COVERING THE WORLD OF CONSTRUCTION

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ON THE COVER

With every tonne of ordinary Portland cement produced, the environment must deal with around a tonne of carbon dioxide emitted by the manufacturing process; with its commitment to more sustainable construction, AfriSam is offering contractors opportunities to move in a greener direction. Among the sustainability efforts are initiatives to use less ordinary Portland cement, which is high in energy-intensive clinker, as well as to improve on water usage, waste management, material sourcing and the final durability of construction materials.

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Concrete's durability plays a central role in reducing the structure's carbon footprint.

Amit Dawneerangen, AfriSam Executive Construction Materials: Sales & Product Technical.

AFRISAM PAVES THE WAY TO GREENER CONSTRUCTION

With every tonne of ordinary Portland cement produced, the environment must deal with around a tonne of carbon dioxide emitted by the manufacturing process; with its commitment to more sustainable construction, AfriSam is offering contractors opportunities to move in a greener direction.

Among the sustainability efforts are initiatives to use less ordinary Portland cement, which is high in energy-intensive clinker, as well as to improve on water usage, waste management, material sourcing and the final durability of construction materials.

According to Amit Dawneerangen, Executive Construction Materials: Sales and Product Technical, there has been a concerted drive in recent years to reduce the proportion of Portland cement in concrete – by replacing it with supplementary cementitious materials. This is part of global efforts among many players in the industry to reduce the carbon footprint associated with cement, concrete and the buildings and structures they create.

"The two common cementitious supplements in South Africa are pulverised fly ash from our coal-fired power stations, and ground granulated blast furnace slag from the steel-making process," says Dawneerangen. Using slag has a further value in environments where chlorides can attack concrete and even start oxidizing the reinforcing steel – a common challenge in coastal areas. Slag has the ability to bind chloride, enhancing the long term durability of concrete.

Being a very fine material, fly ash also offers additional benefits, such as helping to create a dense and less permeable concrete. The spherical shape of its particles also gives concrete better workability and aids with reducing the water requirement.

He explains that geo-polymers are also attracting attention as a potential cement alternative. While slag and fly ash need cement to activate them, there is research underway based on the polymer's ability to fulfil this activation function.

"Over the next few years, the use of polymers is likely to grow as these mainly inorganic materials find their way into specifications for projects," he said. Current construction codes are based on the use of Portland cement, he notes, so it will take some time before the industry feels comfortable using these kinds of alternatives. To reduce the carbon emissions associated with the energy used in conventional cement manufacturing, industry is also looking at Limestone calcined clay cement (LC3). South Africa, however, is not as well endowed with clay as many countries, especially in Europe.

Recycling of concrete aggregates is an important theme in making construction more sustainable. In the Green Star ratings from the Green Building Council South Africa, for instance, recognition is given for the use

Left: To avoid concrete spillage on the road, AfriSam never overloads its readymix trucks. Right: Using slag as a replacement for Portland cement significantly reduced the carbon footprint of concrete.

Systems and equipment ensure accuracy of mixes, reducing waste and return loads.

Ensuring durability starts with quality materials that comply with the relevant specifications.

of recycled aggregates up to 10% of the concrete mix.

"This means the careful sorting of concrete material in demolitions, to provide an acceptable quality of concrete," he says. Water re-use in the readymix sector has become a pillar of responsible practice, especially in a water-scarce country like South Africa, explains Dawneerangen. At AfriSam readymix plants, considerable volumes of water are required for rinsing out the 6 m^3 cement mixing trucks. This water is recycled by channeling the runoff into a series of settling ponds, so that the cleaner water at the end of the process can be used for cleaning again. Rainwater is also harvested for the production of concrete to reduce the volume of municipal water drawn by the plants.

"Even in our mix designs, we endeavour to use as little water as possible – using admixtures to achieve better long term performance," he says. "The accuracy of our measuring systems also ensures that no water goes to waste."

The careful management of waste concrete also contributes to sustainability by promoting a circular economy. AfriSam makes every effort to avoid concrete being rejected at site, by having systems and equipment to ensure accuracy of mixes. Where it is unavoidable to return readymix from site to the plant, however, there is accommodation for this.

"We have designated areas at our quarries where our trucks can dump waste concrete," he says. "After hardening, we can use this concrete in the production of gravel material such as G5, where the recycled concrete actually enhances the product."

In the readymix transportation phase, there is risk of spillage which can be a safety issue as well as an environmental incident. To avoid this, AfriSam makes sure never to overload its readymix trucks, as a steep uphill gradient can cause concrete to pour over the lip of an over-filled drum. The company also goes the extra mile by placing covers on its truck chutes, preventing any residue from dripping onto the site or road as the truck leaves a site.

"Scheduling and logistics are important in managing waste, as the time on the road has a direct effect on concrete workability and performance when it gets to site," he says. "With our sizeable fleets, our GPS and truck-tracking systems, combined with the right admixtures, we can ensure that a workable, on-spec product is delivered every time."

For any readymix operator, a mechanical breakdown of a truck brings commercial and environmental implications – including not just letting down a customer and delaying a construction project, but the waste of energy, resources and concrete. AfriSam's skilled logistics department arranges regular servicing to ensure vehicles are well maintained to be fuel efficient and reliable.

Considering the design life of concrete structures, Dawneerangen highlights that the concrete's durability plays a central role in reducing the structure's carbon footprint.

"If a concrete structure can meet or even exceed its design life – with as little maintenance as possible – it minimises the resources and energy that must be invested in it," he says. "A good example of this is roadworks, where any failure of the structure incurs the cost of repair and associated disruption, both involving extra carbon emissions."

Ensuring durability starts with quality materials that comply with the relevant specifications, he says, from the cement to the aggregates and additives. Once the right materials are sourced from reputable suppliers, it is essential to design and implement the appropriate concrete mixes.

"With AfriSam's legacy and experience, we are well placed to provide customers with these materials and these mixes, suitable for the different applications and environments in which they will be used," he concludes. ■

From left: Lufuno Ratsiku - President of the SACPCMP and Best Projects judge, Wilhelm du Plessis - Editor of *Construction World,* Karen Grant – Publisher of Crown Publications, Erna Oosthuizen – Advertising Manager of *Construction World* and Professor Ian Jandrell, Deputy Vice Chancellor: Systems and Operations at WITS.

RECOGNISING EXCELLENCE: THE WINNERS OF BEST PROJECTS 2023

The winners of Construction World's *Best Projects awards for 2023 were announced at an exclusive event in Johannesburg on 7 November. These awards have, for 22 years, recognised excellence in the built environment in South Africa. The competition attracted 69 entries and the winners represent the whole spectrum in the construction industry – big and small.*

The judges were unanimous in saying that the Best Project adjudication process was an enlightening experience and that they were impressed by the standard, innovation and excellence of the project submitted.

They also said that it is initiatives such as Best Projects that encourage the industry to continue to reach new heights, albeit in very challenging conditions.

AfriSam was the main sponsor – and has been since the start in 2002. CHRYSO Southern Africa was the Gold Sponsor, a.b.e Saint-Gobain the Silver Sponsor and Sika South Africa and the Cement and Concrete Society SA both Associate Sponsors.

The Civil Engineering Contractors category was won by the highly impressive 'Pretoriusrand 20 Mℓ reservoir construction' by Quintibuild while both the 'VA Waterfront East Pier Precinct Civil Service' by Civils 2000 and KMC Construction's 'River Walks Phase 3' received Highly Commended Awards. It is encouraging to note that the number of entries in this category is increasing. It has been erratic for some years – reflecting an industry under stress.

Thirteen projects competed in the Building Contractors category. This category was won by the vast 'Kenhardt Solar Park Project' (entered by CHRYSO Southern African and Scribante Concrete). Highly Commended awards went to '15 Fredman Drive' (WBHO Construction) and Concor Construction for its 'Trevenna Super Basement Project', while the 'Eastgate Sustainability Project' (Concor Construction) and WBHO Construction's 'Oceans Retail project' received Special Mention Awards.

The Specialist Contractors or Suppliers category was won by GeoCiv Group for their 'Pepkor Distribution Centre Soil Improvement Works

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project'. This category had two Highly Commended awards: Sika South Africa's 'Infrastructure rehabilitation Sarnia Road Project' and CHRYSO South Africa and OMV's 'Nancefield Bridge – Musina'. a.b.e. Construction Chemicals' 'Durban Heights Reservoir No 3 Umgeni Water' project received a special mention award.

In the Consulting Engineers category, Zutari was not only the winners with its 'SKA MeerKAT Extension project', but also received a Highly Commended Award for its 'Groote Schuur Estate Refurbishment' project. ARQ won a Highly Commended award for 'Yusufeli Dam and two projects entered by Naidu Consulting received a Special Mention. These projects were 'The Construction of Shongweni Reservoir 6 Mℓ Reinforced Reservoir' and 'Tongaat Water Treatment Works Emergency Remediation Works'.

The Architects category attracted 14 entries and was won by Roelof Rabe Argitekte for 'The Biomedical Research Institute'. There were two Highly Commended Awards: Boogertman + Partners for 'Varsity College – Pretoria Campus' and AVNA Architects for 'Space Weather Centre for the South African National Space Agency'. The category also had two Special Mention awards for 'Thaba Eco Village residential, lifestyle centre and Montessori School' (Boogertman + Partners) and Messaris Wapenaar Cole Architects for 'Cavgold'.

AfriSam is not only the main sponsor of Best Projects, but also sponsors the AfriSam Innovation Award for Sustainable Construction, one of the first awards for sustainable construction in the country.

