** BACCO Estate
- **Start date:** January 2021
- **End date:** October 2022
- **Main Contractor:** WBHO Construction
- **Architects:** Loudon Perry Anderson Associates
- **Principal Agent:** JMHT Quantity Surveyors
- **Project Manager:** JMHT Quantity Surveyors
- **Quantity Surveyor:** JMHT Quantity Surveyors
- **Consulting Engineer:** Sutherland

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BIOMEDICAL RESEARCH INSTITUTE

As one of the top medical and health sciences faculties in South Africa, Stellenbosch University's Faculty of Medicine and Health Sciences has a responsibility to lead the endeavour to ensure healthy lives and wellbeing for all. The Faculty's new Biomedical Research Institute (BMRI) forms a fully integrated, future-focused and superbly organised research complex that matches and, in several ways, exceeds the best the world has to offer.

The BMRI is based at the University's Tygerberg campus, within the Northern Suburbs of Cape Town, and is dedicated to understanding the genetic and biomolecular basis of disease and will be decidedly Africa in focus.

The new facility allows for the immediate expansion of current research activities, as well as the strengthening of research and teaching capacity in fields such as bioinformatics, genomics, anatomy, surgery and neurology.

With the planning of this project, first meetings were held in 2013 and the concept approval was only reached by 2017. Council approval and the tender process was completed in 2018, where after the project was able to commence with WBHO breaking ground in January 2019 for completion in November 2022. The project started off with a contract value of R670m but has increased since and is now at a value of R714m.

The BMRI consists of a new building (13 938 m^2) consisting of four floors above basement level as well as a refurbishment of the existing FISAN building (17 367 m^2) that has six floors above basement level and is linked together by the Atrium. Additional works included within the project is a Dean's Garden, east parking area, Central HVAC plant upgrade, new parking at the main entrance and sport's field, new tennis courts and a bus embayment. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Stellenbosch University
- **Main Contractor:** WBHO Construction
- **Architect:** Roelof Rabe Architects
- **Laboratory facility planning & design:** LTS Health Africa
- **Project Manager:** Henry Fagan Engineers and Project Managers
- **Civil & Structural Engineers:** Ekcon Consulting Engineers
- **Acoustic Engineers:** SRL South Africa
- **Sustainability Consultants:** JG Afrika

BRIDGEWATER ONE – CENTURY CITY, CAPE TOWN

Bridgewater One is a mixed-use development situated between the once iconic Ratanga Junction Theme Park and the Century City Hotel and Conference Centre.

The developer and professional team refer to the development as mixed use at it incorporates both commercial and residential buildings within its confines, which also includes beautiful and relaxing recreational and natural components. The development consists of an 88 room hotel, a 122 apartment complex which is set against the banks of a new waterbody, which was once Ratanga Junction. Finally, three commercial office blocks complete the precinct, which as a unit have been designed in unison with the hotel and apartment complex to form a beautiful courtyard with extensive landscape features for use by the general public. Bridgewater One is Century City's biggest development since the Bridgewater Precinct's Century City Square, and has set the benchmark for other high profile developments to follow within the former Ratanga Junction vicinity. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Rabie Property Group
- **Start date:** November 2019
- **End date:** July 2021
- **Main Contractor:** WBHO Construction
- **Architect:** Vivid Architects
- **Principal Agent:** Vivid Architects
- **Project Manager:** Vivid Architects
- **Quantity Surveyor:** B&L Quantity Surveyors
- **Consulting Engineer:** Zutari

HARBOUR ARCH

Harbour Arch Tower 1 is the first of six towers that will transform the Cape Town Skyline. Tower 1 is a 104 m high-rise building consisting of modern urban retail and residential space, overlooking the picturesque harbour and Table Mountain. The Tower 1 project started in September 2020 and will be completed in May 2023. It has a contract value of R1,06b. The building has a total basement and parking area of 45 422 m^2 and will house 560 Apartments over 24 Floors, which includes high-end luxury apartments (478) as well as affordable units (82).

The building has a very complex plastered façade, that is divided into three sections by using cantilever scaffold brackets. This enabled the building to be plastered and painted while construction of the structure was still underway at the top. This made the project a first of its kind when it comes to façade scaffold innovation.

This project will allow the for integration of people to create an inclusive and sustainable living and lifestyle space that will lead the way in the transformation of Cape Town's property Sector.

Harbour Arch is strategically positioned at the gateway of the vibrant cape Town CBD. Harbour Arch's exceptional location will ensure that it is the most visible and easily accessed development in the CBD.

Cape Town's newest mixed-use precinct is located at the confluence of the N1 and N2 highways making it highly visible to anyone arriving in the city. This unrivalled location will also provide quick and easy vehicular access to the airport, the southern suburbs, the northern suburbs, the Atlantic seaboard and the winelands. Residents will be able to link effortlessly to the neighbourhood, the city, and the world. Excellent transport connections for vehicles via the N1 and N2 highways, as well as access to the BRT routes make Harbour Arch easily accessible by car, bus, shuttle, taxi, bike and rail.

Harbour Arch will become Cape Town's largest and most ambitious sustainable mixed-use development.

Like Melrose Arch, it will be built on sustainable principles and eco-friendly innovation. Integrated green building initiatives will include refuse recycling, water-saving devices and rainwater harvesting, a centralised district cooling facility and low-energy LED lighting.

Within the vibrant pedestrian-friendly Harbour Arch precinct you will find all your daily needs taken care of – restaurants, cocktail bars, shopping, hotels, banking, medical services, health clubs, entertainment and much more. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Start date:** September 2020
- **End date:** May 2023
- **Main Contractor:** WBHO Construction
- **Architect:** Bentel Associates
- **Principal Agent:** Orion Project Managers
- **Project Manager:** Orion Project Managers
- **Quantity Surveyor:** D'Arcy Hedding Cape
- **Consulting Engineer:** Zutari

NELSON MANDELA UNIVERSITY – E BLOCK EXTENSION

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Project start date:** 24 May 2021
- **Project end date:** 30 August 2022
- **Client:** Nelson Mandela Uninversity
- **Principal Agent:** SVA International
- **Architects:** Lead and principal – SVA International
- **Main Contractor:** WBHO Construction
- **Civil Engineer:** BVi Consulting Engineers
- **Quantity Surveyors:** Chimora Group
- **Electrical :** Bosch Projects
- **Health and Safety Compliance:** McSafe

The client brief played a critical role during the conceptualization, design and construction stages. Attention to detail and execution was imperious during the project as this would serve as new identity for Nelson Mandela Ocean Science department, which will furnish a series of dedicated academic spaces within a specialised research environment. With a build of this specific and specialised nature, timeous planning was imperative as challenges prevailed due to the enormous programme constraints caused by COVID pandemic lockdowns and secondly the prevailing factor of water shortage across the region which demanded caution and alternative water sources to ensure continuity of construction and future operations of the completed build itself.

The building was conceptualised as a large internal veranda space, articulated as a triple-volume, multi-layered foyer space which links the main circulation spine with the more private spaces within. The internal planning contains a number of dedicated research spaces, specialised laboratories, offices, meeting areas as well as an eight-metre-deep diving tank used for training purposes, which forms an integral part of the western façade articulation. The specialised labs had to meet specific standards with required a fine combed HVAC system installation, and instrument spaces to handle flora and fauna samples which serve evidence of ocean life.

As this is not a typical student campus, intensive integration of security and access systems have been incorporated to facilitate continuous monitoring of areas through the use of CCTV systems and access control measures within the facility. A three-dimensional sun-screen layer further articulates the main building façade while defining a unique aesthetic internally through the ever-changing shadow patterns throughout the day

Motivating facts about the project:

- The overall concept/ architectural intricacies of the build were even the minor details resulted in distinct disparate elements which all fused to showcase a masterpiece in a larger composition.
- Facility boasts of sophisticated internal finishes, which exceeded expectations
- The mind boggling quality of the building achieved amid prevailing water scarcity in the region which could have easily had a negative effect during the construction processes, secondly the results of COVID each proved to be a nightmare for the construction industry.
- This sophisticated build flags as a state-of-the-art space for research which will create quality working conditions for the end- users.
- Prevailing challenges during the construction process also served as form of motivation for the contractor and in-depth construction knowledge was acquired which would be beneficial in the long term and on any other facility of this nature.
- This building extension is one that NMU will be proud of. ■

ROCKEFELLER

This a new Newmark hotel with restaurant, conferencing facility, gym and residential development

It constitutes 397 apartments of between 23-30 square metres each with larger penthouse apartments on the top two floors. There is a pool and entertainment area on 18th floor with views of the CBD and Harbour.

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Incocure
- **Start date:** April 2019
- **End date:** December 2021
- **Main Contractor:** WBHO Construction
- **Architect:** MLB Architects
- **Principal Agent:** JMHT Quantity Surveyors
- **Project Manager:** JMHT Quantity Surveyors
- **Quantity Surveyor:** JMHT Quantity Surveyors
- **Consulting Engineer:** Sutherland Engineers

NEW HEAD OFFICE FOR THE DEPARTMENT OF AGRICULTURE LAND REFORM AND RURAL DEVELOPMENT

The Department of Rural Development and Land Reform sent out a Request for Proposal for a Public Private Partnership (PPP) for the development of a new head office on 27 July 2009. Much water subsequently flowed under the bridge but eventually persistence by all parties resulted in an Enabling Works Contract (EWC) being concluded on 15 June 2018.

The PPP agreement was entered into between the Concessionaire, Tshala Bese Uyavuna Consortium (TBUC), and DALRRD (the Department) on the 3 December 2020 and Financial Close in February 2021, with site works commencing shortly thereafter.

The Department was now set to get their new head office for 2 159 staff by the end of February 2023.

The TBUC delegated the design and construct responsibilities to the DRD D&C JV (D&C) made up of WBHO Construction (85%) and Mhlaba Properties (15%).

Being a complex and potentially high-risk project with serious consequences for late completion, construction was simplified with flat post-tensioned slabs and unitised façades wherever possible. This meant that whilst the structure was being built on site, the design, importation and manufacturing of façade panels was happening concurrently in the background. This ensured that the building envelop could be closed as early as possible thus allowing maximum time for finishing processes so as to ultimately achieve the best build quality possible.

Float, or contingency time, had to be created in the programme so as to best try and absorb the inevitable delays caused by the "construction mafia", COVID, importation delays, weather and the comprehensive design review processes required in PPPs.

Subsoil drainage design was done by considering a permeable pebble layer that showed itself during the bulk earthworks phase of the contract. The standard perforated subsoil drain network had to be supported by another concrete pipe network below it, which could deal with the potentially high volumes of water that may be experienced. This all had to be diverted towards the northern part of the site where the 100-year flood levels permitted exit into the Apies river.

In order to minimise the effects of the 2021 Numsa strike action and the effects it had on the country's steel production as well as the ever-increasing cost of steel, conventionally reinforced slabs were changed to post-tensioned.

This resulted in a reduced overall steel demand for the project and quicker turnaround times of formwork.

To create a column free area in the ground floor auditorium, the first, second, third and roof floors above were initially supported by temporary cast-insitu concrete columns and then finally supported by large post-tensioned beams built on the roof slab. Once the roof beams had been cast and tensioned, the temporary columns on ground floor could be demolished and the remaining floors above then "hung off" the roof slab.

The large façade presented a wonderful opportunity in that it became the palette for an artwork that extends around the total perimeter of the building. An image depicting various mountain scapes from all of South Africa's nine provinces is either pixelated into the copper-coloured overclad panels or etched into the glazing. We believe that this will be the longest single artwork ever created in South Africa. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Tshala Bese Uyavuna (RF) Consortium
- **Start date:** February 2021
- **End date:** 16 March 2023
- **Main Contractor:** WBHO Construction/Mhlaba Properties D&C JV
- **Architect:** Boogertman + Partners
- **Principal Agent:** DRD D&C JV
- **Quantity Surveyor:** AECOM
- **Consulting Engineer:** Pure Consulting

VANTAGE DATA CENTER

WBHO Construction commenced with this exciting Design and Construct (D&C) project on 14 July 2021. This was to be the first of three data centers that Vantage Data Centers (VDC) is planning to develop in JBN11 campus and was also the first full fit-out hyperscale data center that the WBHO D&C team had ever tackled. Over the short contract duration, the learning curve was very steep, as described further below.

The structure was a fairly simple conventionally reinforced concrete frame with coffered slabs to achieve the load bearing and spanning requirements. Clear distances between columns being critical so as to ensure the data racks would fit in-between them once complete.

The roof slab was somewhat unusual as it was cast to falls in two directions. This would be one of the many factors insisted upon by the client to ensure that the center remained waterproof over its lifespan.

It was critical that the concrete structure went up as quickly as possible but an extensive sleeve network and earthing grid had to be installed below ground level prior to the team gaining full access in the early stages.

Careful planning and re-sequencing was carried out so as to allow the pad footings, columns and surface beds to be built simultaneously with the underground services.

VDC specified a light-weight panellised façade system. This product was fully imported, had never previously been used in South Africa and had a long procurement time.

In order to close the building envelop and minimise the risk of other trades being affected should the supplier be late with his delivery, the WBHO team proposed, and was subsequently agreed to by the Client, that a temporary weatherproof façade be constructed out of a lightweight steel grid, Nutec board and waterproofing bandage to all joints.

This temporary weather barrier was positioned on the floor plate such that it did not have to be removed and could rather enhance the fire resistance, thermal insulation and acoustic properties of the permanent façade.

There were some substantial issues in the delivery of this plant. VDC management required the support of direct suppliers. As timing was a key factor of this project, the key subcontractors had to accelerate what was already a very tight installation program. Additional shifts and teams had to be called on which increased the peak number of personnel on site to approximately 1 200. This required additional supervision and safety measures and so the site became of hive of activity, 24/7.

The six standby generators' exhausts extended well beyond the roof level and were 25 m long. Structural steel frames were required to support these, which in turn were secured back to the building's concrete frame. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Tshala Bese Uyavuna (RF) Consortium
- **Start date:** February 2021
- **End date:** 16 March 2023
- **Main Contractor:** WBHO Construction/Mhlaba Properties D&C JV
- **Architect:** Boogertman + Partners
- **Principal Agent:** DRD D&C JV
- **Quantity Surveyor:** AECOM
- **Consulting Engineer:** Pure Consulting

REALITY CAPTURE IS TRANSFORMING CONSTRUCTION

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Liza Stewart from Agile Business Technology using OpenSpace on a construction site.

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Using 360° images to document the project site allows teams to collaborate better and makes it easier to do quality control and inspections to help identify safety hazards, and can even be leveraged as a point of reference following project completion to assist owners and facilities teams.

The construction industry is undergoing radical change, and OpenSpace believes the future has never been brighter. Artificial intelligence, computer vision, 3D scanning, and other technologies are rapidly evolving, bringing unprecedented opportunities to those willing to embrace them.

OpenSpace is the leader in automated 360° project site capture and AI analytics. Customers choose OpenSpace to quickly and easily capture a complete visual record of the project site which provides teams with a single source of truth that increases coordination, drives accountability, and simplifies dispute resolution.

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RELOCATION OF 30 Mℓ KHUTSONG RESERVOIR

The community of Khutsong is located on the West Rand of South Africa near the mining town of Carletonville. Given the dolomitic geology, sinkhole formation is a common occurrence in Khutsong. When sinkholes form, the local municipality are often required to repair, rebuild or relocate infrastructure to ensure its residents are safe and that service delivery continues. The relocation of the 30 Mℓ Khutsong reservoir is one such project undertaken by the Merafong City Local Municipality.