This category was won by JG Afrika for their innovative 'Harnessing energy from organic waste through engineering' project. The category had three Highly Commended awards: '15 Fredman Drive' (WBHO Construction), 'Eastgate Sustainability Project' (Concor Construction) and 'Soweto Education and Technology Campus' (Growing Up Africa). WBHO Construction's 'Stella P1 Basements' and Concor Construction's 'Travenna Super Basement' Project received Special Mention awards.

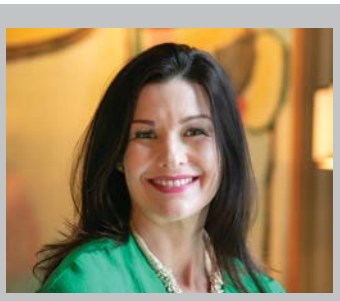
Congratulations to all the winners. Enjoy this display of excellence.

Wilhelm du Plessis
Editor

THE JUDGES

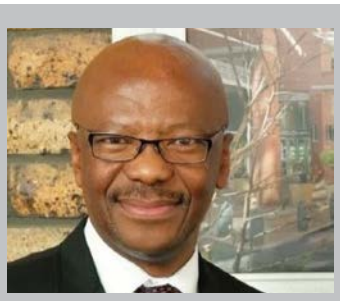
Uwe Putlitz

Retired professional Architect and professional Construction Project Manager



Petra Devereux

Regional Manager for the Chartered Institute of Building (CIOB) of the Sub-Saharan Africa region.



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BEST PROJECTS 2023 WINNERS

This year there were 27 awards - an indication of the high standard of entries.

CIVIL ENGINEERING CONTRACTORS : *The Civil Engineering category was won by Quantibuild for the 'Pretoriusrand 20 Mℓ reservoir'. (From left) Werner Stander, Tanya Ferreira, Neil van der Wat, Nadine du Toit and Sheldon Temlett.*

CIVIL ENGINEERING CONTRACTORS : *Civils 2000 received a Highly Commended award for the 'VA Waterfront East Pier Precinct Civil Service – package A'. (From left) Sandi Klaas and Andre Hansen.*

CIVIL ENGINEERING CONTRACTORS : *KMC Construction won a Highly Commended award in this category for 'River Walk Roads Phase 3'. (From left) Sam Pedlar, Paul van Niekerk, Jeandre van der Linde and Ronald van Biljon.*

BUILDING CONTRACTORS : CHRYSO and OMV won this category with the 'Kenhardt Solar Park Project'. (From left) Eric Fouche, Furio Di Nardo, Silvio Scribante, Adél Coetzee, Hannes Engelbrecht, Patrick Flannigan, Greyling Jansen, Michelle Fick, and Giben Terblanche.

BUILDING CONTRACTORS : WBHO won three awards: '15 Fredman Drive' and 'Oceans Retail' were Highly Commended while '15 Fredman Drive' also received a Highly Commended award in the AfriSam Innovation Award for Sustainability (for Stella Basements) (From left) Rumbie Thabela, Poloko Nketle, Leandro Feiteira and Ivan Viljoen.

BUILDING CONTRACTORS : Concor Construction won four awards. Its 'Trevenna Super Basement' project was Highly Commended in this category while its 'Eastgate Sustainability project' received a Special Mention. These projects were also recognised in the AfriSam Innovation Award for Sustainable Construction category where the 'Eastgate Sustainability Project' was Highly Commended and 'Trevenna Super Basement' received a Special Mention. (From left) Margaret Dube, Christopher Gillespie, Martin Muller, Melinda Isaacs, Justin Matthee, Leah Nwedamutswu and Nathaniel Wakefield.

SPECIALIST CONTRACTORS OR SUPPLIERS : The Specialist Contractors or Suppliers category was won by GeoCiv Group for the 'Pepkor Distribution Centre Soil Improvement Works'. (From left) Dinesh Naidoo, Vincent Bornman, Werner Rix, Angelique Uwase, Greg Whittaker, Burger Rust and Jean Breedt.

SPECIALIST CONTRACTORS OR SUPPLIERS : Sika South Africa received a Highly Commmended award in the category for the 'Infrastructure rehabilitation Sarnia Road Project'. (From left) Shaun Saxby, Mark Griesel, Ken Brown and Richard Long.

SPECIALIST CONTRACTORS OR SUPPLIERS : a.b.e. Saint-Gobain received a Special Mention in this category for 'Durban Heights Reservoir No 3 Umgeni Water'. (From left) Brad Hunt, Elrene Smuts, Warren Trew, Kavish Ramgathi, Rajesh Raghubir, Darryl Laycock and JP Mathee.

SPECIALIST CONTRACTORS OR SUPPLIERS : CHRYSO and Scribante Concrete received a Highly Commended Award for its 'Nancefield Bridge – Musina'. (From left) Greyling Jansen, Antoinet Buitendag, Hannes Engelbrecht, Adél Coetzee, Ben Myburgh, Marinus van den Berg, Jacques Marais, and Michelle Fick.

CONSULTING ENGINEERS : Zutari received two awards in the Consulting Engineering category. 'SKA MeerKat Extension Project' was the Winner of the category, while 'Groote Schuur Estate Refubishment' received a Highly Commended award. (From left) Jannie du Toit, Salona Naidoo (front), Martin Smith (back), Gabi Wojtowitz, Charmaine Bettesworth, Juanita Fourie, Dirk Trollip, Charmaine Achour, Malebusa Sebatane, Nilton de Caires and Martinnque du Toit

CONSULTING ENGINEERS : ARQ received a Highly Commended award for its 'Yusufeli Dam project'. (From left) Yokazi Mkalali, Ryan Cassells, Henry-John Wright and Wilma Nortman.

CONSULTING ENGINEERS : Naidu Consulting was recognised for two projects: 'The construction of Shongweni reservoir 6 Mℓ Reinforced Reservoir' and 'Tongaat Water Treatment Works Emergency Remediation Works'. (From left) Santosh Soobryan, Philani Mkhize, and Lennin Naidoo.

ARCHITECTS: Boogertman + Partners received two awards. A Highly Commended award for 'Varsity College – Pretoria Campus' and a Special Mention for 'Thabo Eco Village residential, lifestyle centre and Montessori School'. Varsity College: (From left) André Wright, Trishal Ramjee, Christa Burger and Hatim Hassan.

ARCHITECTS: Boogertman + Partners received two awards. A Highly Commended award for 'Varsity College – Pretoria Campus' and a Special Mention for 'Thabo Eco Village residential, lifestyle centre and Montessori School'. Thaba Eco: (From left) André Wright, Marius Badenhorst, Alex Evdemon, Ruan Ras, Soné van Zyl and Christa Burger.

ARCHITECTS: Roelof Rabe Argitekte won the Architects category for 'The Biomedical Research Institute at Stellenbosch University'. (From left) Roelof Rabe, Jozanne Louw and Grant Gush.

ARCHITECTS: AVNA Architects received a Highly Commended award in this category for 'Space Weather Centre for the South African National Space Agency'. (From left) Gideon Schoonraad and Heidi McAllister.

AFRISAM INNOVATION AWARD FOR SUSTAINABLE CONSTRUCTION: This category was won by JG Afrika for 'Harnessing energy from organic waste through engineering' (From left) Jefrey Pilusa, Waseefa Ebrahim and Richard Emery.

AFRISAM INNOVATION AWARD FOR SUSTAINABLE CONSTRUCTION: Growing Up Africa won a Highly Commended Award in the AfriSam Innovation Award for Sustainable Construction for its 'Soweto Education and Technology Campus'. Deborah Terhune (Pictured).


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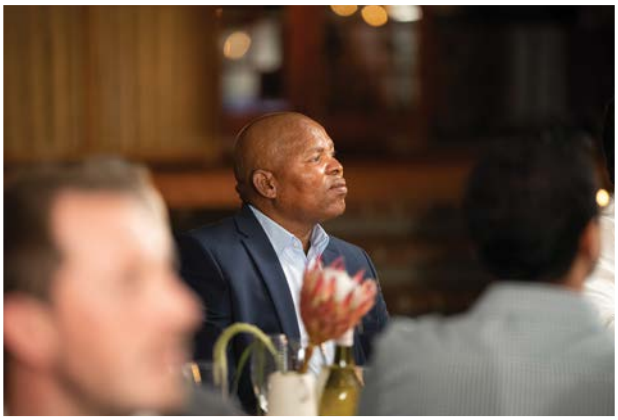


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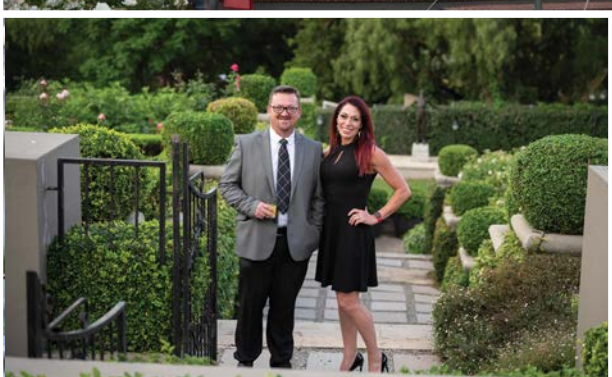

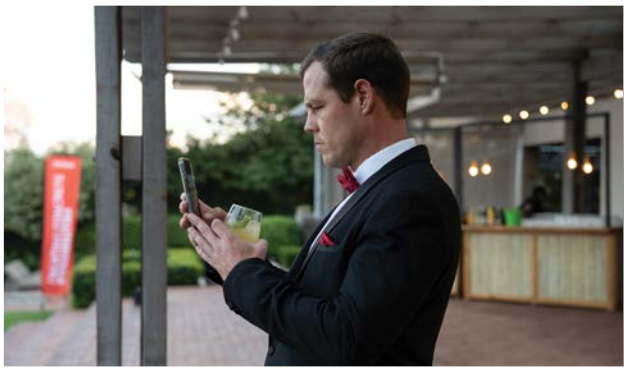

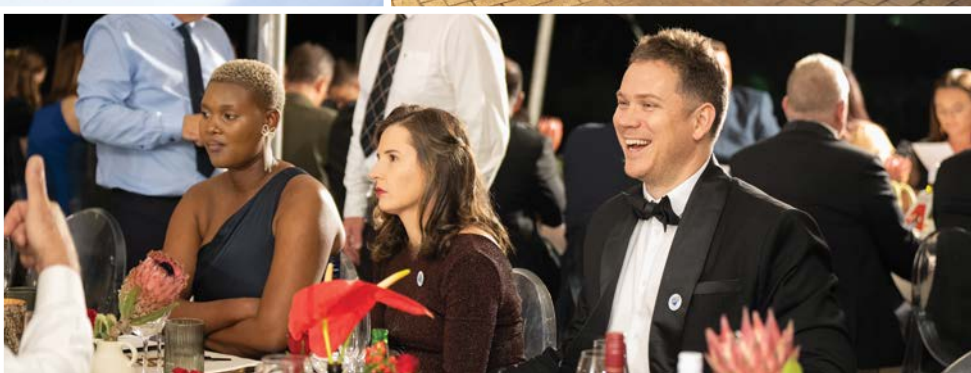

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2023's Best Projects

1. Pretoriusrand 20 Mℓ reservoir

2. Kenhard Solar Park Project

3. Pepkor Distribution Centre Soil Improvement Project

4. SKA MeerKat Extension Project

5. The Biomedical Research Institute

6. Harnessing energy from organic waste through engineering

3

6

PRETORIUSRAND 20 Mℓ RESERVOIR

In recent years, unreliable access to clean drinking water has not only provided endless frustration for everyday South African citizens but it has now begun to affect the country's economy and the health of its citizens. Whilst not facing the water scarcity problems plaguing provinces like the Western Cape and Northern Cape, Gauteng's aging water infrastructure has struggled to keep up with potable water demands simply due to the swift growth in demand that accompanies rapid urbanisation. Consequently, municipalities and developers have begun to partner together to meet the province's growing demand. The Pretoriusrand 20 Mℓ Reservoir project is one such example displaying the success of this partnership.

Having recently pioneered the first prestressed, round reservoir floor in Africa at the Khutsong 30 Mℓ Reservoir, Quantibuild was eager to repeat the innovative application's success at the Pretoriusrand 20 Mℓ Reservoir. Whilst the Khutsong Reservoir floor was designed as a 450 mm thick raft slab given the dolomitic founding conditions, the Pretoriusrand Reservoir site offered no problematic founding conditions, and therefore the basis for an alternative prestressed floor would have to be in terms of both quality and economy. The case for end product quality of a jointless floor in a water-retaining structure was an easy sell given the short-term and long-term issues often caused by floor joints in reservoirs. Additionally, eliminating the jointing products and the entire underfloor drainage system provided savings that could be used to offset the additional costs of prestressing. The significant reduction in reinforcing steel from prestressing however provided substantial savings and made the alternative economically appealing.

One of the key requirements for the alternative floor slab is that there were to be no stress raisers under the floor slab

PROJECT INFORMATION

- **Company entering:** Quantibuild
- **Client:** Central Developments
- **Main Contractor:** Quantibuild
- **Consulting Engineer:** Civil Concepts
- **Subcontractor:** Res Spec

that would increase friction during tensioning. Getting the layer under the HDPE slip surface smooth and level with no obstructions was therefore key to achieving design success. The initial alternative design included for 50 mm of blinding followed by 50 mm of topping under the HDPE liner to achieve this. The Contractor was however able to save additional time and cost by eliminating the topping and power-floating a 75 mm thick blinding layer until the surface was smooth. To ensure levels were within tolerance, the blinding was constructed in four-metre wide lanes running north to south.

Post-tensioning of round slabs provides a unique challenge in that the jacking force needs to be applied perpendicular to the slab edge whilst the cables still need to span in two directions (north-south and east-west) to achieve compression of the entire slab. Whilst curving the cables does achieve this outcome, significant losses in the stressing force can be experienced due to friction and wobble if the cables are not profiled along long, gradual curves. To achieve these curves practically, welded reinforcing ladders with a vertical locator for the centre-line between two cables were accurately made up based on dimensions from the AutoCAD drawing. These ladders were then placed around the perimeter in three continuous rings at 1,5 m, 8 m and 14,5 m from the slab edge. Installation of cables then became a matter of simply lining up the anchor points to the locators on the ladders and smoothing out the curves in between.

A hybrid concrete mix design between a water retaining mix and a PT slab mix was required for the floor slab which meant striking a balance between increased impermeability, reduced

shrinkage, and sufficient early strength gain before shrinkage occurs. Substantial time went into the testing on the first prestressed, round reservoir floor at the Khutsong 30 Mℓ Reservoir which meant that the lessons learned could now simply be applied considering the local aggregates and slight changes in admixtures. A water-cement ratio of 0,47 was used to increase permeability whilst a 52,5 N cement was utilized to achieve the early strength requirements and blended with fly ash at a 70/30 ratio. In terms of aggregates, granitic 19 mm stone was used with a combination of granitic crusher sand and fine plaster sand. In combination with a plasticising admixture type, Chryso 206, the mix performed well in terms of shrinkage with an initial drying shrinkage of 0,029%, and therefore no shrinkage compensating admixture was required.

Placement of the 393 m^3 of concrete on the 50 m diameter floor slab took place on a particularly cold and wet day with a maximum temperature of 12 degrees which would influence the early strength gain. By sampling twenty-one cubes at various stages of the pour for early strength testing and further simulating the strength gain of the in-situ floor slab by leaving the cube moulds next to the slab covered in plastic sheeting to mimic the curing method and weather conditions, the compressive strength results would represent realistic information off which to base post-tensioning decisions. The first phase stressing required a minimum compressive strength of 9 MPa which was expected within 24 hours. However, due to the cold weather, 9 MPa was not achieved at 24 hours and the Phase 1 stressing only commenced at the 48-hour mark after confirmation from the laboratory that compressive strength had been attained. Four separate jacks worked in a coordinated sequence to ensure gradual pre-compression of the entire slab during both Phase 1 and 2 stressing.

Quantibuild again relied on the industry-leading expertise of Tim Dubber from Res-Spec to design the post-tensioned slab on grade floor slab design as an alternative. The 200 mm thick slab was designed with 112no. unbonded monostrand cables (15,2 mm diameter), a bottom mat of reinforcing under columns only, and a top mat of reinforcing to deal with the practicalities of placing concrete without disturbing the profile of the cables. Two layers of 1mm thick HDPE liners were designed to form a slip surface between the slab and the subgrade. To achieve the pre-compression of the slab required to resist crack-inducing tensile forces, the floor would need to be stressed in two phases as the concrete's compressive strength increased but before shrinkage commenced.

On the project as a whole, Civil Concepts, the consultant, delivered well-engineered, practical designs that made construction an absolute pleasure. Additionally, Civil Concepts were open to tweaking several small details on various elements to allow for reduced construction times and/or savings without affecting the quality of the end product. One such example was the addition of four holes in the roof to speed up the stripping of the roof slab decking material and support work. ■

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RIVER WALK ROADS PHASE 3

The Riverwalk Project sets out to bridge the gap (literally and figuratively) in housing in the East of Pretoria. This project has created a corridor between some the latest up-and-coming developments, such “The Blyde” Estate, boasting the largest man-made lagoon (giant swimming pool), with more established areas such as Silverlakes and Olympas. This extension of Hazeldean Drive effectively circumvents the previously limited, bottle-necked routes over the N4 Freeway through the use of the new underpass allowing for safe, unhindered passage underneath the freeway for vehicle, cycle and pedestrian traffic.

The construction of this project saw the use of some of the most cutting-edge technology currently available to the construction Industry. Through the use of these technologies and smarter construction methods world class levels of quality and precision were delivered to the Client and by extension the General Public who shall be making use of same.

KMC employs the use of various technologies to improve construction techniques and quality of products delivered to Clients. One such example is the use of Bitumen Stabilised Materials (BSM) for roadbuilding. BSM technology involves the stabilisation of material, sourced locally or commercially, using bitumen products in order to improve its properties. Material which may naturally not be considered for base layer, such as G4 material, may comfortably see improvements in performance to render it suitable to construct such layerworks.

While the above-mentioned stabilisation process may take place using in-situ recycling methods KMC goes even further by employing cutting edge technologies in constructing layerworks. BSM materials are produced on site using a continuous mixing plant which adds water, cement and bitumen to aggregates. This plant as capable of production rates far exceeding what is achievable using in-situ recycling plants as well as foam bitumen plants, with a rated capacity of 400 tons of material produced per hour. This material is mixed to exacting standards and great precision thanks to the automated system with integrated sensors resulting in a product that is ready to go to ground immediately. Material is produced continuously and may be dispensed directly into tipper trucks for transporting to site or may even be

KMC CONSTRUCTION

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stockpiled for a couple of days for use.

Conventional methods of road construction may usually include large teams of people involving hours of work with graders, watercarts and rollers working tirelessly to construct a road. KMC has instead endeavoured to construct roads with much greater accuracy and efficiency using aggregate/asphalt pavers kitted out with highly accurate autonomous 3D guidance systems. This combination precludes the need for graders and countless hours of construction. It provides an opportunity for meticulous millimetre-precision in constructing road layers. The benefits of this include consistently improved levels of rideability and much greater accuracy of products delivered to our clients.