The existing reservoir servicing Khutsong Extension 3 was previously unable to retain water due to the formation of a large sinkhole under the reservoir floor. The relocation project involved, constructing a new thirty mega-litre reservoir and supporting infrastructure several hundred metres away from the existing, unused reservoir. The supporting infrastructure includes connecting pipelines for both the supply to and distribution from the reservoir, a pump station and general facilities for accessing, maintaining and securing the infrastructure.

As a result of the dolomitic geology, one of the major design requirements for the reservoir floor was the capacity to span a sink hole five metres in diameter whilst fully loaded to overflow height. This requirement led to the first round, prestressed reservoir raft floor in Africa being designed and constructed at the Khutsong 30 Mℓ reservoir. The basic philosophy behind the prestressing option for the floor involves applying pre-compression to the raft floor to provide additional resistance to crack-inducing tensile stresses. The timing of the stressing, the profile of the cables and the concrete mix design were the three critical factors in ensuring the performance of the 450 mm thick raft floor slab.

The concrete mix design for the raft floor required a compromise between an ideal water retaining concrete mix and PT slab mix. A very delicate balance needed to be achieved between reducing shrinkage, increasing the impermeability and ensuring sufficient early strength gain before shrinkage occurs. A further complication was ensuring that the mix was still workable after being on the road for just over an hour given the vicinity of the nearest ready-mix batch plants.

Several trial mix designs were conducted as finding the balance between acceptable shrinkage, permeability, workability and early strength gain proved a sensitive process. The optimum mix was however found by balancing a suitable water cement ratio for permeability with Chryso's shrinkage compensating admixture, CHRYSO® Serenis. CHRYSO® Plast ZA 1559 also proved an effective plasticising admixture and ensured workability after 80 minutes whilst also providing adequate early strength gain. An Afrisam CEM II/A-M 42.5R type cement was selected for both product performance and reliability of delivery during what has been a tough period to secure cement deliveries post lockdown. To test the design's performance, a sample beam measuring 59,25 m long, 0,210 m wide and 0,450 m deep was designed and cast on-site with a single mono strand cable to simulate the influence of one cable on the raft floor.

In terms of concrete placement, the design engineer required the pour to be completed within a 24-hour window to ensure the homogeneity of the concrete under early stressing. At the work face itself, efficiency and adequate resourcing planning were crucial for successful execution. ■

PROJECT INFORMATION

- **Company entering:** CHRYSO
- **Client:** Merafong City Local Municipality
- **Start date:** 10 February 2021
- **End date:** 20 March 2022
- **Main Contractor:** Quantibuild
- **Consulting Engineer:** Morad Consulting
- **Readymix:** RMX WG Wearne Readymix

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The African market has become a long term strategic focus, with this part of our business contributing an increasingly larger share of our overall turnover. We are servicing a similar client type to those we have in South Africa, namely the petrochemical, mining, marine, construction, industrial and manufacturing sectors, offering our full scope of services.

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Regions Currently Operating

1. South Africa
2. Botswana
3. Tanzania
4. Namibia
5. Mozambique
6. Ghana
7. Zimbabwe
8. Zambia

PROJECT INFORMATION

- **Company entering:** CHRYSO Southern Africa & Scribante Concrete
- **Client:** ACWA Power
- **Start date:** 1 May 2021
- **End date:** Q4 2023
- **Main Contractor:** SEPCO III
- **Specialist Supplier:** CHRYSO Southern Africa & Scribante Concrete

HIGHLY COMMENDED

REDSTONE SOLAR THERMAL POWER PLANT

The Redstone Solar Thermal Power Plant (Redstone SCP) has been developed to meet the increasing electricity demands in the Republic of South Africa, which forms part of the South African Renewable Energy Independent Power Producer (REIPP) Procurement program. It is the first and largest CSP-financed molten salt central receiver project in South Africa. The project owner is ACWA Power, Eskom is the off-taker, and SEPCOIII Electric Power Construction Co Ltd is the EPC Contractor for this project.

CHRYSO is the admixture supplier and Scribante Concrete is the concrete supplier for the project. Scribante Concrete's mobile batching plant was erected at the site. This project site is located on the remainder of the farm 469, The Hay District (Administration District), approximately 5 km South East of the Groundwater community and 30 km East of Postmasburg & falls within the jurisdiction of the Tsantsabane Local Municipality of the ZF Mcgawu District in the Northern Cape Province, South Africa. The project's scope includes engineering, procurement, construction, commissioning and maintenance of the 100 MWe Net Concentrated Solar Power Redstone Project.

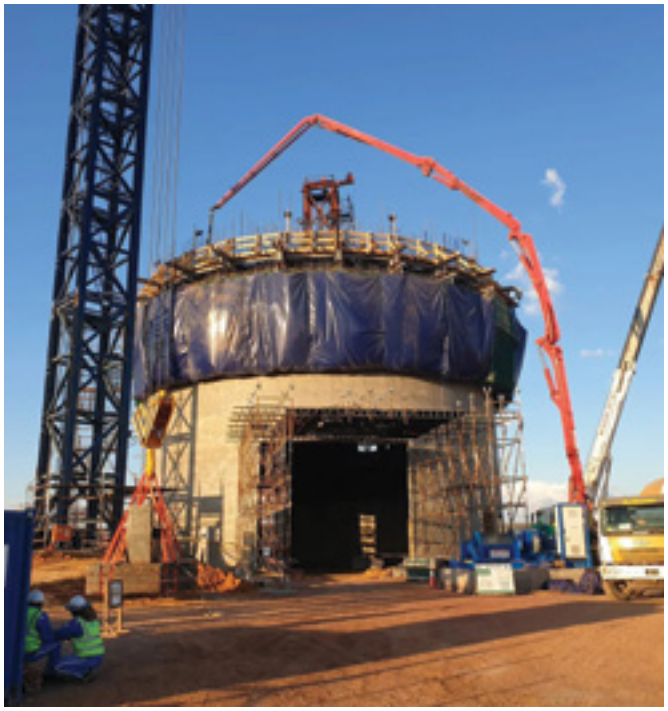
The Redstone Solar Thermal Plant construction is considered one of the largest innovations of 2022. Located in the Northern Cape Province of South Africa, the Redstone CSP project will be equipped with a 12-hour thermal storage system that will deliver clean and reliable electricity to nearly 200 000 households around the clock. Commencement of operations is scheduled for Q4 2023.

In addition to efficiently delivering clean energy to the national grid, the Redstone project will offer tangible socioeconomic value through utilising local supply chains and creating job opportunities: the project will reach close to 44% local content on procurement during the construction period; create more than 2 000 construction jobs at peak, with about 400 from the local community; and create approximately 100 permanent direct jobs during the operating period.

The first of its kind in Africa, the Redstone Solar Thermal Power Project features molten salt energy storage technology in a tower configuration with the capability to support South Africa's demand for energy when it's needed most – day and night. The 100 MW project with 12 hours of full-load energy storage will be able to reliably deliver a stable electricity supply to more than 200 000 South African homes during peak demand periods, even well after the sun has set.

Fuelled completely by the sun, with no backup fuel required, the project also features dry cooling of the power generation cycle as an important element to minimise water use.

With the lowest delivered electricity price of any CSP project in the country to date, the Redstone project will generate more than 480 000 megawatt-hours per year. This annual output is more than twice that of other technologies per MW of capacity, such as photovoltaics (PV) or direct steam solar thermal. ■



SENWABARWANA-BOCHUM

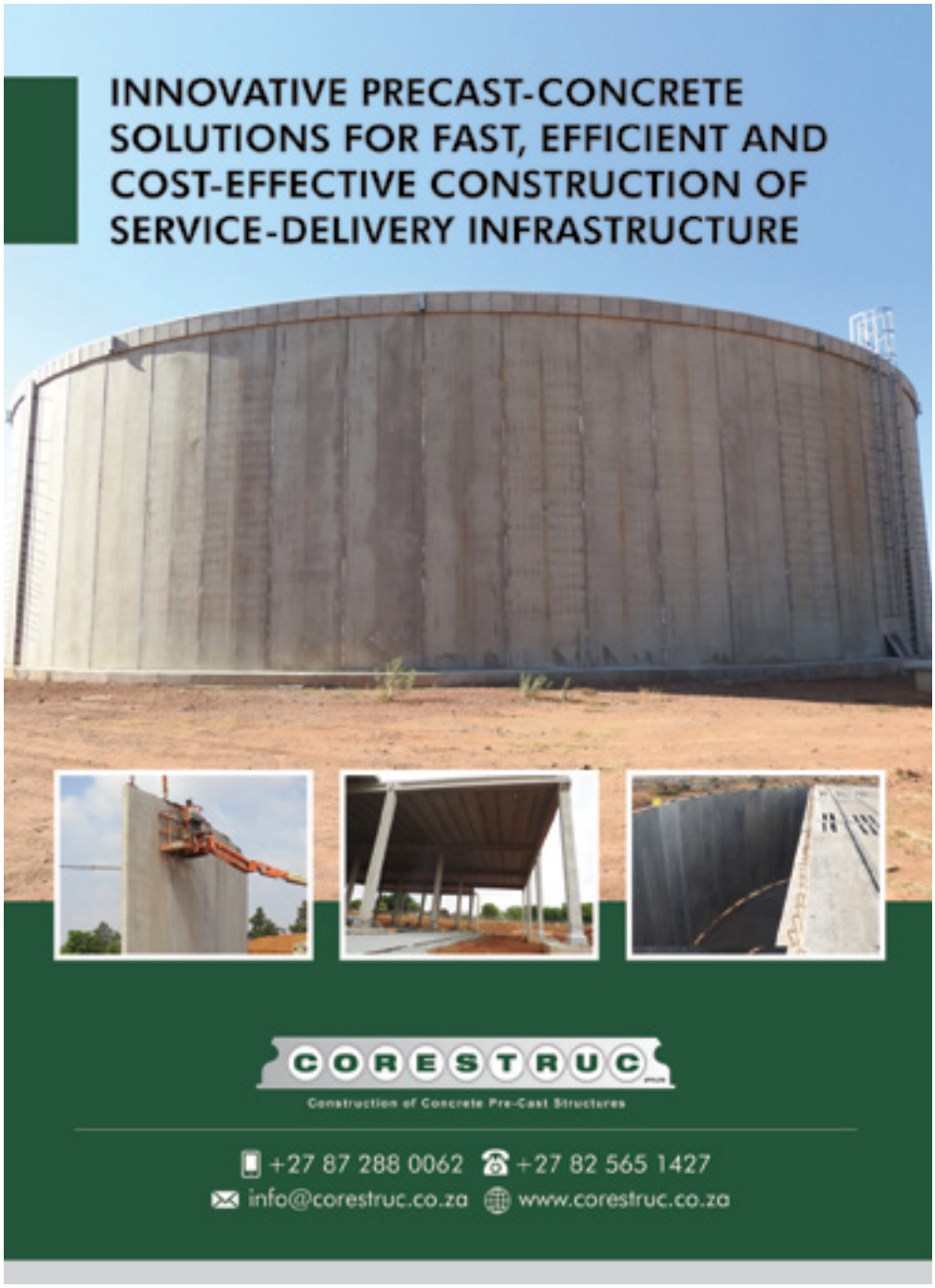
Blouberg Municipality harnessed precast-concrete technology to help significantly fast-track the construction of a large grandstand for a community sports and recreational centre that was built in Senwabarwana, Limpopo. The technology is also providing a more cost-effective means of building these structures and an end product of a higher quality, both in terms of durability and aesthetics.

On this project, Corestruc and Infinite Consulting Engineers worked alongside Chisa Multi Projects, the principal contractor, and Sizeya Consulting Engineers, which designed and supervised the construction works.

The grandstand was erected in as little as four months. Able to seat 3 500 people, the grandstand was designed by Infinite Consulting Engineers and erected by Corestruc. The companies have jointly built more than 30 precast-concrete grandstands in the country over the years for sports and recreational centres.

The approved manufacturer of the system commenced producing the various precast-concrete elements for the grandstand in mid-October 2021. The manufacture of the 20 tapered columns, as well as 20 front-end and 20 top raker beams were completed in mid-January 2022. This is in addition to the more than 340 seating benches, 19 back benches, 34 side panels and 76 steps, as well as the structural steel bracing for the structure.

Meanwhile, the principal contractor commenced constructing the foundations for the structure in mid-October 2021. They were completed before the builders' shutdown period that year to enable Corestruc to start erecting the structure in January 2022. This preliminary work included



excavation; placement of the stabilised fill; and construction of the in-situ 10MPa concrete bases. Constructed in sound founding material, the concrete bases for the front raker beams and front columns are 500 mm thick.

Work started with the installation of the middle precast-concrete elements. The top of the columns was set out with coordinates to confirm the plumb and position. This was followed by the lining up of the front raker beams with the top and bottom bolts of the columns and then fastening them in place. Corestruc then installed the rear columns, again setting out the top of the precast-concrete elements with coordinates to confirm the plumb and position.

The columns were then braced with structural steel. This provided the critical stability that was required at this stage of the erection process, considering the slenderness of the columns. The top raker beams were then installed in the same way that the front elements were placed. Afterwards, they were braced horizontally in a similar sequence to that used for the back columns. This was followed by the placement of the many seating benches. Corestruc's team achieves tolerances of 3 mm when connecting the precast-concrete elements to the foundations and 5 mm when integrating the other components of the system.

Infinite Consulting Engineers and Corestruc have been refining and perfecting this modular system since 2012. The focus has been on designing an "off-the-shelf system" that reduces erection time and only requires minor design modifications – if necessary. This has been achieved by standardising and reducing the number of prestressed precast-concrete elements, while the use of curved columns and flat surfaces for the rakers, benches and side panels has also facilitated quick and efficient installation.

Infinite Consulting Engineers has also refined the method of connecting the various precast-concrete elements over the years. The columns are connected to the in-situ bases by components that have been cast into the precast concrete elements and secured using hold-down bolts in the base. ■

PROJECT INFORMATION

- **Company entering:** Corestruc
- **Client:** Blouberg Municipality
- **Start date:** 22 September 2021
- **End date:** 7 March 2022
- **Main Constractor:** Chisa Multi Projects
- **Consulting Engineers:** Sizeya Consulting Engineers

DURBANVILLE PREPARATORY SCHOOL SEATING

CMA member and global landscaping block designer and license provider, Terraforce, has introduced the Four x Four® Step Block Cap, a concrete panel 400 mm (width) x 200 mm (height) x 50 mm (thickness), designed for installation at the ends of landscaped seating rows and steps to create neater and more attractive edging for outdoor seating installations.

The world's first Four x Four® Step Block Cap block installation was completed in June 2022 as part of a sports facilities upgrade at Durbanville Preparatory School in Cape Town. The upgrade included the construction of 244 m of seating and steps between three and five rows high and built on five elevations. The seating fronted onto two new Astro Turf fields and two grassed fields.

It was constructed with the Terraforce 4×4 Step™ block and the L12 block, and the Four x Four® Step Block Caps were used to panel the edges of the last 4 x 4 blocks at the ends of the of seating and stair rows.