One of the largest components of the Project was the construction of an underpass bridge at the N4 Freeway. This underpass serves as the extension of Hazeldean Drive effectively linking the area north of the N4 with the already well-established Silverlakes area South of the Freeway. As the name suggests, an underpass traverses under the freeway instead of over it like a bridge normally would. This underpass, while not uncommon in freeway construction, holds some qualities unique to this project. This sizeable structure was required to be constructed without disrupting or reducing the capacity of the national freeway. For that reason, the bridge underpass was designed with soldier piles tied into the deck slabs to act as the abutment. These piles were drilled and installed by redirecting traffic from the Eastbound carriageway of the freeway onto a temporary section of road constructed alongside the Westbound carriageway, rendering the Eastbound carriageway free from vehicles. During this time our specialist piling subcontractor

was able to drill and install 900 mm diameter soldier piles, unhindered. The same process applied to the Westbound carriageway, with 42 piles installed in record time without reducing the vehicle-carrying capacity of the freeway the entire time. Another unique characteristic relating to the construction of this underpass is that it was constructed in reverse i.e., the piles (abutments) were constructed first, thereafter the deck slabs were constructed prior to any excavations occurring. Once these structural elements were completed freeway traffic was able to travel on their respective carriageways while the underpass was excavated safely underneath the deck slabs because the pile-and-slab design acted as a highly stable portal frame.

Another on-site improvement which can be attributed to innovative design is the change in base layer from conventional crushed stone base to the BSM layer described above. This layer performs equally well, if not better at times than the conventional alternative. It also allowed for somewhat weaker materials to be reclaimed and suitably improved (strengthened) for use as a high-quality road building material.

A crucial area of impact was the watercourse flowing through a section of the site. An Armourflex Channel and Major Culvert were constructed in such a way to manage the flow of water at safe operating levels, even during flood conditions. The floor of the major culvert was built wider than required in order to reduce the need for future disturbance of the water course should a second carriageway be constructed to further widen Hazeldean drive.

An important point to note is the efficiency of the underpass design and construction method. The pile abutment design and slab-on-ground construction method resulted in a very efficient excavation of the material compared the conventional methods which may require up to 60% more volume removed simply for working space.

From outset KMC approached this project with a keen approach to showcase not only the benefits of smarter construction techniques, methods and high-tech equipment but also our ability to deliver a product to a client which boasts a high level of quality at an affordable rate. This is befitting of our vision: to be the Contractor of choice for quality infrastructure – leading through innovation. We deliver our vision through our values. We strive to change lives with high quality infrastructure and to leave a proud legacy for generations to come. ■

PROJECT INFORMATION

- **Company entering:** KMC Construction
- **Client:** Balwin Properties
- **Main Contractor:** KMC Construction
- **Principal Agent:** Civil Concepts
- **Consulting Engineer:** Superstructures Africa
- **Subcontractor:** Makarios Geodynamics

V&A WATERFRONT EAST PIER PRECINCT (EPP) CIVIL SERVICES (PACKAGE A)

Cape Town's V&A Waterfront attracts over 24 million visitors a year and accounts for over 60% of tourist spending among the top 20 Cape Town attractions. There are several tour companies offering helicopter sightseeing trips from the V&A's East Pier Precinct.

V&A Waterfront required construction works to upgrade the Pierhead Precinct and these include a new heliport building and helideck, desalination building and additional parking areas at the East Pier Precinct.

As part of this work, Civils 2000 were appointed to carry out civil engineering construction works for Package A, which included a rock revetment, seawater intake pipelines (for the desalination plant), brine pipeline, district cooling infrastructure, helipad layerworks and a 4x4 road. The works outside Civils 2000's scope include the desalination plant building and fitting out, heliport building, helideck, parking structure, and seawater intake screens.

This contract was undertaken under the JBCC Minor Works Contract and administered by Igual Project Managers.

Rock Revetment

The reinstatement of the existing informal rock revetment where disturbed due to construction works, which involved excavation and stockpiling of suitable armour rock from the site, benching the foundation and placing fill, installation of a geotextile lining, placing a 400 mm thick filter layer of imported rock, then construction of the revetment armour layer using the rock recovered earlier. Additional armour rock was imported to complete the revetment, before disposing of the surplus material from the excavations.

Seawater Intake Pipelines

The purpose of the seawater delivery pipeline is to convey abstracted seawater from the seawater intake pump station (by others) to the desalination plant. The seawater intake pipelines involved trenching and laying a 240 m long 400 mm diameter PN10 HDPE de-beaded pipeline.

New Brine Pipeline

Constructing the brine pipeline required trenching and laying a 185 m long 315 mm diameter uPVC pipeline, including valves, valve chambers and a concrete headwall.

Construction of a Temporary Helipad Platform and Sea Wash Channel

To accommodate the relocation of the helicopter operators a temporary helipad area was constructed. This work included the diversion of the existing sea wash channel, earthworks for the platform using crushed material from the site, placing and compaction of layer works and asphalt surfacing.

District Cooling Infrastructure

The contract also included the construction of 2 200 m of 450 mm diameter, 1 500 m of 400 mm diameter, 600 m of 315 mm diameter and 2 450 m of 280 mm diameter PN 12,5 pipelines. This is to transport cold seawater to the V&A Waterfront cooling services, to assist in the reduction of electricity required for air-conditioning.

Construction of Helipad Layerworks and 4 x 4 Road Layerworks were placed in layers and compacted to 93% MDD and surfaced before constructing the 4x4 road around the perimeter, immediately behind the revetment.

The construction works required the members of the project teams to use of BIM 360. This software provides significant advantages over traditional methods of contract communication and ensures transparency when sharing of information and ensures open communication with the project managers.

As part of the pipe works, a grouping of 6 No. 450 mm diameter PN12,5 HDPE pipelines were laid around the sea-side perimeter. Due to other construction operations in progress, such as placing levelling and compacting the granular layer materials, space for construction was limited and the 3 m deep trench would have required each section of pipe to be placed in the trench then positioning the pipe welding team to complete each joint, with very limited working space. ■

PROJECT INFORMATION

- **Company entering:** Civils 2000
- **Client:** V&A Waterfront Holdings
- **Main Contractor:** Civils 2000
- **Project Manager:** Igual Project Managers
- **Design Engineer:** MH & A Consulting Engineers











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CONSTRUCTION OF THE NEW HELDERBERG NATURE RESERVE MULTI-PURPOSE CENTRE

The New Helderberg Environmental Centre (HEC) is built on the slopes of the stunning Helderberg Nature Reserve. The mesmerising natural views overlooking the reserve as well as False Bay make it an ideal location for the plant and animal kingdom of Somerset West and the larger Western Cape. The building epitomises sustainable design thinking where the construction methodology incorporated alternative building technology. These included ramped earth walls, echo bricks, green roof with solar panels, etc. all contributing to reducing carbon emissions. The project commenced at a slow pace but soon found its momentum and delivered project benefits within specified criteria.

The objectives of the project were to construct a new Education Centre using mainly alternative methods (for the building to become a teacher in its making and end product) and sustainable materials and construction methodology to demonstrate and provide visitors first-hand experience of the positive impact of sustainability in action. It was all about balancing the location and orientation with the natural environment. This was to accommodate the biodiversity of the site landscape and not to take away from the environment alone but to give back with and through the building toward sustainability and combating climate change. The project's aim, at its essence, is to construct a new Environmental Centre within Somerset West. This space will be dedicated to educating schoolchildren and various user groups, fostering a deeper connection with the environment. Its objectives lie in utilising alternative construction methods and sustainable materials, transforming the building into a living lesson in sustainability. The scope of the project includes recycled materials like reinforced tires and rammed earth technology, with a focus on passive design interventions for optimal thermal performance. The design concept is rooted in "biophilic design principles", encouraging human engagement with the natural world. ■

PROJECT INFORMATION

- **Company entering:** City of Cape Town
- **Client:** The City of Cape Town – Environmental Department
- **Main Contractor:** The Construction Co.
- **Architect:** Ebesa Architects
- **Principal Agent:** Ebesa Architects
- **Project Manager:** City of Cape Town
- **Quantity Surveyor:** Narker & Associates
- **Consulting Engineer:** New Consulting Engineers

LENTEGEUR OVER-RAIL PEDESTRIAN BRIDGE

This project, south of the R300 in Lentegeur, Mitchells Plain in Cape Town, entails the construction of a pedestrian bridge over the existing railway line, which links Katrina Harries Road and Rosa Hope Crescent (on the Western side of the tracks) with Portulaca Street and Plumbago Crescent, on the Eastern side. The site was handed over to Civils 2000 on the 25 November 2022 and was due for completion on the 13 November 2023.

The structural engineer's design called for a skew, 11 span reinforced concrete bridge with ramped approaches and staircases on either end. The bridge is founded on micropiles at a depth of 15 m each with 10 piles per foundation, with each deck span supported on elastomeric bearings and completed with precast parapet beams. The deck spans are screeded concrete deck slabs, with the abutments completed with stone-pitched embankment fills and surfaced pathways, platforms for informal traders, with pedestrian lighting at walkways as well as on the bridge. Provision for CCTV cameras were also installed.

Civils 2000 offered construction advice which was later implemented, placing 20 mm aggregate wrapped in Bidim geotextile below the column bases to mitigate potential problems relating to the high-water table in the area. In addition, Civils 2000 designed a temporary propping system that was installed to immobilise the precast bridge beams due to excessive wind loads experienced. The propping system was installed and maintained until the down stand bridge deck between the beams was cast and reached sufficient strength.

Design of any aspects of the permanent works was outside Civils 2000's scope of works, however, Civils 2000 was responsible for design of the temporary works, specifically the formwork, scaffolding and lateral support of piled foundations adjacent to the railway tracks.

This project, which was completed on 13 November 2023, has been executed with very few hitches due in large part to a positive client, a proactive project manager, thorough detailed planning by the site team, and the methodical implementation of strict project management, safety and environmental controls. The bridge will be completed and handed over ahead of schedule. ■

PROJECT INFORMATION

- **Company entering:** Civils 2000
- **Client:** City of Cape Town Transport Infrastructure Implementation
- **Main Contractor:** Civils 2000
- **Project Manager:** FENG JV
- **Design Engineer:** Denith Africa

PROJECT INFORMATION

- **Company entering:** City of Cape Town – Environmental Department
- **Main contractor:** Entsha Contruction
- **Architect:** DK Architects
- **Principal agent:** DK Architects
- **Project manager:** City of Cape Town
- **Quantity surveyor:** Senekal Allen & Partners
- **Consulting engineer:** HHO Engineers

NEW EDUCATION DOME AND EXPERIENTIAL EDUCATION GARDEN: GREEN POINT PARK

This project entails the creation of a novel composite structure within the Greenpoint district. The envisioned Dome will stand at a height of 6 m, constructed with a timber-framed structure featuring an approximate 6 m radius. It will be supported by a reinforced concrete foundation and adorned with a weathered steel-clad façade. The inspiration for its unique shape draws from various forms of 'Khoi-San huts'. The Dome's primary purpose is to serve as an educational facility, catering to school groups, learners, and the wider public. It also holds potential as a covered gathering space. To fulfill its educational role, the Dome must meet specific requirements, including the provision of an audio-visual sensory gallery and educational displays for on-site learning.

Therefore, it is imperative that the structure is weatherproof, waterproof, and practical for housing electronic equipment and displays.

Historically, the Green Point area has been of significant cultural and ecological importance. Indigenous herder and hunter groups have utilised the Cape's shorelines, rich in nutrient-dense resources, for over a millennium.

The project is a captivating fusion of cultural heritage, architectural brilliance, and unique design, destined to serve as a beacon of inspiration and cultural education. It is a celebration of the remarkable legacy of the Khoi people, paying homage to this First Nations group by crafting a dome-shaped classroom inspired by their traditional dwellings.

This structure stands as an architectural marvel, seamlessly integrating with existing Khoi structures and the biodiversity showcase garden, setting itself apart as a symbol of cultural preservation and environmental enlightenment. ■

PROJECT INFORMATION

- **Company entering:** Civils 2000
- **Client:** Department of Public Works
- **Main Contractor:** MWC Global
- **Project Manager:** Delta Built Environment Consultants
- **Architect:** Delta Built Environment Consultants
- **Consulting Engineers:** Delta Built Environment Consultants

SALDANHA MILITARY BASE DOD & MILITARY VETERANS: CONSTRUCTION OF SICKBAY FACILITY

This project involved Civils 2000, as subcontractor to MWC Global, building a 40-room 1 255 m² sickbay clinic – including operating rooms, dental surgeries, physio facility, consulting rooms and emergency resuscitation section, guardhouse, pump station, helipad, civil services, and paved roads and parking areas for at the Saldanha Military Base.

The civil works and building design, including architectural, mechanical and electrical designs, were undertaken by Delta Built Environment Consultants.

Civils 2000 advised and implemented a proposed water tank storage system which was changed from structural steel due to the corrosive environment close to the sea.

The structural design concrete blocks in the main bearing face brick walls. The result was in keeping, aesthetically, with the rest of the building. Civils 2000 innovated and employed a local artist to paint the concrete blocks to simulate the surrounding brick, and the result was a huge success with it being virtually impossible to identify the concrete.

The extension of the existing sewer pumpstation to accommodate the new pumps that were to be installed was another Civils 2000 design suggestion and in addition Civils 2000's construction Manager, Kavish Kusial, assisted Exalon Environmental and Delta to create the solution to the wetland capacity and flow problems.

Civils 2000 also leant on our building experience by recommending to the designers that a moisture barrier be installed below the concrete work as the initial design did not account for the risk of the vinyl flooring pulling up due to moisture in the floors because of the proximity of the building to the sea. Civils 2000 also recommended the use of air bricks on the 2nd floor to provide additional ventilationThe civil, structural, mechanical and electrical engineering designs and the architectural designs were undertaken by Delta Built Environment Consultants. Civils 2000 were not required to design any of the permanent works; however, temporary works designs were required for scaffolding and formwork.

Exalon Environmental Consultants was the client-appointed environmental control officer (ECO) and was responsible for ensuring the requirements of the environmental specification and statutory requirements were met by Civils 2000.

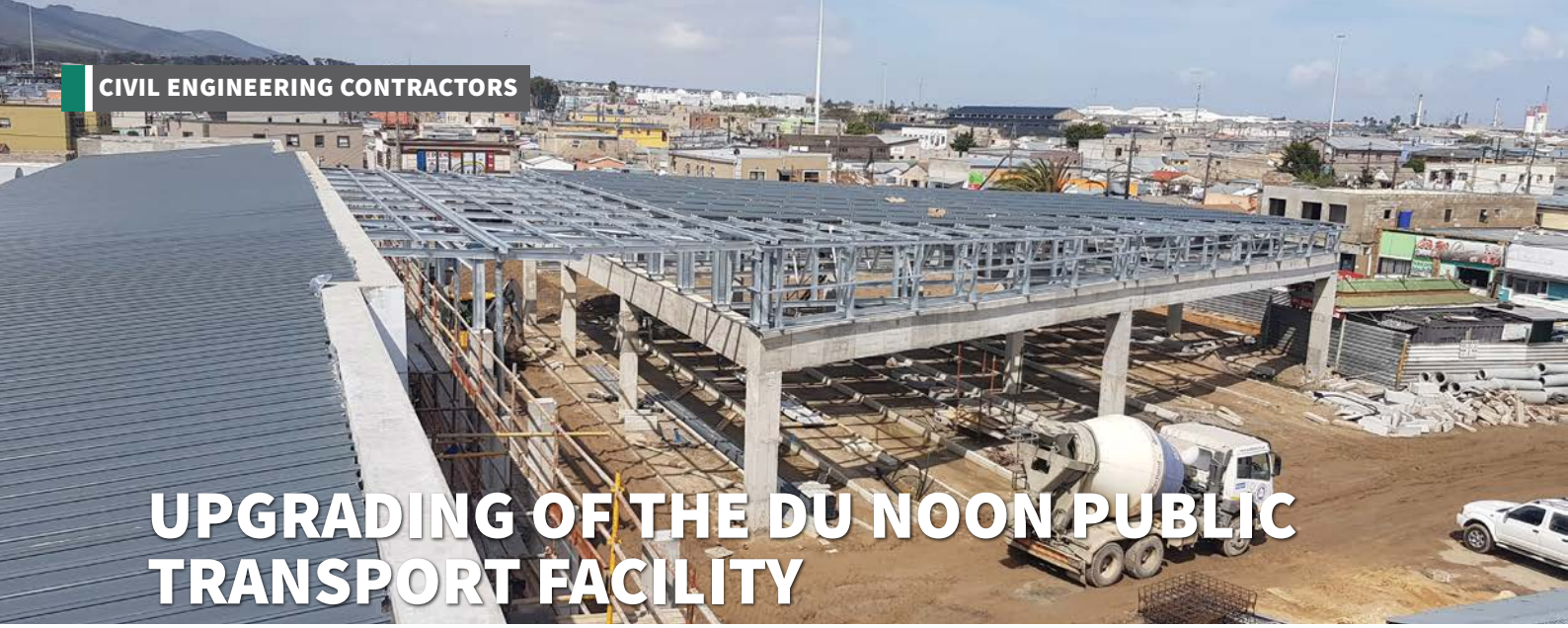
Manatoka and Blue Gum invasive plant species were removed off-site before flowering to reduce seed dispersal while performing the construction work.

Due to the flat topography, the stormwater drainage required some additional works, including a collection pond and constructed wetland area to provide some secondary treatment of stormwater flows.

The initial construction period 24 months was extended to 30 months due to additional works being instructed.

To reduce time at completion stage, Civils 2000 rectified minor omissions and defects as work progressed and this saved time during the practical completion phase.

The building work was completed to a very high standard, particularly the terrazzo flooring and plaster work finishes, and dental installation (PANCEPH 3D unit and chairs), HVAC, electrical, painting, vinyl flooring. All the buildings and civil works were built to SABS 1200 specifications. ■



UPGRADING OF THE DU NOON PUBLIC TRANSPORT FACILITY

The Du Noon Public Transport Interchange (PTI) project exemplified Cape Town's urban development strategy by creating a more effective, inclusive transport system. The project enhanced the existing Du Noon PTI allowing it to accommodate the local taxi association and vendors, and serving as a model for upgrading dense urban areas. Executed in two phases, it included new offices, trading facilities, ablution amenities, a security tower, covered walkway, and taxi rank. External services like civil, electrical, fire, and mechanical services were also incorporated. This initiative established a precedent for economic activity in high-density urban zones. The Du Noon PTI new transport interchange project is located on the corner of Potsdam and Dumani Roads, Du Noon, opposite Parklands and the N7 main road, Cape Town.

The Du Noon PTI modernisation included constructing offices, taxi rank, walkway, security tower, and services to rehabilitate infrastructure and services for Dunoon's improved service delivery. Key goals encompassed sustaining socio-economic activity during construction, ensuring accessibility, stimulating entrepreneurship, and coastal risk mitigation. The project aimed to boost service delivery through innovation, safety, and environmental enhancement. Benefits included preserving local socio-economic activity, enhancing accessibility, maximising opportunities, and improving infrastructure management. This pioneering project showcases transport's contribution to local economies, addressing inadequate Du Noon PTI conditions, accommodating taxi operations and vendors, and upgrading the rank for improved operations.