The project also included the construction of a vertical wall between the two Astro Turf fields built with L12 blocks. And in a first for the Western Cape, the top blocks of the wall were capped with the L12 Terraforce® Cap, a capping panel similar to the Four x Four® Step Block Cap. All the products used on the project, including the Four x Four® Step Block Cap and the L12 Terraforce® Cap, were manufactured by licensed Terraforce block manufacturer, Klapmuts Concrete. Overall, 10 000 4×4 Step Blocks, 3 200 L12 blocks and approximately 150 caps were used for the project. The actual installation work was done by Decorton Retaining Systems as a sub-contractor to the main contractor, DP2 Construction. During the installation process additional reinforcing was provided using dry concrete to support the blocks.

Cast with two bars of reinforcing with hooked ends, the Four x Four® Step Block Cap is easy to install. The host block is simply filled concrete into which the reinforcing is pressed until the capping panel is flush with the block.

One of the challenges of the project was the extremely long seating rows and sloped embankments which meant the seating had to be stepped down in several places. Moreover, the seats and stairs were given a slight slope to allow for water run-off.

The introduction of the Four x Four® Step Block Cap resulted from a special request from the school which had previously undertaken similar projects using the Terraforce blocks.

As a result, the Four x Four® Step Block Cap blocks will now be made available countrywide and globally through other Terraforce licensees. ■

PROJECT INFORMATION

- **Company entering:** Terraforce
- **End date:** June 2022
- **Main Contractor:** DP2 Construction
- **Consulting Engineer:** Lyners Consulting Engineers

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1 ON OSBORNE

The site is located on the corner of Osborne and Cavendish Road in Claremont, right opposite Cavendish Square mall. The restricted site's footprint is approximately 1 000 m^2 where Keller Geotechnics SA was tasked to deliver a 16,5 m deep basement.

Keller's scope consisted of a permanent composite lateral support system, incorporating perimeter piles, a capping beam, post tensioned soil anchors, gunite arches and waler beams, survey monitoring together with bulk earthworks, dewatering and some civils scope of sub-soil drainage.

Keller offered a design, supply and installation solution for the basement.

Typical geotechnical solutions for this depth of basement would consist of diaphragm walls, steel sheet piles or secant walls. Keller however has developed over many years, a proven composite lateral support system which caters, not only to the adverse geotechnical conditions of a highwater table and highly weathered Kaolin clays and rock, but also to the highly restricted access constraints and workspace on this very busy corner site. Keller not only provided lateral support up against the neighbouring buildings where negligible impact was experienced, but also provided a lateral support system that could carry nominal load, per linear metre, on the capping beam, allowing the columns to be constructed on the capping beam adjacent to the neighbours.

SDA anchors of varying lengths were installed specifically to accommodate and achieve the required anchor forces.Dewatering was required to avoid the kaolin very soft rock, disintegrating into clay or slop.

Keller made use of low noise piling rigs and the working hours accommodated the neighbouring flats and business premises.

Recycled steel was used in the piles.

The job was constructed through the Cape winter season and completed on time and within budget.

The design and construct method that was followed on the project, highlights the cutting-edge advantage that Keller has in South Africa. When large and complex geotechnical challenges appear, Keller's operational and design specialists collaborate internally and externally with engineers and clients to find viable and economic solutions for their projects. ■

PROJECT INFORMATION

- **Company entering:** Keller Geotechnics SA
- **Client:** Port Wild Props 33
- **Main Contractor:** Keller Geotechnics SA
- **Project Managers:** Bruce Burmeister & Associate Architects
- **Consulting Engineers:** De Villiers Sheard
- Demolition: Ross Demolition

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ANSE LA MOUCHE DEEP FOUNDATIONS

Anse La Mouche is a hotel resort development located South West of Mahe, Seychelles. The soil profile comprise deep, unconsolidated estuarine deposits which pose significant settlement risk to the development.

The final solution was 350-600 mm diameter Driven Prefabricated Precast Spun piles. Spun piles have high axial and moment capacity and are suitable for the project conditions. This is the first use of Spun piles in Southern Africa.

The geotechnical profile called for precast piles to varying depths of up to 27 m. The typical square precast piles manufactured in the Seychelles are not economic and have historically had quality control issues. The suggestion to use the Malaysian manufactured prestressed hollow precast circular spun piles set us apart from the competition. This solution proved more cost effective despite the shipping. This was the first time that the solution was used in Seychelles.

The project facilitated community involvement during the construction phase; Keller employed between 20 and 25 people during the course of the works – up to 15 being from local communities. The raising of the general platform combined with the unconsolidated sediments resulted in significant settlement and down-drag to the piles.

In order to minimise the effects of down-drag, the piles were slip coated in the upper third or half. The slip coating debonded the pile from the surrounding soil, thereby reducing the down-drag forces on the piles.

Spun pile section are mass manufactured in factory environment which allows reduced costs as well as high quality sections. Despite the shipping time and costs, the use of the spun piles ultimately provided the required financial and quality assurance benefits for the project.

The project was carried out during height of the COVID-19 pandemic. Shipping and logistics were extremely disrupted and uncertain during this period and posed a significant risk to the project.

To mitigate this risk, it was decided that part of the project be founded on traditional Franki type enlarged base piles for which the equipment was available. ■

PROJECT INFORMATION

- **Company entering:** Keller Geotechnics SA
- **Client:** RDC Royal Development Company
- **Main Contractor:** Sanken Contractors
- **Project Managers:** Hooloomann Project Services
- **Consulting Engineers:** WSP in Africa

PIONEER FOODS: MALMESBURY SILOS – STRUCTURAL REPAIRS TO GRAIN SILO COMPLEX AT MALMESBURY HILL

Pioneer Foods is one of South Africa's largest producers and distributors of various well-known food and beverage brands and products. Operating predominantly within South Africa, while exporting to more than 80 countries across the globe, the Pioneer Foods Group provides wholesale, retail and informal trade customers with consistently high-quality products.

Sitting within the Essential Foods division, their Grains business unit prides itself on supplying foods of exceptional quality that are safe, nutritious and trusted by millions of consumers every day.

So, when Pioneer Foods detected large vertical cracks in their grain silos of their Malmesbury Mill silo complex in 2018, they appointed LNW Consulting Engineers and Project Managers to investigate and determine the structural integrity and remaining lifecycle of the silo complex comprising of a 39 tubular starbin configuration. Once the investigation was completed, LNW were directed to refurbish the silos to ensure the high standards Pioneer Foods promises its customers.

The silo is around 77 years old, already having outlived its original life expectancy. To determine the cause of the structural distress and the best possible way to extend the silo's life for another 20 years, LNW conducted a root cause analysis. Making use of the latest state-of-the-art infrared and high-resolution scanning equipment, LNW collected evidence of the typical distress patterns to complete a thorough structural analysis.

The insights gained from this investigation indicated ring tension failure of the horizontal reinforcing with large areas of fatigue within the concrete walls. This information enabled the engineers to design and develop a complete silo rehabilitation repair methodology. The decision was to repair the entire silo complex, utilising external structural reinforcement methods such as horizontal carbon fibre composite strapping, along with various types of mortars, epoxies and protective coatings.

After assessing the original diagnostic survey and rehabilitation proposals, as well as trialling various product options, the team decided that Sika's innovative products were the best-performing solutions for this project.

LNW was appointed as the Consulting Engineers and Project Managers, and Sika products were specified in the tender. REDEC Industrial and Engineering Solutions, a specialised contractor, was appointed as the successful repair contractor. ■

PROJECT INFORMATION

- **Company entering:** Sika SA
- **Client:** Pioneer Foods
- **Start date:** October 2019
- **End date:** January 2020
- **Main Contractor:** Redec
- **Project Manager:** LNW Consulting
- **Consulting Engineer:** LNW Consulting
- **Quantity Surveyor:** LNW Consulting

PROJECT INFORMATION

- **Company entering:** CoreSlab
- **Client:** Venetia Mine
- **Main Contractor:** BMH Africa
- **Architect:** CSKO
- **Subcontractor:** Coreslab

VENETIA MINE RESIDENTIAL DEVELOPMENT

De Beers' Venetia Mine's mine accommodation projects are being fast tracked using hollow-core slabs to construct suspended slabs. Coreslab has helped Woodtec Construction, principal contractor, and BMH, project manager, deliver more than 100 residential units for De Beers' Venetia Mine. Last year, Woodtec Construction, BMH and Coreslab completed 33 apartments and 12 houses in Musina in record time.

On the more recent mine accommodation projects, Woodtec Construction and BHM were again working to a very tight schedule. The use of hollow-core slabs ensured swift and efficient construction of the units.

Hollow-core slabs provide a faster method of constructing a quality suspended slab.

Hollow-core slabs are reinforced or pre-stressed concrete slabs, comprising cores that extend the full length of the elements. They generally vary in thickness from 150 mm to 300 mm and span up to 14 m, depending upon loading, and are between 300 mm and 1 200 mm wide.

These precast-concrete elements are placed on a 5 mm to 20 mm-thick levelling screed on masonry walls with a minimum bearing of 100 mm.

To accommodate thermal movement on roofs or exposed balconies, bitumised soft-board or other similar materials are used. This makes allowance for changes in camber or deflection, particularly where light parapet walls are built on pre-stressed hollow-core slabs. Light mesh reinforcement is also placed in the finishing screed or topping in these circumstances.

Hollow-core slabs are significantly lighter than a large solid concrete suspended slab of equal thickness or strength due to the use of fewer raw materials. This reduces the cost of manufacture and transportation of the "planks" to site where they are lifted and placed, levelled and grouted to complete the suspended slab.

However, one of the biggest advantages of hollow-core slabs is that they are manufactured in a controlled factory environment where the non-modular sections are also cut to size according to the building dimensions immediately after the concrete has reached the required strength.

The various elements are then transported to site where they are lifted directly from truck and placed on top of the load-bearing walls using a mobile crane or truck-mounted boom crane. Once they have been installed, building contractors and trades are able to work on the structure almost immediately to significantly accelerate the building project. This includes above and below where there is no propping or staging. The building contractor also does not have to first wait for the concrete slab to cure to proceed.

Coreslab can install an element every five minutes to complete a floor structure in record time. This speed is also facilitated using special lifting tackle that has been engineered by the company.

The growing popularity of hollow-core slabs in this market is largely being driven by the severe workload in a very competitive and volatile industry. These factors are being exacerbated by widespread skills shortages in the construction sector.

Home builders and their professional teams want peace of mind that the installation will be done correctly the first-time round, while smaller architectural and structural-engineering firms are also increasingly specifying hollow-core slabs in the early design stages of the project to mitigate risk and reduce construction costs.

High levels of accuracy also minimise wastage, another notable benefit of hollow-core slabs that is complemented by the significant cost-savings in concrete, propping and labour that is associated with the use of both in-situ construction methods and rib-and-block systems. ■

RICHARD'S BAY MINERALS SILOS REPAIR

Cutting-edge colloidal silica post-placement pozzolan technology was deployed in the successful repair of five concrete silos at Rio Tinto's Richards Bay Minerals (RBM) operation, South Africa's largest minerals sands producer.

SCP 743 was specified as part of the repair design by LNW Consulting Engineers, a leading provider of multidisciplinary engineering and project management services to the heavy industrial engineering and commercial sectors. On the company's previous projects, SCP 743 enhanced concrete remediation practices. LNW Consulting Engineers also supervised the repairs, which were undertaken by Rodcol Contracts, a reputable concrete repair specialist with a solid track record providing quality services to all industries in the Zululand area, Swaziland, Natal Midlands, Mozambique and the Eastern Cape. The colloidal silica post-placement pozzolan technology was supplied by Spraylock Africa, the African distributor of SCP technology.

A total of 4 725 m^2 of concrete was treated with SCP.

Considering the sheer size of the silos, it was an extensive undertaking. Ore Silo 4 is 20 m is diameter and 34 m high; Char Silo 1 12 m in diameter and 25 m high; and the Lime and Magnetite Silos 7m in diameter and 17 m high.

The most onerous and time-consuming process entailed first erecting scaffolding inside and outside of the structures to provide access to the work areas, the largest of which was Ore Silo 4 where SCP was applied over 2 095 m^2. The external repairs first entailed removing the spalled and cracked concrete and then cleaning and treating the exposed reinforcing bar with an epoxy coating. SCP 743 was then applied to the opened concrete area to neutralise the concrete and bring it back to an acceptable level.

Considering that this was the first time that Rodcol Contracts used SCP technologies, the company received training on the correct application of the technology from Spraylock Africa. Spraylock Africa is the exclusive African distributor for Spraylock Concrete Protection based in Chattanooga, Tennessee in the USA.

Inside the structures, Rodcol Contracts repaired the cracked and spalling concrete and a provided a new 50 mm gunite layer. Colloidal silica post-placement pozzolan technology imparts ultra-high durability levels to conventional concrete mixes.

Colloidal silica post-placement pozzolan, "colloidal nano silica" or "nano silica" is a cutting-edge nano technology that has been used for more than two decades throughout the world, including in South Africa, to make the oldest commodity-based material more durable and, therefore, longer lasting.

These amorphous silicon dioxide particles are less than 100 nano metres in size and suspended in water. They are applied to concrete onto horizontal, vertical or overhead slabs after they have been cast.

Their extremely small size provides a tremendous amount of reactivity and pozzolanic potential – even greater than that of undensified silica fume. This reaction takes place in the capillary voids and pore space that are created in concrete as bleed water exits the construction material, essentially filling them with more calcium-silicate hydrate (C-S-H). C-S-H is the same reaction product that provides concrete with its strength and durability traits. Even under hydrostatic pressure, the movement of water through concrete is restricted. This waterproofing action considerably reduces water-borne contaminant ingress, including the transport of chlorides. These are the main sources of concrete degradation and structural failure throughout the world. ■

PROJECT INFORMATION

- **Company entering:** Spraylock Africa
- **Client:** Rio Tinto
- **End date:** November 2020
- **Main Contractor:** Rodcol Contracts
- **Consulting Engineer:** LNW Consulting

Experts in engineering innovation and asset integrity management

Cutting-edge engineering services prolong lifecycle of infrastructure assets

LNW Consulting Engineers and Project Managers, a leading multi-disciplinary engineering firm remains the first point of contact for cutting-edge structural maintenance, repair and rehabilitation services.

Over the years, we have gained a wealth of knowledge while servicing the structural maintenance, repair and rehabilitation requirements of leading heavy industrial and commercial engineering companies. Since our inception in 2001, we have refined and honed our ability to undertake these technically complex projects in high-risk environments.

Annual inspections ensure compliance

LNW Consulting Engineers and Project Managers undertakes periodic and annual inspections of structures to certify their structural integrity. This is in line with the requirements of the Occupational Health and Safety, as well as the Mine Health and Safety Acts. As part of this service, LNW Consulting Engineers & Project Managers develops a long-term maintenance repair programme for its clients.

Comprehensive baseline assessments

A comprehensive baseline assessment is then undertaken of severely compromised structures. To determine the possibility and feasibility of rehabilitating structures, the firm uses a host of engineering tools.

All structural anomalies, including cracks, as well as signs of spalling, leaching and erosion, are recorded and geographically mapped for future reference. Moreover, the structures are three-dimensionally and thermally scanned using drones and high-definition photography. In-situ carbonation testing and core drilling for sampling and laboratory analysis are also undertaken. This is in addition to half-cell potential measurements, ultrasonic scanning and rebound hammer testing. Notably, we focus on the functional purpose of the structure placing particular emphasis on duty cycles and natural frequencies. A further focus is on understanding the behaviour of typical atmospheric conditions on the structure, as well as previous maintenance and repair cycles.