The project is a demonstration of modern South Africa and an inclusive and connected city (first of its kind). Not just transport orientated but an economic and social hub integrated with informal settlements. Provide cutting edge quality service delivery. ■

PROJECT INFORMATION

- **Company entering:** City of Cape Town
- **Client:** City of Cape Town – urban mobility
- **Main Contractor:** RC Civils
- **Architect:** Meyer & Associates
- **Principal agent:** NAKO ILISO
- **Project Manager:** City of Cape Town
- **Quantity Surveyor:** QS Talani
- **Consulting Engineer:** NAKO ILISO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KENHARDT SOLAR PARK PROJECT

In the context of the Kenhardt Solar Project, where South Africa grapples with critical energy and water shortages, CHRYSO SA's contribution takes centre stage. CHRYSO's cutting-edge super plasticiser and retarder played a pivotal role. A total of 2 955 truckloads, or 42 000 litres of additives, were supplied by Scribante Concrete for this monumental project that used 18 814, 50 cubic metres of concrete.

The Kenhardt Solar Project emerges as a beacon of hope and a practical solution in the face of South Africa's energy and water challenges. Amidst acute shortages and the pursuit of sustainable alternatives, the significance of renewable energy sources cannot be overstated.

This project exemplifies South Africa's commitment to pioneering sustainable solutions in the energy sector. It stands as a testament to vision and innovation, shaping a greener and more sustainable future, not only for South Africa but also for the broader global community.

The project, spanning an incredible 9 km by 3 km area, has set the stage for pioneering Construction Innovation Technology that deserves recognition. As the sun rises over the 540-megawatt solar plant, the construction team's dedication becomes evident. Ibhayi Contracting installed 180 000 steel piles concreted in situ, 41 000 tons of steel, 1 million solar panels and a staggering 36 681 221 fixing components, all done at record installation rates with 97% local lab and new innovative installation methods, to tight tolerances all done to the backdrop of the energy crisis in South Africa. Ruwacon, the civil construction contractor, harnessed cutting-edge methods to lay the foundation for this colossal renewable energy venture. The expertly cast 3 420 piles, meticulously positioned to house the crucial battery containers, exemplify the fusion of technology and craftsmanship. Guided by Scribante Concrete, they've embraced advanced techniques, including the use of a new generation super plasticiser and retarder in the concrete mix design, a demonstration of their commitment to excellence.

This innovation, without affecting the concrete's workability, allows for a reduction in water content, enhancing durability. Simultaneously, it increases the slump/flow, resulting in superior off-shutter finishes and improved cohesion. Moreover, this remarkable technology is robust to differences in cement characteristics and can be used with various supplementary cementitious materials. It doesn't compromise early-age strength and, in some cases, even enhances it.

The Kenhardt Solar Project is evidence of

PROJECT INFORMATION

- **Company entering:** CHRYSO Southern Africa and Scribante Concrete
- **Client:** Eskom
- **Client:** Department of Trade & Industry
- **Project Owners:** Scatec
- **OEM Contractor:** Scatec Operations
- **Construction Company:** Ruwacon Construction
- **Mechanical Contractor:** Ibhayi Contracting
- **Concrete Supplier:** Scribante Concrete
- **Admixture Product:** CHRYSO Super Plasticiser

pioneering Design Innovation that redefines the possibilities of renewable energy. The incorporation of approximately 1 million solar PV modules showcases a harmonious blend of form and function, harnessing the sun's energy with unparalleled efficiency. The integration of a pioneering battery storage system ensures continuous power generation, even after the sun sets. This visionary approach not only addresses energy reliability but also reshapes the trajectory of sustainable power on a global scale. The Kenhardt Solar Project's design innovation is an awe-inspiring demonstration of human capability, deserving of acclaim as a shining example of progress in the renewable energy landscape.

From financial close to commercial operation, this remarkable endeavour achieves an extraordinary feat, completing construction within a mere 15 months. This remarkable timeline underscores the project's commitment to timely delivery without compromising quality. Speaking of quality, stringent standards are upheld for all contractors and sub-contractors involved, with an unwavering focus on precision and excellence.

A dedicated quality team diligently monitors every facet of the construction process, leaving no room for compromise. The project's meticulous approach to quality assurance is evident in the comprehensive inspection records meticulously maintained for every step of the construction journey. ■

15 FREDMAN DRIVE

With the existing building constructed in the 1980s, WBHO was appointed to execute the refurbishment of what is now the new home of the Primedia Group. It must be noted that there were no available construction drawings of the existing structure. The project's new design required a large extent of demolition works to the existing structure as well as the preservation and restoration of existing facades and concrete elements internally and externally.

The existing structure consisted of two levels of basement parking areas (1 100 m^2 per floor) and three levels of office space (1 800 m^2 per floor) with a concrete roof slab. The east and west elevations included two open to the element atriums that would later be converted into internal atrium spaces. The existing slab construction included the use of precast lintels resting on perimeter ring beams with a in-situ cast slab resting on the structure.

The basement parking was expanded to both the north and south side of the existing parking areas adding an additional 1 535 m^2 of parking space per basement floor, along with a brand new third basement (1 240 m^2) parking level, constructed on the south of the building.

This was achieved by drilling over 150# 800 diameter, 9-metre-deep piles along the existing structure as well as the neighbouring properties and roads in order to create a lateral support.

The existing concrete roof was changed into an additional office floor and a structural steel sawtooth roof was built over the floor.

Approximately 524 m^3 of existing concrete was carefully demolished and removed from the structure. Most of this material was removed mechanically and carted close by for removal from site. Ninety per cent of the concrete material removed was reclaimed and recycled off site.

Based on there being no available drawings of the disposal of the structural and architectural design teams of the existing structure, a team of surveyors was tasked at the onset to conduct a full 3D scan of the existing structure across all levels, internally and externally. This scan was converted into a 3D digital model that could be merged with the Revit model whereby all disciplines were then coordinated.

The preservation of the existing face brick facades was paramount to the success of the project and required structural strengthening by means of structural steel beams clamping the walls back to the concrete structure. Only once this was completed could the intermediate brick piers be demolished and the aluminum "picture frames" be installed.

Internal face brick walls were carefully demolished and bricks cleaned to be re-utilised on portions of the facades where the face brick match was required to maintain the overall aesthetics.

Available space in and around the existing building was extremely limited and resulted in the contractors developing specialised rigging frames. These rigging frames were constructed to install the atrium link bridge and atrium closure slab structural steel beams. This was necessary as the tower crane could only be erected once the bulk excavations of the new parking structures were completed.

New penetrations through slabs required the installation of 12 mm thick, sandblasted steel plates. These plates were epoxied to the underside of the slab and anchored to the exiting beams. All beams had to be scanned in order to determine the location

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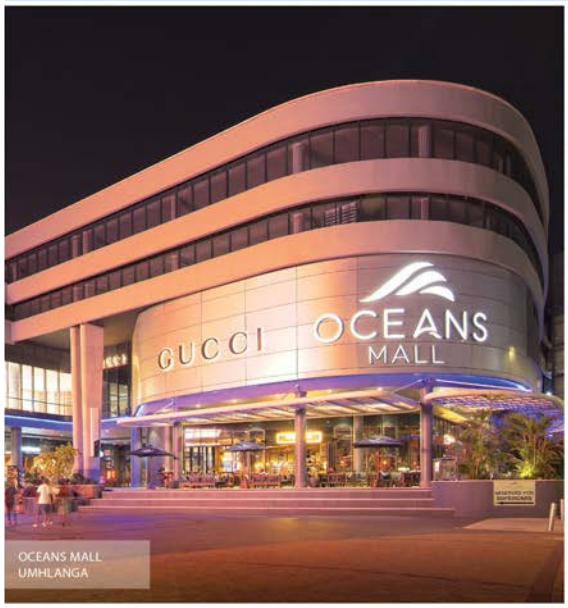

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of the reinforcing in order to coordinate the anchor points through the steel plates to avoid clashes with reinforcing post plate and epoxy application.

Back propping and structure temporary support designs were a crucial part of the demolition works. Once the existing structure had been sufficiently supported on all floors, contractor and engineer had to do a full/detailed inspection to ensure supports were placed correctly as per detailed design to avoid any collapse of the existing structure. Investigative measures were implemented ahead of full demolition by means of coring into concrete elements, scanning of concrete elements and isolated demolition of part of an element to ensure the structure remained stable at all times and the employees within the structure were safe at all times.

All new interior walls were constructed from Everite Hebel lightweight blockwork due to the limited loading capacity that the existing structure could hold.

Primedia was a Greenstar project and required Environmental Authorisation to be obtained. As such, there was a detailed Environmental Management Plan (EMP) drafted for the development and the requirements therein were strictly adhered to mitigate any adverse environmental impacts. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Zenprop
- **Main Contractor:** WBHO Construction
- **Architect:** Paragon
- **Principal Agent:** Morta
- **Project Manager:** Morta
- **Quantity Surveyor:** Schoombie Hartmann
- **Consulting Engineer:** Sotiralis

TREVENNA SUPER BASEMENT PROJECT

Concor was appointed by the Public Investment Corporation (PIC) as the principal contractor on the large and challenging Trevenna Super Basement Project in Sunnyside, Pretoria – which has created a 'future-proofed' five-level basement as a precursor for A-grade office buildings in the Trevenna Office Campus.