Engineering a long-term repair solution

Repair design services are motivated in a baseline case assessment report. It includes a Finite Element Analysis (FEA) of the compromised structure. This is compared to the FEA of the proposed repaired structure. The rich information garnered during baseline case assessments enables us to suggest the best repair solutions, including a selection of materials for each. Our design will incorporate a repair method statement, as well as repair and material specifications. This is in addition to capital requirements and details of the planned repair programmes.

Developing and implementing a sustainable repair solution

The development and implementation of the repair programme is undertaken on a typical brownfield project-management basis. We therefore serve as a consultant engineering team or as part of a client owners team. The firm's responsibility includes procurement and detailed project planning.

Notably, the firm insists on back-to-back guarantees of at least 10 years from suppliers of repair materials. This novel approach, therefore, ensures longevity of the repairs, which are also monitored on an annual basis.

Concrete rehabilitation experts

LNW Consulting Engineers and Project Managers also harnesses the combined 40 years concrete rehabilitation experience of our team to extend the lifecycle of silo storage and cooling facilities, as well as reservoirs, concrete dams and any industrial type of facilities. It is a capability that we have been developing for more than 20 years to provide clients with a feasible alternative to replacing this costly infrastructure. Our service is complemented by our extensive skills and experience in building technically complex structures, including mass storage and cooling facilities, to provide a comprehensive engineering solution to our industrial and engineering clients.

LNW Consulting Engineers and Project Managers is well known to our clients for working hand-in-hand with their maintenance managers to design and scope repair works, no matter how technically challenging. LNW Consulting Engineers and Project Managers provides a full 360-degree project solution that keeps our clients' assets safe and in service for the foreseeable future.

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GOLOMOTI SOLAR PV AND BATTERY ENERGY STORAGE PROJECT, MALAWI

The Golomoti solar PV plant is the first with a Battery Energy Storage System (BESS) in Malawi. Golomoti Solar is being co-developed by JCM Power, a Canadian independent power producer (IPP) and InfraCo, an investment company of the Private Infrastructure Development Group (PIDG), with JCM Power managing the execution of the works.

Golomoti was Zutari's first EPCM appointment in solar PV. The solar power plant entered the commercial operation phase in early 2022. The project's success was possible due to several partners, including USAID providing critical development funding, Innovate UK's Energy Catalyst programme providing grant funding for the batteries and IFU providing JCM with debt funding.

Malawi is one of the poorest countries in the world, where only about 10% of its population has access to electricity. Completed in 2021, Golomoti is a 28,5 MWp solar PV and BESS project. The solar plant is coupled with a 5 MW/10 MWh battery storage system and will provide the Malawian power grid with 20 MW of much-needed power. In early 2022, the project entered the commercial operation phase.

Co-developed by JCM Power, a Canadian independent power producer (IPP) and InfraCo Africa, the project is the first utility-scale grid-connected hybrid solar and battery energy storage system in sub-Saharan Africa.

Zutari was the Engineer for the project and was extensively involved throughout site identification, concept development, tender development/ procurement, preliminary design and detailed design through to project execution.

In addition to the complex ground conditions of the Golomoti site, designing the PV array was complicated by the need to preserve a large, majestic Baobab tree. Instrumental in designing solutions for these challenges was the application of Zutari's 3D modelling and the company's latest computational design tool, 7SecondSolar.

Developed in-house, the tool allowed optimisation and design to be carried out efficiently, resulting in savings in both cost and time. The Malawi PV project showcases the future of project delivery where digital tools enable high performance, resulting in technical excellence.

Golomoti marks a significant milestone for the region as energy storage provides an important tool for integrating increasing amounts of renewable energy into a utility's networks. By including the BESS, the project reduces variation in output during cloud cover, supports controlling voltage and frequency of the grid and dispatches energy in the evening peak.

The ground conditions on-site were complex and changed with the seasons from hard ground to soft sludge. The team applied an innovative approach to testing the foundations and ground remotely due

PROJECT INFORMATION

- **Client:** JCM Solar Corporation Limited
- **End date:** December 2021
- **Main Contractor:** HEJ Engineering
- **Consulting Engineer:** Zutari
- **Geotechnical:** Geoconsult

to COVID-19 travel restrictions to understand site conditions. Creativity was applied in articulating the foundation risks to the client and developing an adaptive construction process to site conditions, enabling the client and contractor to make informed decisions.

The development of a power plant requires an extensive array of expertise and disciplines. Zutari brought together a solid team for the project, including civils, geotechnical and electrical comprising substation and overhead lines, grid code compliance, protection study, lightning and earthing protection expertise and digital skills in the form of 3D visualisation, 3D design and automation. Such technical mastery, led by eminent practitioners in each of these fields, occurring all in one team is unique, and Zutari brought this to the project. Some very complex problems were solved through collaboration across the teams and with the client using digital tools. The project demonstrates best-in-class.

Instead of overwhelming project team members with large numbers of drawings and specification sheets, they were shown one single Zutari 3D model that embodied all the equipment and layouts and was fully specified concerning dimensions and working clearances to meet the required standards. The desired detail could be revealed with a tap on the screen. This provided information on cable works, trench depths, cable spacing, backfilling, danger tape and crossing off other services, such as drainage and oil pipes, which could be indicated below ground level. Benefits of the use of Zutari's advanced 3D design technology for the electrical substations included:

- Enhanced accuracy through the increased exposure and reviews of every portion of the design.
- Design refinements were made to the manufacturing drawings for steelworks using accurate, detailed 3D models. This ensured all parts fit together.
- The detailed 3D design could be used to generate drawing numbers, as well as all the relevant manufacturing drawings needed for the manufacture of parts.
- The program could generate a detailed Bill of Quantities (BoQ) geared to the client's specifications and document needs.

Construction monitoring utilising the construction monitoring tool 'Elements' allowed weekly progress reports to be represented in 3D models. Using drone surveys and the model allowed efficient reporting of site progress and measurement of quantities, saving time-tracking progress.

Zutari's 7SecondSolar tool assists clients with layouts, cable routing options and equipment selections. It provides detailed and design-level accuracy BoQ, total and block-level trenching distances and cable schedules for all LV components and cables for the solar PV plant. In addition, unlimited iterations of block designs, site layouts, architecture options and equipment selection are available.

While most of these outputs feed into Zutari's engineering analysis and design, seeing this level of detail for each equipment or layout option allows the client to make exceptionally well-informed decisions on optimising the plant to their requirements. Applying 7SecondSolar optimisation contributes significant savings in both capital expenditure and energy losses.

Golomoti showcases the future of design where the best solutions are human-centred and planet-minded. Creating the best solution is finding the sweet spot – the intersection between business viability, technical feasibility, human desirability, and environmental sustainability. Golomoti Solar showcases how this can be achieved in reality.

The team's adaptability and resilience, together with effective partnering, enabled work in-country, such as the geotechnical investigation and pile testing, to continue through the intense COVID-19 lockdowns and multiple waves.

Adaptability was also showcased by the electrical team, which procured from a worldwide array of equipment to give the client flexibility in selection, optimising costs and logistics. These are essential considerations for a land-locked country where equipment must be sourced globally.

Civil designs were optimised to reduce costs by designing earthworks and drainage using locally available materials. Drainage was crucial, as the solution needed to consider the broader impact on the surrounding villages.

Golomoti is the first project to be built based on a design using Zutari's latest computational design tool, 7SecondSolar. It allowed Zutari to deliver a customised and flexible Solar PV design experience to the client, JCM Power, that is not available anywhere else on the market today.

Through 7SecondSolar, Zutari enabled JCM Power to make highly informed design decisions much earlier while potentially allowing them to commit to equipment suppliers much later. In addition, 7SecondSolar allowed Zutari to provide JCM with detailed BoQs and engineering calculations, including cable volt, drops, power losses and trench detail, with advanced visualisations in unprecedented short turnaround times. ■

N7, SECTION 1 FROM ATLANTIS SOUTH TO KALBASKRAAL (PHASE 2)

The second phase of the National Route 7, Section 1 from Atlantis South to Kalbaskraal is is one of several projects over the last decade contributing to the South African National Roads Agency SOC Limited's (SANRAL) process of upgrading National Route 7 (N7) which links Cape Town with the Namibia International border towards the north.

The entire section of the N7 in the Western Cape between the Melkbos Interchange just outside Cape Town and the town of Malmesbury has now finally been upgraded to a dual carriageway freeway in line with recommendations made in various traffic studies done.

This section of the N7 has been divided by SANRAL into three project phases as follows with AECOM the successful bidder for all three consulting engineering services appointments:

- Phase 1 – Melkbos intersection (Section 1, km 17) to Atlantis South intersection (Section 1, km 26).
- Phase 2 – Atlantis South intersection (Section 1, km 26) to Leliefontein (Section 1, km 43).
- Phase 3 – Leliefontein (Section 1, km 43) to Hopefield intersection (Section 2, km 6).

In February 2012, AECOM was appointed by the client, SANRAL, for consulting services for this phase of the N7 upgrading between Atlantis South intersection to Leliefontein (Phase 2).

Upgrading the N7 to a dual carriageway with freeway status meant that all existing at-grade accesses had to be closed and reconciled to an

improved secondary road network that links to the N7 via grade-separated interchanges. This had a significant impact on the surrounding landowners, communities and other roads authorities.

The Environmental Impact Assessment (EIA) process included numerous proposals for the improved road network layout for the N7 upgrading, each of which were assessed by a process with comment from all interested and affected parties. AECOM also undertook separate meetings with the directly affected landowners, as required during the land acquisition process, and initiated meetings with the provincial and municipal roads authorities affected by changes in their road networks.

Several alternative layouts were reviewed during the preliminary design stages until a preferred road network was finally selected for the detailed design stage. This process, which required extensive planning, innovative design and consultation, took more than two years mainly due to all the impacts on stakeholders, road users, surrounding communities and affected landowners.

The overall objective was to upgrade the route to a divided freeway standard with a 120 km/h design speed. Access to the N7 will be via grade-separated interchanges only. The route traverses a relatively flat topography with rolling terrain which is typical of the area.

A total of 12 bridge structures were constructed for this contract. Nine of these will be new and three will replace existing structures. The design of the bridge structures has largely been dictated by cost, constructability, construction sequencing, road geometry and future geometric requirements as well as hydraulic requirements, where applicable. Full structures reports detailing the structure options and findings were required by SANRAL.

There were two river crossings along the project section at the Sout River and at the Swart River. The N7 only crosses each of these rivers once while a newly proposed extension of the Klein Dassenberg Road also crosses the Swart River about 300 m east (downstream) of the N7. Detailed hydrology and hydraulic investigations were conducted for each of the river crossings to determine the capacity of the existing structures and newly proposed structures. The outcome of the investigations was that the existing bridge structures need to be replaced by larger structures.

On this project in particular ecological sustainability was a key feature and priority.

An EIA process for this project began in July 2012. The scoping phase of this process required the development of multiple project proposals. The proposals were developed through desk top studies, site observations, preliminary design investigations, as well as the requirements of the Project Brief, and were done in consultation with SANRAL, SLR Environmental Consulting and the municipal and provincial roads authorities.

The scoping phase concluded in September 2013 with the Department of Environmental Affairs approving the Final Scoping Report and providing further conditions for the impact assessment phase of the process. ■

PROJECT INFORMATION

- **Company entering:** AECOM
- **Client:** SANRAL
- **End date:** 25 October 2020
- **Main Consultant:** AECOM (SA)
- **Subconsultant (Design and Construction Monitoring):** ERO Engineers
- **Environmental Consultant:** SLR Consulting (Design Stage), J G Africa (Construction Stage)
- **Main Contractor:** Haw & Inglis Civil Engineering Construction (Previously Triamic Construction)
- **Piling Subcontractor:** Keller-Africa (Legacy Franki Africa)

RETREAT LOW LIFT SEWER PUMP STATION AND REFURBISHMENT OF EXISTING BULK OUTFALL GRAVITY SEWER

BVi Consulting Engineers was appointed by the City of Cape Town to undertake the planning, design, tender documentation, project management and site supervision for the construction of the new Retreat Low Lift Sewer Pump Station.

The pump station forms part of the Cape Flats Sewage Reticulation System. The proposed upgrades to the sewage infrastructure comprised of the following components:

- Constructing the new Retreat low lift sewer pump station with increased capacity of 750 l/s flows.
- Constructing grit chamber, installing automated screening equipment and odour control system.
- Cured-in-place-pipe (CIPP) technology trenchless underground pipe refurbishment and rerouting of an existing 1 050 mm diameter gravity sewer.
- Demolition of the old Retreat low lift sewer pump station, and construction of new multipurpose community sportsfield.

The underground concrete structure reaches depths of up to 9 m below ground. With geotechnical investigation indicating the water table at only 1 m below natural ground level, groundwater presented a challenge to the deep excavation which required continuous and extensive dewatering. A cofferdam (12,85 m x 50 m) with wellpoint dewatering system was constructed from sheetpiles up to 12 m deep. The excavation process for the construction of the pump station below ground concrete structure entailed extensive dewatering of the cofferdam. This allowed for continuous access to the deep excavation. The dewatering was finally decommissioned after the below ground reinforced concrete base, walls and ground level slab had been constructed and backfilled. This was a critical point as the concrete structure needed to have sufficient weight before the water table could be allowed to rise without resulting in the structure floating due to buoyancy effect.

The existing outfall gravity sewer was found to have deteriorated extensively and silted up above 50%, reducing the pipe capacity when construction commenced. This, along with regular local pipe collapses on the outfall gravity sewer, resulted in continuous surcharging of manholes and regular sewer flooding the Site. The overpumping scheme envisaged at design and local overpumping thus was regarded as a non-feasible approach as sewer could not be overpumped into a surcharged discharge chamber the and a silted outfall gravity sewer with reduced capacity.

A revised overpumping scheme was implemented which would allow bypassing of the problematic outfall gravity sewer main between Retreat Low Lift Pump Station and Retreat Main Pump Station. This was to mitigate on-going risk of further collapses and surcharging leading to sewer flooding the new pump station construction site and ensure ready access for proposed refurbishment of the outfall gravity sewer. It negated the need for additional local overpumping during the CIPP stage of the project and mitigated risk of regular extensions of time due to flooding of the site.

The new Retreat Low Lift sewer pump station was designed for energy efficiency, ease of operation and maintenance, high security and visual aesthetics. The incoming raw sewage has a high influx of rags and inorganic solids. Two automated mechanical raking screens (one duty, one standby) were installed to remove rags, reduce clogging and thus prolong the life span of new pumping equipment and downstream infrastructure.

Three immersible sewage pumps (two duty, one standby) were installed with variable speed drives in a dry well configuration. Telemetry system and Scada system were installed for early detection and relaying of signals and faults to enable quick response as well as offsite monitoring of the pump station. ■

PROJECT INFORMATION

- **Company entering:** BVi Consulting
- **Client:** City of Cape Town
- **Consulting Engineer:** BVi Consulting
- **Environmental:** Silito Environmental
- **Civil Contractor:** CSV/Mazarin JV
- **M&E Contractor:** Tricom Africa

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SPECIAL MENTION

NIKE SHAPA SOWETO

PROJECT INFORMATION

- **Company entering:** Aspire Consulting Engineers
- **Client:** Nike
- **Start date:** March 2021
- **End date:** December 2021
- **Main Contractor:** Billet
- **Architect:** C76
- **Principal Agent:** C76
- **Quantity Surveyors:** QS3 Architects
- **Consulting Engineer:** Aspire Consulting Engineers

The Shapa Soweto project is a flagship project for Nike and has been established on the ethos that sport has the power to change the world and thrives off connecting and uniting people. Shapa Soweto started during the South African 2010 FIFA World Cup as a world-class football training facility for footballers in Soweto. The facility was aimed at bringing together the highest quality trainers and coaches to inspire youth through sport while teaching them important life skills and contributing to their overall development. The facility was extremely well used at first but began losing support over time as it failed to pique the interest of the wider community. An intense renovation and relaunch of Shapa Soweto was therefore commissioned by Nike in 2020 with the aim of creating a facility that gives young people the creative freedom to discover the sports and activities that move and inspire them.

The project has diverse aspects that make it noteworthy – from the technical nature of the works; to the value built environment professionals try to create for the end user; the lessons learnt along the way that have united us. This project is unique in its aim to bring communities together – which epitomises the spirit of Ubuntu.

This project was carefully coordinated by the professionals and the client with a considerable attention being placed on the technical requirements. This with the significant time pressure further exaggerated by the effects of the global pandemic almost resulted in the project not going ahead. The team however mitigated against this.

The project had a large community involvement and at times contributed to the challenges with the project

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during construction. The project's technical nature - from lifting a roof of an existing building and installing a dance floor – to the social yard canopy installation with minimal columns required plenty hours of grueling design work and team work to get the project to its final position. But most of all the project is noteworthy because a small engineering firm successfully delivered a unique project to a billionaire international client. The project was highly technical, and the time pressure was significant. But today there stands a facility that unites a community.

For us the most rewarding part of the project is the change it will bring to underprivileged communities where leisure activities are often disrupted by the quest to fulfil basic needs. The facility will host sports as well as after school activities to over 300 school children and further assist as a safe space for women and children. The project is an exemplar of what private-public partnerships can achieve.

The same energy and optimism that ran through the professional team, contractors, community members involved in the project now resonates within the walls of the building itself.

In the words of Caster Semenya: “First you build the human, then you build the athlete, and then you build the leader.” ■

GOLD FIELDS SOUTH DEEP GOLD MINE DOORNPOORT TAILINGS STORAGE FACILITY (TSF)

In 2007 Golder Africa (now WSP in Africa) and Metago (now SLR Consulting) were appointed, to and in 2009 completed the design of the Doornpoort Tailings Storage Facility (TSF), a 400 ha TSF with a 14 ha, one million cubic metre HDPE lined Return Water Dam (RWD). The design of the TSF included, but was not limited to, the following infrastructure:

- Earthfill starter walls.
- Concrete encased penstock decant outfall pipeline including six temporary penstock intakes and one permanent penstock.
- Underdrainage systems within the TSF (toe drain, main drain and cut-off curtain drains) along with a drainage collection system downstream of the TSF wall.
- Catchment paddocks with associate decant structures.
- Silt trap.
- Three pump stations (2x slurry and 1x water).
- Three motor control centres.
- 12 km of overhead powerline.
- Two provincial road crossings.
- 35 km of steel HDPE lined pipelines.

Due to WSP and SLR's history with providing project management and resident engineering support during the success of Phase 1, the client saw the benefit of appointing the same consultants and as the owners' team for Phase 2 (140 ha) and again WBHO was appointed as the main contractor for a 1-year project.

The main components of the Phase 2 project consisted of bulk earthworks, main and toe drains, two concrete penstock towers, choke station and 4,6 km of steel HDPE lined pipelines. ■

PROJECT INFORMATION

- **Company entering:** WSP Group Africa and SLR Consulting
- **Client:** Gold Fields South Deep Mine
- **Start date:** 16 May 2021
- **End date:** 31 September 2022
- **Main Contractor:** WBHO
- **Project Manager:** WSP Group Africa
- **Quantity Surveyor:** Bossert KPO
- **Consulting Engineers:** WSP Group Africa and SLR Consulting

PROJECT INFORMATION

- **Company entering:** Naidu Consulting
- **Client:** KZN Department of Transport
- **Start date:** 3 February 2020
- **End date:** 26 November 2021
- **Main Contractor:** Icon Construction
- **Principal Agent:** Naidoo Consulting
- **Consulting Engineer:** Naidu Consulting

MSUNDUZE BRIDGE

Located in the heart of the Mandeni Local Municipality features the successfully completed Msunduze River Bridge, a four-span continuous reinforced concrete river bridge, straddling a total of 65 m over the Msunduze River. In addition to the construction of the bridge, the works included the upgrade of the gravel Local Road L3110 and its associated stormwater infrastructure. The successful completion of the project has not only improved the level of service delivery for the Nyoni and neighbouring communities by providing infrastructure development, but has also left its mark through the realisation of significant social initiatives that have uplifted and developed the skills of local community members and targeted enterprise contractors.

The project boasts surpassing the contract targets in all areas of community-based initiatives such as job creation, contract participation goals as well as accredited and on-the-job practical Training to both local community members and emerging contractors. Through a collaborative effort of the KZN Department of Transport, Naidu Consulting and Icon Construction this was realised through detailed planning, social facilitation and the implementation of labour-intensive construction principles. Despite the complexities associated with the construction of a reinforced concrete river bridge and the challenges faced with the COVID-19 national lockdown restrictions, the main contractor, with the extensive participation of the emerging contractors were successful in overcoming these challenges and successfully completed the project in November 2021, whilst strictly adhering to quality control and programme related constraints.

Naidu Consulting was appointed by the KwaZulu-Natal Department of Transport to undertake the design and construction supervision of the Msunduze River Bridge. The motivating factors that contributed to the requirement of a river crossing was not only to facilitate safe travel for pedestrians including scholars and the elderly but also to improve access for emergency services and encourage long term economic development by 'unlocking land' and promoting public transport to the Nyoni and neighbouring communities.

The structure comprises of a four span, cast in-situ solid concrete deck. The deck slab was made continuous over the piers to eliminate the necessity for expansion joints, limiting them to the abutments only.

Abutments and piers are reinforced concrete that are on pile caps consisting of 750 mm diameter piles socketed into bedrock.

At design stage, the social aspects of the projects were given high priority by the intentional inclusion of design elements that were able to incorporate labour intensive construction methods as well as by the inclusion of work suitable for targeted enterprises. Innovative ways to achieve CPG were thought of at design stage, making the approach of the project unique. ■

N2 REALIGNMENT UMHLALI BRIDGE TO UMVOTI BRIDGE

Naidu Consulting's emphasis on value engineering ensures that innovation is continually introduced to improve efficiency, enhance productivity and service quality through all its projects. The design improvements resulted in the realignment of horizontal curves north of the Umhlali and the Umvoti River Bridges and the construction of the pavement structure to match the existing concrete pavement structure and lane configuration.

The realignment of the N2/27 at the Umhlali and Umvoti river bridges boasts as the first road infrastructure project in South Africa to be implemented on the BIM 360 platform in 4D illustration. The software that was utilised to achieve the 4D Model were, Civil 3D, Navisworks, Microsoft Projects and BIM 360.

The success of BIM required the Client's support as well as commitment from both the engineer's and contractor's supervision teams leading to a collaborative production of project information. The project team for this project comprised SANRAL (Employer), Naidu Consulting (Consulting Engineers) and Raubex (Contractor).

Numerous design options were investigated for the realignment of the existing horizontal curves north of the Umhlali and Umvoti Bridges. Different combinations of curve radii, curve lengths and superelevation rates were investigated in order to achieve a 120 km/h design speed. However, each combination resulted in the superelevation development occurring within the bridge and as a result the existing bridge parapets would require re-construction.

Transition curves were introduced as part of the design in order to contain the superelevation development within the transition length thereby limiting the change of the finished road levels to outside of the bridge extents.

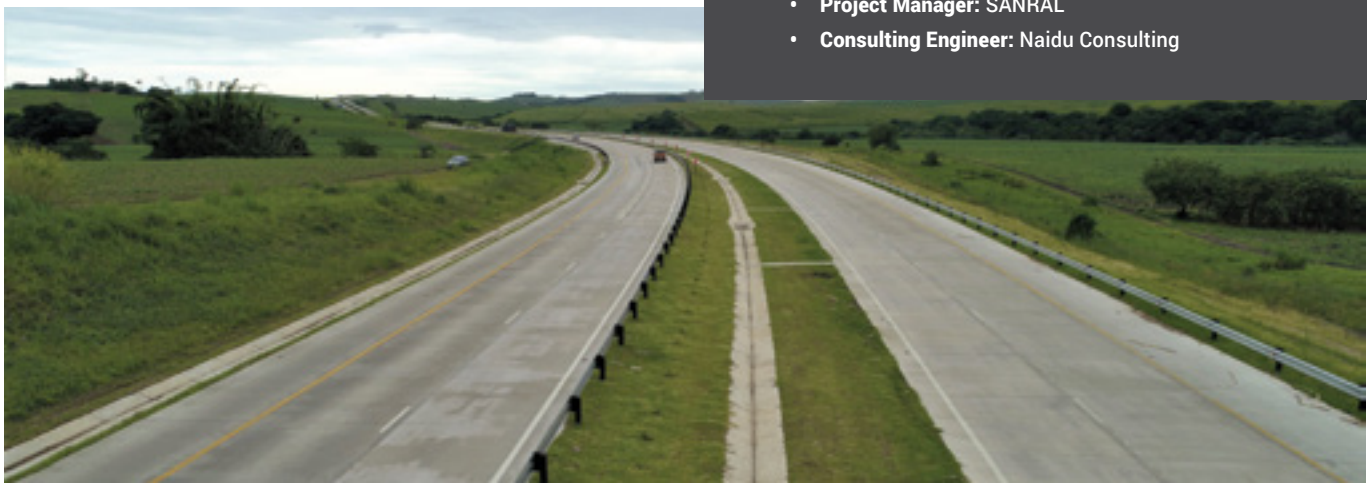
The introduction of transitions curves resulted in the superelevation development taking place outside of the bridge. Therefore, eliminating the need to re-construct the existing bridge parapets. This proved to be the more feasible and economical solutions without compromising the safety of the road users while still achieving the required minimum design criteria for the proposed design speed.

While the scope of works for the construction of the road did not deviate from the conventional construction methods, the project was viewed as a great opportunity to showcase the innovations present in the industry by delivering the project Construction and Close-out phase through "Digitisation". The digitisation of the project was implemented through BIM 360 solution, which is a cloud based Common Data Environment (CDE) that allows paperless workflows. A 4D BIM model is a 3D geometric model of the road which is further advanced by linking it to a Construction Programme, thereby giving a real time visual simulation of the scheduling and sequencing of the construction activities on site.

The 4D model is then uploaded to the Common Data Environment (CDE) BIM 360 platform where more data is linked to it. This data is managed through data collection templates that include inspection checklists, quality control checklists, and product/material specifications, which are georeferenced as pins in the model. All this information, once linked to the model, completes the 4D BIM Model. This model can be used and accessed at any given time by the asset owner to get a visual representation of the asset – confirming that the asset has been built to specifications, access to specifications and quality control data within the 4D model by just a click of the button. This easily accessed 4D BIM model makes it easy for the asset owner to plan and carry out maintenance in the future. ■

PROJECT INFORMATION

- **Company entering:** Naidu Consulting
- **Client:** SANRAL
- **Start date:** March 2020
- **End date:** 13 October 2021
- **Main Contractor:** Raubex KZN
- **Principal Agent:** Naidu Consulting
- **Project Manager:** SANRAL
- **Consulting Engineer:** Naidu Consulting



REHABILITATION OF 13,4 KM OF TRUNK ROAD 31/2 FROM ASHTON TO MONTAGU THROUGH COGMANSKLOOF, INCLUDING THE NEW ASHTON ARCH BRIDGE

The project aimed to reconstruct parts of the Trunk Road 31 Sections 2 and 3 from Ashton to Montagu (start of tourist Route 62). This was needed to improve traffic and pedestrian safety, as well as to improve the flood capacity of bridges and resistance of the overtopping of the road at several problem locations. It included the upgrading of the historic Cogmanskloof Pass which was originally completed in 1877 by the renowned road engineer Thomas Bain.

The 13 km long road section is also the start of the strategically important tourist 'Route 62' with more than 8 000 vehicles travelling through Ashton and 4 000 vehicles through Cogmanskloof Pass toward Montagu every day.

The New Ashton Arch is South Africa's first concrete tied arch bridge constructed using a transverse launching method. It represents a proud moment for the Western Cape Government, Department of Transport and Public Works: Roads Branch, the people of the Ashton-Montagu area, and all the contractors, labourers and suppliers who were involved in the project.

AECOM was the appointed structural engineer, while the build was contracted to H&I Construction. State-of-the-art bridge analysis and software packages were used for the construction stage analysis, in-service analysis and design, a joint effort by AECOM teams in South Africa and the United Kingdom's long-span complex bridge teams.

The management team of H&I Construction worked in close relationship with AECOM to develop meticulously detailed method statements, well in advance of each activity, to ensure compliance and agreement before construction commenced. ■

PROJECT INFORMATION

- **Company entering:** AECOM
- **Client:** Western Cape Government, Department Transport & Public Works, Roads Branch
- **End date:** 30 March 2022
- **Main Contractor:** Haw & Inglis Civil Engineering
- **Consulting Engineer:** AECOM

SANI PASS PHASE 2 ROADWORKS (KM13,6 TO KM25)

The Sani Pass, which was built in the 1950s, remains a problematic drive in 4x4 vehicles, with all the challenges, bad weather, and treacherous conditions that one would expect from a pass with an altitude of 2 876 m above sea level.

In 2005, Lesotho and South Africa signed a cooperation agreement to improve commercial, social, and economic opportunities and accessibility between the SADC countries. Included in that agreement was the upgrade of Sani Pass to improve road drainage, prevent gravel loss, and limit erosion caused by high-intensity storms and flooding.

As per the agreement, South Africa will surface the P318 up to Sani Top, and Lesotho will surface the road to Mokhotlong, with the ultimate goal of having a surfaced road all the way to Maseru.

The project comprises three phases:

- Phase 1 – From km 0.0 (junction with Main Road P126 from Himeville) to km 13.6 (Good Hope Trading Post).
- Phase 2 – From km 13.6 to km 25.0 (SA Border Post).
- Phase 3 – From km 25.0 to km 33.0 (summit at Lesotho Border Post).

Phase 1 was completed approximately 12 years ago, Phase 2 was recently completed (the roadworks portion is included in this submission), and construction of Phase 3 is yet to begin.

This submission is for Phase 2 of the Sani Pass upgrade project. It involves roadworks between the Good Hope Trading Store at km13,6 and the South African Border Post at km 25.0.

The section of the P318 in question begins at km13.6 at an elevation of 1,577m. It generally follows the southern banks of the Mkhomazana River as it climbs the escarpment in a series of steps with relatively long sections of moderate gradients interspersed with short sections of steep gradients. Temperatures in the Drakensberg range from -20°C to 35°C. The area's climate is defined by high annual rainfall of 1 800 mm and severe storms in the summer months. Winter brings cold temperatures and snowfall, and the upper sections of the Pass are frequently covered in ice.

The existing gravel narrow track and drainage system could not handle the high-intensity water run-off on steep gradients, resulting in excessive scour and gravel loss. Gravel is a non-renewable resource, and good quality gravel is especially hard to come by in the Drakensberg.