To prepare the way for the future evolution of the upper structures, the scope of work also included extensive underground services such as sewer and stormwater infrastructure, electrical reticulation, lifts to the ground floor and access control.

Covering almost 70 000 square metres of parking space and other amenities, the super basement extends 20 metres below ground level. This meant that the basement floor was 12 metres below the water table, creating significant groundwater and rainwater challenges. Hard rock conditions were also encountered and required controlled blasting and other excavation to reach the required levels.

The Trevenna Super Basement is in a busy urban area, surrounded by high density residential accommodation. Community engagement was therefore key to the project's success, as was careful planning, effective communication and a flexible approach from the contractors.

To facilitate the fast pace of construction, Concor deployed five tower cranes on the site for expediting movement of steelwork, formwork and other construction materials. Space was at a premium due to the busy urban location, and the footprint of the basement extended across almost the entire site.

In preparing the ground for the basement, Concor was required to work in rock with a hardness up to 250 MPa, and 12 metres below the natural water table. Controlled blasting was applied, and sumps and channels created to pump water continuously from the site. Careful planning and hands-on implementation of resources allowed Concor to break up the challenging areas into manageable blocks – to progressively work towards the upper levels.

During construction, a key innovation was the use of post-tensioned beams throughout the super basement. This allowed for thinner slabs and reduced the concrete and rebar requirement - adding to the overall project's green star strategy.

The post-tensioned designs provided flexibility for the design engineers in terms of loading and constructability within the large super basement structure.

Dealing with water ingress required extensive waterproofing of the structure, so hybrid systems were used to ensure no ingress of rain or underground water. This included the use of concrete additives in shaft pits and waterproofing applications on tanks to ensure no leakage.

The Trevenna Super Basement slab levels had to tie up with existing adjacent basements, requiring ramps to be designed and constructed. Where access portals were necessary, these were supported with structural steel while concrete cutting or stitch coring was conducted. Concor is committed to limiting the environmental impact of its projects, including the reduction of the carbon footprint through lower emissions. At Trevenna Super Basement this was achieved in various ways. The local participation of subcontractors and suppliers meant that most resources – in labour and materials – were from the Tshwane region.

The various concrete mixes for the columns, walls and slabs, supplied by readymix specialist AfriSam, were specified to have a 30% replacement of cement with fly ash to reduce its carbon footprint. This provided a green star mix of four stars in terms of the Green Building Council of South Africa criteria.

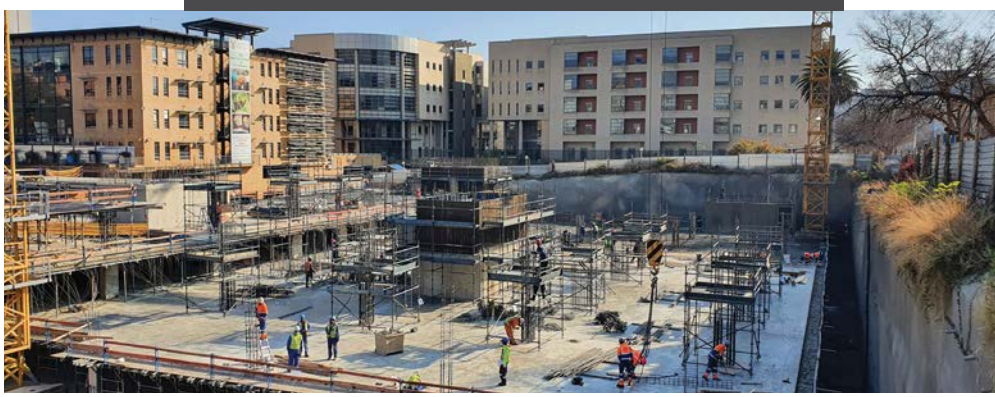
The main supply for the readymix concrete also came from AfriSam's nearby Ferro Plant in Pretoria North – just 14 km from the site – ensuring carbon emissions from the readymix trucks were minimised. AfriSam also supported the project's environmental sustainability aims by managing the production and delivery of readymix in a responsible manner that reduced waste.

Management of water on the site was done in compliance with the client's water use licence. Working below the water table meant continuous pumping of water from the site, which required the measurement of water volumes leaving the site and entering the city's stormwater system.

The future-proofing of the super basement meant that all foundations and vertical structures were designed to accommodate the top structures – which at the time of the basement's construction were not yet designed. ■

PROJECT INFORMATION

- **Company entering:** Concor Construction
- **Client:** Public Investment Corporation
- **Main Contractor:** Concor Construction
- **Architect:** Paragon
- **Principal Agent:** Origin PM
- **Project Manager:** Origin PM
- **Quantity Surveyor:** Crane QS
- **Consulting Engineer:** NAKO ILISO



EASTGATE SUSTAINABILITY PROJECT

In a three-pronged project to improve the sustainability, efficiency and resilience of Liberty Two Degrees' Eastgate Shopping Centre in Bedfordview, Johannesburg, Concor was engaged to execute three different construction elements. These are the extension of the solar energy generation plant, the installation of rainwater harvesting, storage and treatment facilities and the upgrade of the heating, cooling and ventilation (HVAC) system.

Underpinning each of these fast track sub-projects is the demanding condition that trading activities at this busy shopping centre must be allowed to safely continue undisrupted. At a technical level, there are myriad challenges which the Concor team is successfully overcoming through careful planning, efficient execution and skilled workmanship.

Solar Energy Generation Plant: The solar energy system – the second phase which augments an existing installation – covers 30 000 square metres of the roof top parking area. It comprises concrete stub columns supporting a steel framework of girders and trusses, on which photovoltaic (PV) panels are mounted.

Rainwater Harvesting, Storage and Treatment Facilities: The rainwater harvesting facilities comprise two large water tanks which will store water from the roof top run-off and groundwater under the centre, as well as pipework and a water treatment system.

HVAC: The HVAC upgrade involves the installation of heavy chiller units above an existing building on the centre's roof top – requiring extensive demolition and strengthening work to bear the added load. In executing this project, Concor has adopted various construction innovations to address the technical complexity of working on a shopping centre roof parking level with low load bearing capacity, and conducting work safely and efficiently within a live environment where tenants and shoppers continue trading.

Aligning with existing columns

For the solar energy generation facility, the weight of the steelwork domes and PV panels could not be supported by the roof slab itself, so the layout of the supporting stub columns (as would have been usual with ground-based solar farms) is not uniform.

Protecting post-tensioned cables

An added challenge of this endeavour is to accurately locate the existing column heads below the roof top parking's tarmac, and open them up without damaging the post-tensioned cabling in the slabs.

No heavy equipment

The limited load bearing capability of the shopping centre roof also means that heavy equipment cannot be used to carry machinery or materials to the working areas.

The project is all about sustainability – from energy generation and water conservation to making the best use of available energy and taking significant load off municipal supply which is already under stress.

The extended solar generation facility will add 5,74 MW of solar power to the centre's renewable capacity, reducing the carbon footprint and taking a welcome load off the national grid.

The rainwater harvesting system demonstrates the commitment to water conservation by making optimal use of scarce water resources. It provides another constructive example of how the private sector can support society's call for responsible water stewardship, and will undoubtedly be followed by other shopping centres.

The upgrade of the HVAC system is an advance in both energy and water efficiency. Using energy efficient technology, it will optimise power draw and its closed water loop means that water is no longer lost to evaporation.

The solar domes are designed to match the existing solar structures from Phase 1 of Eastgate Shopping Centre's evolution to renewable energy. In this design, PV panels are fitted closely to create a high and sealed roof effect. This will function to protect shoppers and their parked vehicles from sun and rain, while still allowing sufficient cooling air movement under the dome.

The CAD design of the complex steel framework to support the panels was important in meeting the project's tight timelines. It was designed well in advance and premanufactured to allow easy assembly without on-site cutting and welding.

The visual impact of the HVAC building on the roof will also be enhanced by a perimeter louvre structure that is designed to hide the equipment from the view of shoppers. ■

PROJECT INFORMATION

- **Company entering:** Concor Construction
- **Client:** Liberty Two Degrees
- **Main Contractor:** Concor Construction
- **Architect:** Batley Partners
- **Principal Agent:** Origin PM
- **Project Manager:** Origin PM
- **Quantity Surveyor:** Acost
- **Consulting Engineer:** Zutari

OCEANS RETAIL

The Oceans Retail development is situated at 7 – 11 Lagoon Drive, Umhlanga Rocks. The 36 000 m² mall is part of the R4,3b Oceans Umhlanga mixed-use development project. The mall has top national and international brands, two large anchor tenants - Woolworths and Checkers and 14 restaurants. The luxury Platinum Walk for fashion features premium international fashion brands such as Dolce & Gabbana, Burberry, Gucci and Versace. There is also a 90 000 m² parking structure servicing the Mall, Hotel & Apartments.

The site was taken over from an existing contractor and an extensive process had to be to be followed before commencing, to determine the scope of work remaining and also to ensuring that what had been previously constructed tied back to the drawings and was of the correct quality.

The project created approximately 6 000 jobs during construction and approximately 2 500 permanent jobs.

Lift Shafts

WBHO understood the varying complexities of the different lift shafts. To this end it had opted for a hybrid approach to this construction. On the more complex shafts WBHO developed the Hydraulic Climbing System. This system allows vertical elements to progress ahead of the floor slabs. The climbing shutters were designed and manufactured precisely for this project.

Tower Cranes Coordination

The project was serviced by five tower cranes. Tower crane coordination was one of the important factors in the design of temporary works. The cranes were designed to stand at different heights and at positions such that they did not clash during operation and at free slew.