The eroded gravel eventually settles in local streams and rivers, particularly the Mkhomazana River, causing sedimentation and pollution in the lower reaches and negatively impacting aquatic biodiversity. Furthermore, the dust created by passing vehicles negatively impacted the biodiversity of the adjacent vegetation. ■

PROJECT INFORMATION

- **Company entering:** Royal HaskoningDHV
- **Client:** KwaZulu-Natal Department of Transport
- **Consulting Engineers:** Royal HaskoningDHV in Joint Venture with Semenya Furumele Consulting
- **Main Contractor:** Leomat Construction
- **Geotechnical Consultants:** ARQ Consulting Engineers

TASEZ 'CLUSTER 2' FORD FRAME

The Ford Frame hub is part of the Tshwane Automotive Special Economic Zone (TASEZ), Africa's first automotive city. The zone has been conceived to be a catalyst for employment, transformation and socio-economic development and industry growth by being a node attracting automotive suppliers and automotive-related manufacturers, assemblers and supporting services.

TASEZ is being built as a partnership between the Ford Motor Company of Southern Africa (Ford) and the Department of Trade and Industry (DTI). The Ford Frame hub is a 100 000 m² facility that consolidates offices, warehouse space for Ford and its suppliers, as well as a chassis E-coating, waxing facility, and assembly line for their vehicles. Zutari was appointed as the Structural Engineers for the building.

The Ford Frame building is a massive structure with a footprint of 78 000 m² and a gross building area of approximately 100 000 m² (including the basement) (including canopies and basements). The purpose of the Ford Frame building is essentially to serve as a manufacturing, painting, and storage factory for the new Ford chassis in South Africa. The building hosts the largest Chassis E-coating pit as well as the biggest hoist structure in Africa.

The quality of the structural engineering design was one of the pillars contributing to a successful project. There were many challenges in conceiving and delivering the structure for this project, such as:

- The building had to be delivered within an extremely short time frame: 14 months from inception of the design process to delivering the final phase of the building to Ford for beneficial occupation. The building had to be completed in phases so that Ford could start installing their equipment, while construction of the remainder of the building was still under way. This posed numerous logistical, operational, and structural challenges as parts of the building had to be completely stable on its own, while other parts were constructed.
- Due to the first bullet above, the design and delivery of this project had to run concurrently. The team was in constant collaboration with the Ford and TASEZ Representatives with design coordination meetings happening daily for the first few months. This meant that Zutari had to design the building structure to be as adaptable as possible, since many of the design parameters and constraints were not known at the time of construction. The structure had to provide Ford with the flexibility to "change their minds" at a later stage, within reason.
- On this building, the structural system interfaced with all the disciplines and had to accommodate aesthetical, mechanical, electrical, wet-services and fire engineering requirements. It meant that, whereas on more conventional warehousing or commercial buildings the structural engineer mainly interfaces with the architect, on the Ford Frame building Zutari had to collaborate and coordinate directly with all trades, while complying with the rigid budgetary allowances. The building also had to be made as easily constructable for the contractor as possible. While this had its challenges, since many of the "forces" were opposing (budget vs speed of construction, mechanical openings/weights vs structural, the tenants international design standards vs South African building norms), it also gave Zutari the unique opportunity to co-create the building – which is an exciting prospect for a structural engineer.
- Tenant Specific Loading and Functional Requirements: The Ford specialist loading requirements on the structure resulting from the coating tanks, plant and platforms suspended from roofs as well as dynamic loading from overhead traveling cranes demanded a quality and robust structural design. Serviceability limit states (specifically deflections and vibrations) were the governing factor in most of the cases.
- From the above, it is evident that the structural design had to fulfil many functions and had to be of the highest quality so that it could be integrated with the facility's functionality, while promoting fast-track construction and complying with the budgetary constraints.

Zutari promoted the use of Revit/BIM interoperability, which also proved to be of immense value during the reviewing process of structural steel workshop drawings, where Zutari's 3D models were overlaid on the contractor's fabrication models, with no loss of accuracy/data during the importing/exporting process. This process also accelerated turnaround time, allowing the contractor to fast track their fabrication.

Navisworks was also used by the entire professional team to assist in the coordination of services and the resolving of clashes between the various services, all to mitigate the risk of any delays or abortive works that could lead to negative programme and cost implications. ■

PROJECT INFORMATION

- **Company entering:** Zutari
- **Client:** Tshwane Automotive Special Economic Zone (TASEZ)
- **Main Contractor:** WBHO
- **Steelwork Contractor:** Cadcon
- **Cladding Contractor:** Tate & Nicholson
- **Flooring Contractor:** CHC-SA Concrete Floors
- **Structural Engineer:** Zutari
- **Architects:** DGIT Architects
- **Quantity Surveyor:** RPE Consultancy Services

PROJECT INFORMATION

- **Company entering:** ADA Consulting Engineers
- **Client:** The Kliptown Youth Programme
- **Architect & Principal Agent:** Roger Davies Architects
- **Quantity Surveyors:** JS & Associates Quantity Surveyors
- **Structural & Civil Engineers:** ADA Consulting Engineers & Mironox Consulting Engineering Services
- **Contractor:** ENZA Construction

THE KLIPTOWN YOUTH PROGRAMME

Kliptown's Youth Programme's (KYP) mission since their humble beginnings in 2007 has been to provide opportunities that will enable young people to rise out of poverty. They seek to develop young and dynamic individuals who are willing to contribute effectively for the betterment of their community. KYP's tutoring, athletic, and arts programs provide a life to the children of Kliptown not defined by survival, but by their ability to be active community members, to have dreams, and most of all, to have hope for their futures.

ADA Consulting Engineers in a joint venture with Mironox Consulting Engineering Services were appointed to provide the civil and structural engineering services for this ground-breaking social infrastructure project.

The site is situated in Kliptown, Soweto, is surrounded by informal dwelling structures built right up to and against the boundary walls. The property is narrow and long and has the lower boundary onto a wetland. These circumstances all provided some unique challenges. The architectural design demanded a first world facility which, considering its place, required construction solutions enabling employment opportunities from the local community. The unusual combination of high specification structural steel fabrication and labour intensive construction methods were employed.

The architectural spacial design required the primary learning block to have a tuition class rooms on the perimeter around a central large double volume but weatherproof communal space. The solution to this main building was a central double volume structural steel structure which was fabricated, transported to site and erected first.

This structure once erected immediately simplified the construction in providing the line and level for the more labour intensive masonry construction of the surrounding classrooms.

These surrounding classrooms were double storey built from load bearing masonry walls and in-situ reinforced concrete slabs all requiring substantial labour in their construction. These classroom structures were in turn relied upon to brace the central steel structure thereby reducing the steel member sizes and optimizing its cost. This symbiotic relationship between the different structure types embodies the relationship between the Kliptown Youth Programme and the surrounding community which it serves.

Kliptown in Soweto, has 44 000 residents of which 3 out of 4 adults are unemployed, the community struggles with a high number of teenage pregnancies; HIV/AIDS; substance abuse and food insecurity. Their underperforming schools are overcrowded with one teacher for 40 to 50 students.

The Kliptown Youth Programme was established in 2007 by a group of individuals in the Kliptown community, with the view to uplift the children and youth in the community by providing a facility that focusses on improving education. The site of the existing facility lies on the southern side of the Kliprivier in Soweto.

The programme has been so successful, that KYP was now in a position to completely revamp the old facility by demolishing the entire campus and building new optimised spaces to carry out the required functions to the 500+ members of the community that they now serve.

The new facility has a hall, 20 classrooms, a library, computer laboratory, administration block, an Astro turf playing field as well as a complete revamp and re-structuring of the existing buildings. As it is the role of the KYP to serve the community, the project provided work opportunities for the local community. ■

PROJECT INFORMATION

- **Company entering:** dhk Architects
- **Client:** RDC Property Group
- **Start date:** Design (November 2014) and on site (May 2019)
- **Main Contractor:** GVK Siya-Zama
- **Architect:** dhk Architects
- **Principal Agent:** Iqual Project Managers
- **Quantity Surveyor:** Smith and Co.
- **Consulting Engineer:** Sutherland Engineers

OLD CAPE QUARTER

A complex structural analysis and intervention was required to carry the load of the four additional floors onto the existing structure. A large percentage of the foundations had to be enlarged, underpinned or replaced. Extensive temporary steel structures were required to facilitate façade retention during construction as well as the removal and/or strengthening of columns and slabs.

The retail/office centre was previously becoming disused following the opening of the larger Cape Quarter and was in need of a major upgrade.

The redesign demonstrates a true mixed-use environment with retail, office and residential spaces surrounding a publicly accessible courtyard which allows the surrounding community to positively interact as a tenant or patron, facilitating the meeting of likeminded people. Furthermore, the development provided employment during construction, as well as via the servicing of the building post-construction.

Security in the precinct is enhanced by having a 24/7 mixed use precinct with activated street frontages.

Adaptive reuse/extension: Rather than demolish the existing structure and build a new building, the decision was taken to retain the existing structure, street facades and parking below (with minor strategic demolition where absolutely essential) and to design an additional contemporary four-floor architectural intervention above, which intentionally contrasts with the heritage buildings on Waterkant and Hudson Streets. Reconfiguring the existing internal layouts and courtyard footprint as well as adding four levels onto the existing structure led to an innovative layered hybrid development,

which resulted in a unique intervention.

Fragmentation of form: The smaller scale and fragmented character of the historic De Waterkant context is referenced rather than mimicking as a pastiche. This was achieved by fragmenting the building mass into smaller distinct plastered masonry forms, respectfully set back from the existing streets frontages.

Façades: Dissimilar to most high-end residential schemes in Cape Town (with the expressed slab edges and maximized glazing) this contemporary plastered wall structure features punctured window apertures that vary in size, alignment and depth to create a contemporary addition to the existing buildings.

The adaptative reuse and extension of the existing building is the key driver of environmental sustainability as substantial embodied energy savings are made by repurposing buildings. Furthermore, the project demonstrates:

- Adherence to the City Densification Strategy.
- Enhancement of a publicly accessible landscaped courtyard.
- Reduction of energy loading requirements: through a double-glazed performance façade to reduce solar heat gain, optimisation of the exposed MEP services specification, and intelligent passive design measures.
- A well-considered material selection.
- Future-proofed design for different tenant types on lower ground, ground and first floors.
- No additional parking built on site over than existing.

From the architects' time/cost perspective this project required a disproportionate amount of time and costs in preparation and approval of a design which could be approved by the neighbourhood commenting bodies, City and provincial Heritage Bodies, City Zoning and Construction Plans approval.

In terms of cost and quality, the client (Tower Property Fund at the time) understood the need to balance the project viability with a building that required a high level of specification for the facades, landscaping and interiors due to the building context as well as the target market for tenants and apartment purchasers.

The complexity of the construction onto existing buildings in terms of programme, unexpected discoveries on site and cost thereof made the viability challenging. ■

GREEN SCHOOL SOUTH AFRICA

Green School South Africa is the first building in Africa which complies with the most stringent green building certification, the Living Building Challenge (LBC), which is organised around the seven performance petals of the LBC. The goal being to create a Living Building/Campus that incorporate regenerative design solutions that improve the local environment rather than simply reducing harm.

This means they must produce more energy than they use; use less water than the site naturally receives; increase rather than reduce the biodiversity and beauty on site; and be healthy – providing plenty of natural light, fresh air, food, a close connection to nature and a sense of community.

Green School South Africa, is an eight-hectare sustainable schooling campus located in the low-lying Paarl Valley in the Western Cape, spatially defined by the Paarl Berg to the north, Drakenstein Mountains to the east and south, and Simons Berg towards the southwest. The spatial arrangement at a macro level is what inspired the space making, but also down to the individual buildings and spaces between them.

Reoccurrence of multiples at incremental scales is an idea that defines the behavior of most natural systems. The architecture of the individual buildings is defined by organic tectonic shapes originating from the mountains that contain the valley but also more directly from the Paarl Berg Boulders. These solid shapes are arranged to accommodate the programmatic need of each of the individual buildings.

The first phase of the campus was completed in February 2021. Which constitutes of various clusters of buildings nestled in amidst orchards, vegetable gardens, walkways, landscaped terraces and spill out spaces. These buildings include 16 classroom facilities for children ranging from kindergarten to Gr 8, the Sangkep (Balinese term for a multipurpose space), an Administration Building, Heart of the School, Recycling Centre and Composting Station.

Upon arriving at the school, a landscaped gabion wall leads the visitor to the Administration Building that sits on the main axial circulation spine of the campus, linking the more public buildings together. These buildings include the Sangkep, tree-lined Market Area, Deli, Co-Working Space and Heart of the School. The Heart of the School is the centre of the precinct were all the paths converge. The building is defined by three boulder-like shapes defining the path leading from the arrival plaza.

The main circulation spine branches off into carefully considered meandering routes, to create moments of excitement, wonder and discovery. These secondary routes lead to the Primary School and Kindergarten where both spill out in landscaped courtyards. The Kindergarten Cluster is sheltered and hidden by landscaped berms, and the walkway covered with a hand-woven sapling growing tunnel.

Visual connectedness of the buildings is not the only aspect that link the architecture with nature..

Phase 02 is set to start in 2023, which will include a Middle School and High School. ■

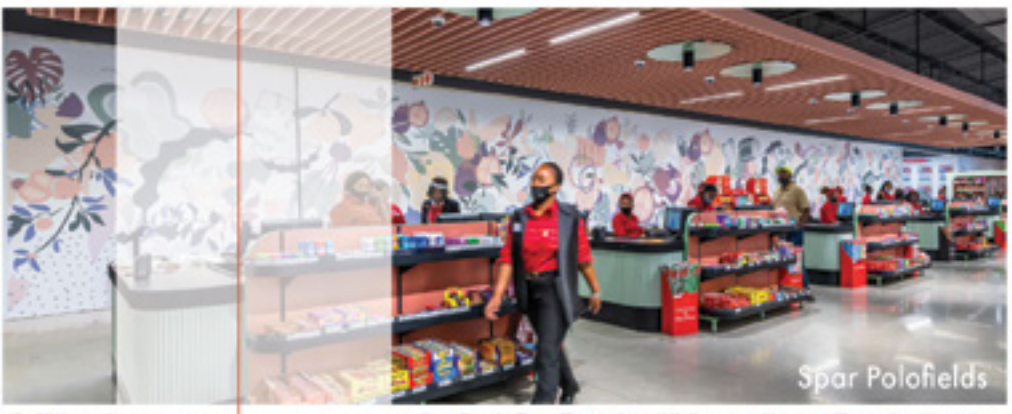
PROJECT INFORMATION

- **Company entering:** GASS Architecture Studios
- **Client:** First Transaction Capital
- **Start date:** February 2020
- **End date:** February 2021
- **Main Constractor:** Energy Master Builders
- **Architect:** GASS Architecture Studios
- **Consulting Engineer:** Sutherland Engineers

One on Mutual

Jewel City

Tobakhuis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Green School South Africa

GASS

ARCHITECTURE STUDIOS

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BUSHBUCKRIDGE SHOPPING CENTRE

Located in the vibrant town of Bushbuckridge in Mpumalanga on the corner of the R40 and R533, the refurbishment of the Bushbuckridge Shopping Centre commenced early in August 2020 and had its opening on 18 November 2021.

The previous centre was approximately 18 800 m^2 and has undergone a complete revitalisation of leasing providing a much improved environment for both the tenants to trade and shoppers to enjoy a pleasurable retail experience that services their needs. An additional 5 000 m^2 of GLA now includes a new Pick n Pay supermarket and liquor store of 2 500 m^2, Sheet Street, Identity, Mr Price Clothing and Style, to name a few.

Prior, the shopping centre had poor aesthetic quality canopies, paving, planting, shopfront, columns and balustrades. Shopfronts looked worn out and old-fashioned, signages were ineffective and outdated and the majority of the plants and planter boxes acted as barriers for pedestrian flow and visibility. All these contributed no aesthetic value to the centre.

However, the site has considerable changes in level that had to be included in the design and allow for ease of access for all shoppers. This proved quite a challenge and these level changes were dealt with by a series of ramps and stairs which double up as seating areas which serve the many shoppers who arrive on foot and make use of the post office facility for grant collection once a month.

All walkway canopies were resheeted and the extent of canopies was extended to provide adequate shaded areas to improve comfort to the open retail environment for shoppers where a portion of the existing mall received a new roof, a Nutec application was used to clad the extended mall façade which also received a water jet cut design into the boards.

Careful consideration was given to the design of the new covered portion of the mall which included for high level openings which maintained the beauty of natural light as well as eliminated the requirement for a sprinkler installation.

All public ablutions and interior mall façades have been uplifted. The mall areas have received new shopfronts with intricate cladding details above and new tenant signage. External façades also include far improved opportunity for tenant signage providing them with greater exposure.

There are two new entrance tower features where seating has been integrated into planters. These main architectural features and new branded mall signage to entrance 5 stands proudly above the new roof line and pool of parking below providing excellent visibility and immediately displays the new vibey edge that the refurbishment of the mall has brought about.

In an attempt to be consistent with existing facebrick, but to introduce a new energy into the aesthetic, a positive and negative detail was developed within the brickwork which is also transferred into the patchwork of paint colour application to brick details at planters and entrances. ■

PROJECT INFORMATION

- **Client:** Nthoese Developments and Sampada Private Equity
- **Start date:** August 2020
- **End date:** 18 November 2021
- **Main Contractor:** Belo & Kies Construction
- **Architect:** Bentel Associates International
- **Project Manager:** PROLEAD Professional Consulting
- **Quantity Surveyor**: Ilungile Consulting Services

3 ALICE LANE

The development team sought to develop a concept that would not only cater for Bayport's requirements but also would re-establish 3 Alice Lane within the greater Alice Lane precinct.

The design was such that it needed to provide a solution for the tenant to operate in the building while under construction. The design solution was to use a unitised facade system to be installed on the exterior precast panels, with the old glazing being removed outside working hours when the tenant was not operating.

The existing façade of the building had begun spalling and posed a safety risk. Compared to recently completed counterparts in the Sandton precinct, the building had become dated in terms of its aesthetic design and environmental performance.

Unitised facades were used which consist of pre-fabricated assembled units that can be moved directly from the factory environment to site for fast installation onto pre-prepared fixings, thus improving efficiencies and overall quality control on site. The end result being a perforated unitised façade system, distinguished by the use of a Galtex ventilated façade system. This unitised system is made up of a high-performance, solar-reflective coated glass product that delivers energy efficiency that exceeds the minimum regulatory requirements.

With a combination of bending and folding aluminium, thereafter the introduction of perforations of non-regular shapes that are not typical to similar projects in South Africa, the architects achieved what can be considered as a piece of 'urban art'. The complex perforation was achieved in collaboration with a Serbian collaborator. The patterns and angled planes of the facades were achieved by the Structural team with the use of digital tools. The final façade is alive with movement and appears visually different, depending from which angle you view it. A tapestry of true African innovation in its detail and construction.

The double-skin façade, not only contributes to solar shading for the building occupants, but also provides a fresh aesthetic that is on par with other commercial property assets on Alice Lane.

From the outside, the perforated facades seem solid, however, from the inside the perforated aluminium screen has transparent opening views and bring defused light into the interiors.

Building information modelling (BIM) was the key practice to integrate design, manufacturing and construction processes to increase the level of transparency and internal operation among the professional teams and contractors. Pre-fabricated components and advanced fabrication tools were used to bring the three-dimensional façade to life. This refurbishment embraces the energy of its context but starts to demonstrate the level of skill, technology, and design enthusiasm within our architectural landscape and built environment. Consisting of over 900 panels all stitched together like an African quilt, this double skin facade is layered and introduces a three-dimensional dynamic façade plain being the first of its kind in the Sandton Central District. The Architect took ordinary materials and used such in an extraordinary way.

A secondary double-skin façade adds a 'wow' factor to the design and what we deem as a giant piece of 'Urban Art' infused in built form. With Johannesburg arguably being the largest man-made forest in the world, as part of designing and conceptualising the aesthetic of the perforations, a concept of a forest tree canopy was adopted as a 'natural algorithm' that would define the perforated holes and create a giant-sized artwork that can be seen on the street-facing façade. ■

PROJECT INFORMATION

- **Company entering:** Arc MU:V
- **Client:** Public Investment Corporation
- **Start date:** 20 June 2019
- **End date:** 8 April 2021
- **Main Contractors:** Façade Solution and GVK Siya-Zama
- **Architect:** Arc MU:V
- **Principal Agent:** Arc MU:V
- **Project Manager:** BVi
- **Quantity Surveyor:** Equate Africa
- **Consulting Engineer:** THS & Consultants

CONRADIE PARK

To create cohesion and consistency, while remaining cognisant of the financial prudence needed around the social housing elements of the greater scheme, the design team agreed that there should be no distinguishable architectural differences between tenure types for the new neighbourhood at Conradie Park.

Predominant use of clay brickwork was used throughout in the buildings and public realm to bring consistency. Brick features or 'rustications' around windows and the ground plane interface bring expression and create dynamism around the facade, and a play on light and shadow.

The choice to use brick (as opposed to plaster for example) was made for its robustness, sustainability and aesthetic appeal, as well as for its durability, and low-maintenance and hardwearing qualities.

The integrated mixed-tenure neighbourhood proposed by the public/private partnership project that is Conradie Park creates an environment designed for all incomes and age groups and life stages, while ensuring safety, innovative and affordable education, and job opportunities both onsite and within the nearby areas and close to the Cape Town CBD.

Built into the project's very design is accessibility to good-quality housing across the income spectrum to foster a blended community.

- Conradie Park, spread across 22-hectares, is envisaged as a self-sustaining community with all the facilities and amenities a good neighbourhood needs; from a high-quality public realm, to security, educational institutions, medical care, retail and office space, and a linear park with hundreds of trees.
- The full spectrum of the residential market has been considered, from multiple property owners (buy to let), to first-time buyers and those residents who qualify for subsidised affordable sale or social rental housing.
- The integration of residential tenures (social, transitional and market) has been designed to be non-distinguishable.
- The scheme's high-quality public realm design sets it apart.
- The integrated social and market housing on one site is supported by a school, a park and a convenient neighbourhood retail centre.
- The organising street grid is rotated 45 degrees off north orientation – so that the courtyard housing blocks all have optimal orientation, either northwest or northeast. ■

PROJECT INFORMATION

- **Company entering:** dhk Archictects
- **Client:** Concor
- **Start date:** 2019
- **End date:** Approximately 2027
- **Main Contractor:** Concor
- **Architect:** dhk Archictects
- **Principal Agent:** Igual Project Managers
- **Project Manager:** Igual Project Managers
- **Quantity Surveyors:** MLC Quantity Surveyors

PROJECT INFORMATION

- **Company entering:** Boogertman + Partners Architects
- **Client:** WBHO Construction
- **Start date:** January 2019
- **End date:** March 2023
- **Main Contractor:** WBHO Construction
- **Architect:** Boogertman + Partners Architects
- **Project Manager:** WBHO
- **Quantity Surveyor:** AECOM
- **Consulting Engineer:** Pure

DEPARTMENT OF AGRICULTURE, LAND REFORM AND RURAL DEVELOPMENT

Every aspect of the building design down to the smallest detail takes human scale into consideration and forms part of the design approach and philosophy. Extensive landscaping further reduces the scale of the buildings and improves human interaction in the spaces created in and around the buildings.

The building prominence in its context places an added responsibly to creating a welcoming and inviting form and space to the public. This is achieved by extensive landscape measures and where necessary introducing berms up to the structure. These berms reduce the visual impact and scale of the building when experienced from the public realm.

Great care has been taken to promote pedestrian movement throughout the site and building by creating stimulating pedestrian spaces and walkways. The link between the heritage components and the new building will be exclusively for pedestrian use.

A public drop-off space has been proposed off Lilian Ngoyi Street along the egress road from the podium. This space will be framed by a formal 'entrance' to the new public realm. This will allow for users to be bussed/taxied to the department and contact directly to the structure's public interface.

Furthermore a landscaped public 'piazza' is proposed on top of the podium which integrates to the street/pedestrian edge and draws users to the central entrance.

The purpose of the design is to create a visual landmark for the city. The architectural language creates a powerful statement that acts as an aesthetic manifestation of the department's purpose as a narrative gateway to the city. Through the combination of a unique architectural language, fundamental principles of responsible design, hierarchical entrance building and prominent public spaces, the new structure and its 'reformed' surrounds help in the creation of a functional, meaningful landmark building.

The above mentioned free-form shapes contribute to the landmark quality of the building and also reflects the importance of the building on an urban scale.

It is envisaged that this new public realm will be appropriated as a gathering and reflective space. The connection from the podium to the bermed landscape provides a functional outdoor spill-out space.

Users of the building are provided with a wealth of different external break-away and interactive spaces that provide tangible and intangible links to the historic nature and purpose of the site.

The goal is to create a series of connecting building clusters, rather than creating a single large structure. This enables the designers to maximise the north–south orientation of the buildings and to optimise the depth of the office wings to enable easy access to natural light.

The building design has been based on creating the highest quality of working environments, by ensuring that every person has direct access to natural light.

Each block has shared service cores (vertical circulation and ablution facilities) connected through the structures span by a shared corridor across each level. This enables each block access to five ablution cores across the internal length which will improve access opportunity and movement efficiency.

The building design has been developed with the goal of creating a built environment that is honest in communicating its function.

By using forms that have been determined by their functionality and materials, textures and colours that are as close to the natural environment as possible, conveys a strong message of integrity to all who view this building. ■

PROJECT INFORMATION

- **Company entering:** JAKUPA Architects and Urban Designers
- **Client:** City of Cape Town
- **Start date:** 2013
- **End date:** 2022
- **Main Contractor:** Haw & Inglis
- **Architect:** JAKUPA Architects and Urban Designers
- **Principal Agent:** DeltaBed
- **Quantity Surveyor:** AMPS QS
- **Consulting Engineers:** Element Consulting Engineers and Arup

DISTRICT SIX HOUSING, CAPE TOWN

Site Q has a steep gradient which needed to be mitigated so as to adequately allow for a variety of unit typologies. It overlooks Table Bay to the north and is cradled by Table Mountain to the south. Significantly, the original Hanover Street, a high street in the historic District Six, forms the northern boundary of the site and is celebrated by the creation of a public open space newly named “Old Hanover Street Square”. The adjacent neo-classical 1886 Moravian Church is accessed via the original Russell Street which edges

the western side of the site. The site is divided into a series of stepped terraces to simplify issues related to the infrastructure of the housing units. Multi-level row house type units straddle the level changes of the terraces, thus facilitating a street relationship on both levels. Along the terraces the row-house units are placed hard up on one another and create a continuous, flowing street façade. This interface supports the safe passage of pedestrians. A secondary street grid caters for people-active, intimately scaled streets (public), with the introduction of parked courts (semi-private), where cars would predominately park.

A total of 108 housing opportunities were developed for returning District Six residents, made up of 48 row houses (18 Type A and 30 Type B) and 60 apartments in 10 blocks of six each. ■

THABA ECO VILLAGE RESIDENTIAL, LIFESTYLE CENTRE AND MONTESSORI SCHOOL

Balwin Properties has long been recognised as a leader in the residential green building space, and now its Classic collection developments are taking the green building to new heights. All targeting EDGE advanced apartments and GBCSA 6 Star Green Star New Build and Net Zero Carbon ratings for their lifestyle centres and Montessori's. Balwin aims to be the leading developer in the residential market. Thaba-Eco village recently won the International Properties Award for best Apartment and Architecture Multiple Residence for South Africa.

Thaba-Eco Village is nestled at the foot of the Klip Riviers nature reserve offering the home-owners and lifestyle centre visitors to utilise the 300 hectares nature reserve for hiking, running and cycling. The residential blocks, consisting of a mix of 1,2, and 3 bedrooms are carefully designed to minimise its carbon footprint and optimise the human scale of each block. The lifestyle centre and Montessori are situated on a separate secured precinct allowing the public to visit the amenities offered.

Balwin Properties CEO, Steve Brooks, says that the Classic Collection developments are close to his heart as he sees them paving the way to the South African dream of a home for everyone. "We believe they are the obvious choice for home-buyers who want to manage their carbon footprint and reduce energy consumption. They are affordably priced and meet the expectations of a growing number of buyers who strive to be environmentally conscious."

By exposing every green intervention and making it part of the aesthetic, as opposed to submerging it in the fabric of the building and surrounding landscape, its value and importance are shared within the community. The concept forefronts green design as a living principle that will influence greater awareness and ultimately change behaviour.

Tied into the concept is the urban design of the development, which places importance on walkability within purpose-planned green belts, pocket parks, and nature reserve in and around the estate to encourage outdoor activity within the community. Up to 30% of the overall project is used for the development of pocket parks and walkways

connecting the parks to its community. Where key heritage trees are identified, they are built into the design and any natural wetlands or existing indigenous features are preserved and incorporated into the urban design.

Balwin as the contractor, client, quantity surveyor and procurement manager, have the luxury of procuring products aligned with their ultra-green vision for these structures. Building materials are carefully selected to ensure a high content, with Balwin committing to using steel with over 90% recycled content and more than 1% of their contract value is made up of materials with recycled content. During construction, project-specific environmental and waste management plans have been developed to minimise the environmental impact and contribution of waste to landfills through the construction process.

Of course, sustainability hinges as much on how a building operates as the design and materials used in its construction and, to this end, sophisticated systems are in place to ensure maximum efficiency across the board. The energy efficiency of the building is achieved by applying various Greenstar measures as well as the extensive solar array installed on site. An energy model of the building was generated in the design stage which showed that the overall building design showed an overall improvement of 100% over a SANS 10400 notional building. These measures have resulted in the base building operating at net-zero carbon emissions. ■

PROJECT INFORMATION

- **Company entering:** Boogertman + Partners Architects
- **Client:** Balwin Properties
- **Start date:** 2019
- **End date:** 2023
- **Main Contractor:** Balwin Properties
- **Architect:** Boogertman + Partners Architects
- **Project Manager:** Balwin Properties
- **Quantity Surveyor:** Balwin Properties
- **Consulting Engineer:** Kantey & Templar

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THE MEDIAN OF ROSEBANK

Messaris Wapenaar Cole Architects was commissioned at the end of 2014 to design what was originally intended to be a 14-floor apartment building. With its prime position in the heart of the busy hub of Rosebank, The Median was envisaged by the client as a building which was to become the icon of nouveau apartment living in Rosebank.

The site for the new building was the corner of Tyrwhitt and Craddock Avenue, the gateway to the pedestrianised upper Tyrwhitt Avenue where it intersects the north/south pedestrian artery from the Mall of Rosebank to the taxi rank at Jellicoe Avenue, and is walking distance from the Gautrain and all of Rosebank's amenities.

As with most urban sites, the median site is compact and consequently the footprint of the building is small. Access and egress for both vehicles and pedestrians would be on Tyrwhitt Avenue, occupying most of the façade at street level, with the exception of a small retail offering addressing the building's contribution to the Rosebank retail precinct.

What was clear from the start, was that if the building were to become any sort of icon at all, it would need to be a type of urban scale sculpture, boasting an urban scale iconography whilst addressing the human scale of the largely pedestrianised mall of upper Tyrwhitt Avenue that it would become part of.

The urban scale iconography of the building speaks to the public spaces around it, in terms of the interface the building has with the street, as well as the interface between the street and the pavement-scape itself. Above the street, the private apartment part of the building surrounds a 15-floor covered atrium. The apartments face outward, with views directed diagonally from the building to secure a feeling of space in what will ultimately become a totally high-rise environment.

The initial design concept was derived from what other designers, charged with similar briefs, had done before internationally. Thereafter, historical precedent became the informative backbone of the design. The skeletal curve of the balcony arrangement was adopted early in the design process together with the full height atrium window over the entrance in Tyrwhitt Avenue to create the buildings urban scale appearance.

The Median's 140 apartments were then integrated into the, hopefully iconic, skeleton of the Tyrwhitt/Craddock corner in a midnight blue rectangular structure characterised by modernist L-shaped exposed elements and four reflective screens. In considering the environmental impact, a decision was made to create setbacks between the building and the boundaries, as well as the curvature which was introduced to minimise the shadow cast by the building as well as the colour choices which cause the building to blend with its urban environment.

Internally, the entrance, although small for a

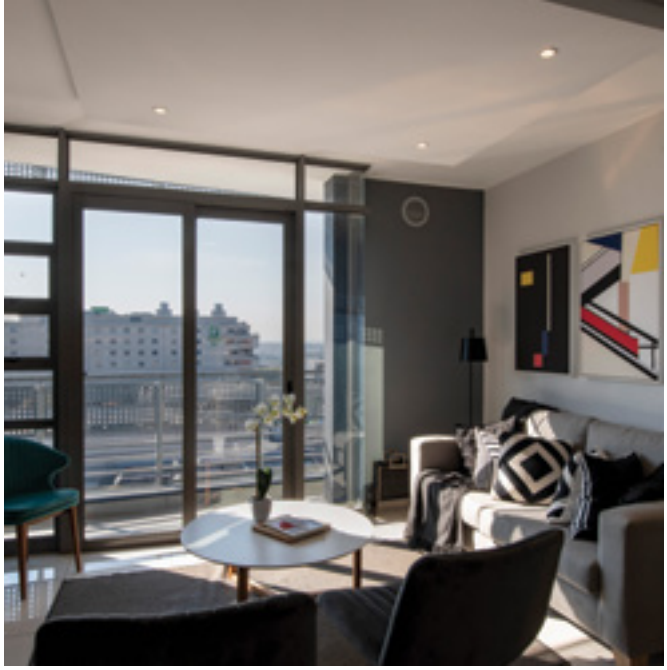
building of this size, was masterfully designed and detailed by Blue Tangerine Interiors to take the eye up for a taste of the 15-floor internal atrium above. The atrium itself is fiercely modernist in its simplicity. The skylight washes the walls while the walkway ceiling lighting is designed to softly illuminate the walkways without disturbing the privacy of the units at night.

The building's apartments are ultra-modern, mostly two-bedroom apartments, with a pocket of one-bedroom units catering for "semigrators" who commute to and from Rosebank, and four luxurious penthouses on the 14th and 15th floors.

Internally and externally the surfaces are plastered and painted, with the out-of-reach light coloured areas of the façade coated with a colour fast plaster product for ease of maintenance. The balustrades and the external screens are galvanised unpainted steel.

The building uses a conventional concrete frame construction with brick infill, most commonly used for mid and high-rise buildings in the country. The water heating is achieved by way of a central natural gas boiler system located in the lowest basement and circulated around the building for instant hot water to all the apartments.

The building also boasts state-of-the-art full BMS, security, backup power generation, and a natural gas central water heating system, together with the latest fire safety equipment and a full height observation lift overlooking Rosebank. ■



PROJECT INFORMATION

- **Company entering:** Messaris Wapenaar Cole Architects
- **Client:** Rentprop
- **Start date:** April 2017
- **End date:** February 2021
- **Main Contractor:** Vlaming Construction
- **Architect:** Messaris Wapenaar Cole Architects
- **Principal Agent:** Devcon
- **Quantity Surveyor:** Vlaming Construction
- **Consulting Engineer:** KCE Consulting

PORTSWOOD PRECINCT, V&A WATERFRONT, CAPE TOWN, SOUTH AFRICA

The V&A Waterfront is one of the greenest precincts in Africa. The Ridge is located in the Portswood Precinct of the V&A Waterfront.

Recognised for its integrated engineering response The Ridge has achieved a 6-star Green Rating Design and As-Built Certification from Green Building Council South Africa. The building achieved a total of 9 out of the 10 available innovation points. The rating is considered as demonstrating 'World Leadership' and is referenced as a Living Breathing Building-organism.

The Ridge creates an unparalleled internal environment with the highest level of natural light and fresh air. The building incorporates clever design, centred around people, planet, the broader community, and economic efficiencies.

The building structure is fire-resistant to retard the spread of fire. Below-ground is resistant to fire for 20 minutes, the ground floor for 120 minutes and floors above ground for 60 minutes.

The stairwells, lift lobbies and shafts, stores and plant rooms are engineered and constructed using enhanced fire-resistant materials. An integrated system consisting of automated sprinklers, hydrants and hose reels, fed with water from the non-potable water tank in the basement, protects the building in the event of fire.

Smoke is extracted from the atrium space via eight mechanical smoke extractor fans. Smoke monitoring and control systems serve the three-storey basement, the atrium and the third floor.

Since the ground, first and second floors are ventilated through the atrium space, any smoke will be extracted from the atrium.

The design, construction and operation of The Ridge represents an exemplar green building design and has the following key features:

- An energy-efficient mixed mode climate control system using natural ventilation, TABS, and displacement ventilation.
- Focus on natural lighting.
- Water piped through the floor slabs for cooling.
- Generation of renewable power.
- Water harvesting for reuse.
- Timber façade that has significantly less carbon than typically used material, and
- 5,5 tonnes of single use plastic Eco bricks locked into the building.

The goal was to maximise the periods when the building could be naturally ventilated. This was achieved by responding directly to the site location and shaping the building envelope to minimise solar load, thereby reducing energy demand. The Ridge is located on a rectangular site that would create deep and dark floor plates in the building without design intervention. The first step was to arrange wings on either side of a central atrium. These wings were sized to maximise natural daylight penetration into the building, which has four storeys of office space, and allow for efficient cross-ventilation. Using extensive innovative, sustainable solutions, the design provides optimal internal conditions for the occupants in a low-energy manner.

Timber locks carbon into the structure. This not only yields savings in operating costs for heating and

Integrated multidisciplinary engineering

Arup's collaborative first principles design is accelerating the transition towards net zero with a low-energy building that achieves an 82% reduction in carbon emissions and the first use of mass CLT timber in a commercial building in South Africa.

ARUP

Services provided for The Ridge:

- Civil Engineering
- Structural Engineering
- Mechanical Engineering
- Electrical Engineering
- Wet Services Engineering
- Fire Life Safety Engineering
- Facades Engineering
- Sustainability & Green Star Consulting
- Specialist Lighting & Daylight Consulting

cooling, but also greatly benefits health, productivity and worker well-being for building users as suitable daylight and natural fresh air circulates throughout the building. 354 Mt of CO_2 is saved by using timber on this project when compared to conventional materials. The usage of this natural material enters the lifecycle of the project with a negative embodied carbon content. The final product as installed on site is durable and long-lasting with a service life of 50 years plus, provided by the Accoya timber rainscreen covering that protects the CLT timber façade

The Ridge's structural timber façade is designed to compensate for the slightly off-North-South orientation of the building. The saw-tooth angle façade corrects this orientation. Effectively, this means that the direct sunlight entering the building is controlled. The folded façade performs as a straight deeply shaded façade which significantly reduces the amount of direct sunlight entering the building. This allows for more glazing without external shading devices. The orientation of the operable and active timber façade provides a controlled, natural environment by allowing fresh air into the building via manual automatic openable windows. Biophilic design increase occupancy connection to the natural environment. This has health, economic and environmental benefits for occupants and urban environments. ■

PROJECT INFORMATION

- **Client:** V&A Waterfront
- **Main Contractor:** GVK Siya-Sama Building Contractors
- **Architect:** StudioMAS Architecture & Urban Design
- **Principal Agent:** MACE Management Services
- **Quantity Surveyor:** Smith&Co Quantity Surveyors
- **Consulting Engineer:** Arup
- **Interior Architecture:** Paragon Interface
- **Landscape Architect:** Planning Partners

Purpose. People. Planet.

Our formula for a greener tomorrow

Every time a new building goes up, a community decides what kind of future it wants for itself. We all share in tomorrow – that's why each structure must earn its spot on the skyline by working for all.

At the V&A Waterfront, we keep people and the planet at the heart of what we do. As a community, every development that we green-light in our waterfront world is underpinned by a people-first, planet-forever philosophy and led by our focus on sustainability and future thinking.

We partner with like-minded architects, engineers, developers and visionaries to curate and construct a pioneering, progressive neighbourhood that meets the wants and needs of its users, visitors and viewers.

Portswood Ridge – home to Deloitte in Cape Town – is a shining example of this vision. As the winner of the ABC Award in the 2022 Best Construction Projects edition of Construction World magazine, this design is the perfect example of our purpose in action.

Raising the bar in sustainable development, The Ridge features an energy-efficient mixed mode climate control system using natural ventilation, TABS, and displacement ventilation. It is a thermally activated building system (TABS) with a timber facade containing significantly less carbon than typical material, and 5.5 tonnes of single use plastic ecobricks.

With a 6-star green rating design and As-Built Certification from The Green Building Council of South Africa (GBCSA), The Ridge is a living, breathing building-organism, incorporating innovative design to create one of the continent's greenest buildings in one of Africa's greenest precincts. Its design, construction and operation represent an exemplar building design which sets the standard for similar developments.

Learn more about our latest developments and our vision for a greener tomorrow:

RMB 8 MERCHANT PLACE

Identifying the need to improve the quality of its employees' work-life balance, private bank RMB planned to consolidate various employee well-being offerings into a new integrated lifestyle facility building within its existing Merchant Place Campus in Sandton, Johannesburg.

Structural calculations revealed that the load-carrying capacity of the existing columns and foundations in the basement was insufficient to support the additional load from the new building. Accomplishing the aesthetically striking architectural vision and client's concept for the new building required exceptional ingenuity and civil engineering expertise.

Zutari played a crucial role in bringing this wellness centre to fruition by providing structural, civil, wet services and sustainability consulting services.

The building was awarded a 4 Star Green Star certification under the Public and Education Building scheme of the Green Building Council South Africa (GBCSA). Occupants' health and well-being and optimal building performance are central to the design of the building.

Strengthening details were developed for the existing columns using reinforcement concrete collars. The existing foundations were strengthened by underpinning with new micro piles and pile caps. The surface bed was removed to a size that allowed sufficient access for the piling rig to install the new micro piles.

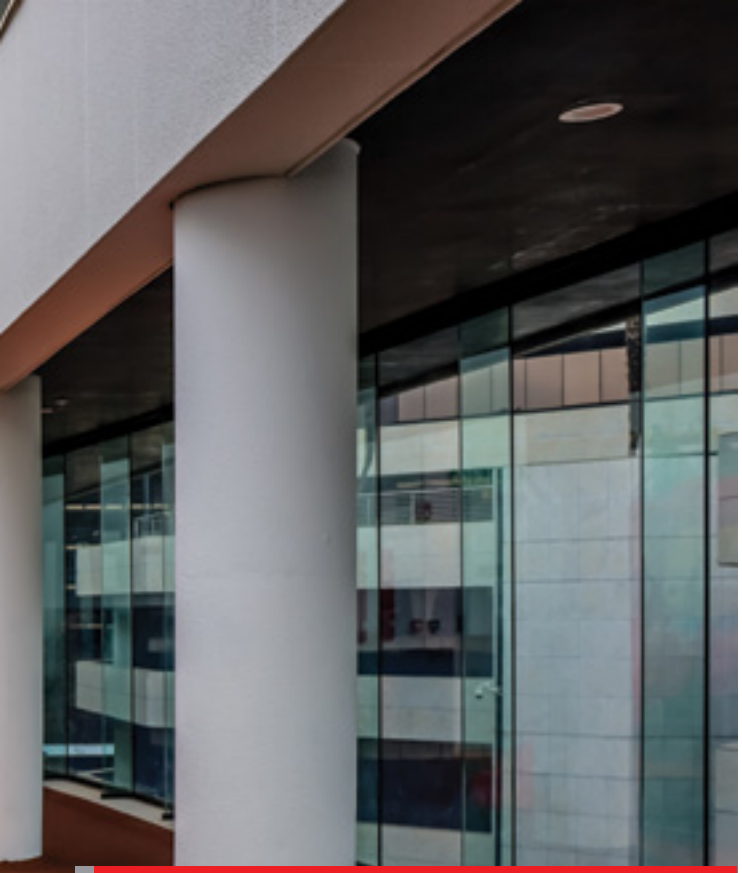
Existing services in the basements (e.g., water tanks) could not be moved, which posed additional challenges, resulting in some of the foundations having the underpinning piles installed eccentrically to avoid existing services. Tie beams were introduced to resolve the eccentric loads showing the tie beam reinforcement. Once micro piles and the pile caps were cast, the columns were strengthened. This was done by casting reinforced concrete collars around the columns.

To transfer the new building loads to new micro piles, a new reinforced pile cap was constructed underneath the existing pile cap. The load from the current pile cap is transferred to the new pile cap through a combination of the bearing of the exposed part of the bottom of the existing pile cap on the top of the new pile cap and shear friction (enhanced by dowels) between the shaft of the current pile and the new pile cap. The loads are then transferred to the micro piles from the new pile cap through a strut-tie mechanism.

The strengthening work had to be carried out with minimal interference to the functioning of the building and vehicle movement along Bute Lane and in the basements. Although the parking bays next to the columns and foundations being strengthened were temporarily blocked, most of the basement parking area remained accessible.

Zutari was responsible for ensuring that measures were implemented to mitigate the risk. This included assessing the additional load on the existing structure during construction and the life of the new building and developing strengthening solutions to enable the structure to remain fit for purpose.

The necessary details and information required for the strengthening of the existing building and the designs for the new building were communicated



PROJECT INFORMATION

- **Company entering:** Zutari
- **Client:** Rand Merchant Bank
- **End date:** 31 July 2021
- **Main Contractor:** Trencon Construction
- **Consulting Engineer:** Zutari (Civil, Structural, Wet services and Green Star Consultant)
- **Architect:** Boogertman + Partners Architects
- **Project Manager:** Metrum Project Management
- **Quantity Surveyors:** Vusela Quantity Surveyors
- **Electrical Engineer:** Claassen Auret
- **Mechanical Engineer:** Adaptive Resource Engineers
- **Fire Engineer:** Chimera Fire Protection Consultants

timeously with the quantity surveyors, project managers, the client and the rest of the consulting team. This ensured that the structural works were coordinated, there was sufficient allowance in the budget, and the programme allowed for the complexities of the project. ■

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