Birdcage Scaffolding

There were a number of feature opening areas in the mall through the first-floor slab. A specialised scaffold was designed to bridge these openings. This was done so that scaffolding did not have to be erected on the ground floor and impede works. Also, to allow earlier access in order to complete finishes sooner and for the tenants to start their fitouts earlier. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction - KZN Building
- **Client:** Government Employees Pension Fund
- **Main Contractor:** WBHO Construction
- **Architect:** ELP
- **Principal Agent:** PMSA/Betts Townsent
- **Quantity Surveyor:** Crane Quantity Surveyors
- **Consulting Engineer:** Sutherland Engineers

5 PARKS BOULEVARD, OXFORD PARKS, ROSEBANK

PROJECT INFORMATION

- **Company entering:** Concor Construction
- **Client:** Intaprop Investments
- **Main Contractor:** Concor Construction
- **Architect:** GLH Architects
- **Principal Agent:** Duncan Clark
- **Quantity Surveyor:** Agora Africa
- **Consulting Engineer:** Pure Consulting

The design and construction of 5 Parks Boulevard – which is Concor's seventh contract at Intaprop's Oxford Parks Mixed-Use Development in Rosebank, Johannesburg – achieved a high Green Star rating from the Green Buildings Council South Africa (GBCSA). Built on four platforms with 80 piles, the elegant building comprises four basement levels and five office levels – providing about 7 300 m^2 of gross leasable area (GLA). The stylish office block features a façade combining glazing and stone which enhances the use of natural light. Constructed at a fast-track pace, the Concor team accomplished a safe and on-specification result between July 2022 and Beneficial Occupation in February 2023 with final handover in August 2023.

The elegant structure of 5 Parks Boulevard comprises conventional reinforced concrete slabs from the basements to the roof, with a lift core to accommodate three lifts down to the lowest basement. An innovative method of lift construction was implemented using an hydraulic formwork system, which allowed the vertical shafts to be constructed ahead of the slab pours to optimise the cycle time between slabs.

Each level of slab consumed between 150 m^3 and 250 m^3 of 25 MPa readymix concrete, with the bulk supply of all readymix concrete provided by AfriSam. The slab on each level was placed in four pours, with the schedule requiring on average two pours per week. Higher strength concrete – ranging from 35 MPa to 60 MPa – was used for the columns and verticals.

The roof and levels three and four were designed and constructed using higher strength readymix concrete with additional steel reinforcement to enable early strip to be achieved. This, in turn, allowed early access to complete façade elements and services on the top two floors.

The façade of the building was constructed using prefabricated facade panels which were lifted into position and bolted onto the structure between the slabs. This process was facilitated through the accurate detailing of the façade panels during the early stages of construction which allowed these to be manufactured ahead of time, again speeding up the construction programme. As part of its qualification as a Green Star rated building, the concrete mix designs used in the construction of 5 Parks Boulevard contributed to reducing the overall carbon footprint of the structure. This was achieved by using more fly ash in the mixes reducing cement levels by 30%. Less cement means less clinker, which consumes considerable energy in its manufacture.

The green design includes photovoltaic panels on the roof, which will generate renewable energy for up to 90% of the tenants' needs.

To further support the energy efficiency requirements of the Green Star rating, the building makes extensive use of glass windows – about half of which are double-glazed. Thin-glazed glass will be mainly used on the atrium side, with punch windows being installed for the rest of the building.

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. All waste is separated into wood, steel, cementitious and general waste on site, and placed into the appropriate skip containers before being removed and disposed of responsibly by certified waste removal subcontractors.

Concor's ISO 14001 environmental certification also required that the project's suppliers and subcontractors were sourced within 40 km of the site, where possible, to reduce the CO_2 footprint.

The design of 5 Parks Boulevard combines functionality and aesthetics, with a triple-volume atrium in the reception area that makes the most of natural light and reduces energy consumption. This feature extends from the ground floor through to the second floor. Further utilising the natural light is a double-volume area on the third and fourth floors of this five storey building.

The façade encompasses various elements including double-glazed glass and large tiles, and a Versus paint application which gives a durable textured finish that does not require extensive maintenance. ■

DR PIXLEY KA ISAKA SEME HOSPITAL

The Dr. Pixley ka Isaka Seme Hospital, constructed by Enza Construction, is the most advanced, specialised medical institution in KwaMashu, KwaZulu-Natal. The 500-bed regional hospital is part of the KwaZulu-Natal Department of Health's hospital Revitalisation Programme, which provides healthcare to approximately 1,5 million people living in KwaMashu, Inanda, Ntuzuma, and surrounding communities in the northern Durban area.

Enza Construction is a 100% Black-owned company with a Level 1 BBBEE Contributor and a professional and experienced management team. Enza has a strong expertise in project management, construction, and property development, and over the previous 23 years has amassed a comprehensive and broad portfolio of projects.

In the heart of the vibrant community of KwaMashu, Durban, nestled amidst a backdrop of rolling hills, stands the 86 000 m² Dr. Pixley ka Isaka Seme Memorial Hospital - a beacon of healthcare excellence, boasting state-of-the-art facilities and cutting-edge medical technology. From advanced diagnostic imaging to specialised surgical units, the hospital leaves no stone left unturned in its aim of providing comprehensive treatment. It has evolved into a medical innovation and centre of excellence, attracting outstanding healthcare experts from all around the world. This extraordinary institution honours the life and legacy of Dr. Pixley ka Isaka Seme, a visionary leader and advocate for social justice. The hospital is a testimony to his perseverance, delivering exceptional healthcare to many people in need.

This system has a world standard heating, ventilation, air conditioning (HVAC system) cooling capacity of nine megawatts, many dedicated air handling units, centrifugal water-cooled chillers, and closed-circuit cooling towers. It also employs a rainwater collection system to replenish cooling tower water and toilet flushing. ■

PROJECT INFORMATION

- **Company entering:** Enza Construction
- **Client:** KwaZulu-Natal Department of Health
- **Main Contractor:** Enza Construction
- **Architect:** TV3
- **Principal Agent:** PMSA
- **Project Manager:** PMSA
- **Quantity Surveyor:** AECOM
- **Consulting Engineer:** Zutari

HILL ON EMPIRE PHASE 2

The Hill on Empire Phase 2 project required the construction of an eight-story office block in Parktown, Johannesburg for developers Abland and Redefine Properties. The building was designed by architects MWLF and interior designers, Thinkspace. Structural designs were completed by LnS Consulting.

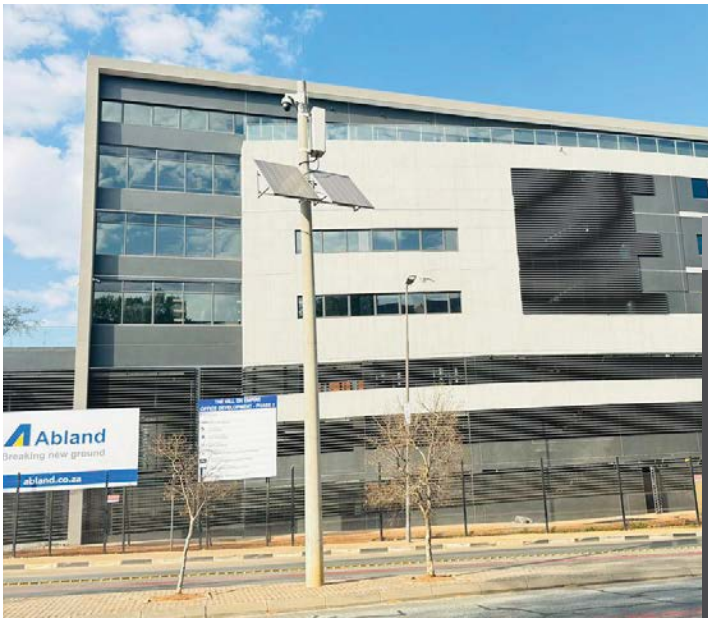
The building has a 6 000 m² footprint which is broken into three parking levels, a ground floor and three office floors with a concrete roof. The building has three cores which house two lifts, an in-situ cast concrete staircase and a toilet block each. A further two in-situ cast fire escape staircases are located on either end of the building. The façades of the building consist primarily of brickwork, plaster with either a paint or a marmoran finish, and either strip or punch windows for fenestration.

The scope of works also comprised a full tenant fit out on the ground floor, the three office floors with a roof entertainment area and service plant room.

The site is located in the heart of Johannesburg, just north of the Johannesburg CBD.It is sandwiched between Empire Road on the North and Joubert Street on the South, flanked either side by the Hill on Empire Phase 1 project (completed in 2018) and the SAPS Gauteng provincial head office. Logistics to supply the site would definitely make or break the project with only Joubert Street being a viable source of access for all construction activities, deliveries etc.

Due to the constraints of the site only one tower crane could be placed.

The building itself has a stormwater attenuation tank designed and constructed at the north western end of the building. This attenuation tank has not only all the stormwater from the building attenuating into the tank but also of the surrounding office complex. There is also an overflow section which runs off onto a stone pitched area should there be any blockages or mass flows. During construction of the project great care was taken to ensure minimal impact on the local environment. Waste was separated at source into clean builders' rubble, general waste, timber and steel. This was then removed off site to local registered landfills. ■



PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Abland
- **Main Contractor:** WBHO Construction
- **Architect:** MWLF
- **Principal Agent:** MWLF
- **Project Manager:** Abland
- **Quantity Surveyor:** Quanticost
- **Consulting Engineer:** LnS

LEFIKA VILLAS AT SUN CITY

WBHO was contracted by Sun International to build a new development called the Lefika Villas (Lefika) in the picturesque hills surrounding the existing Vacation Club complex at Sun City.

This is the first phase a of a larger development planned by Sun International. The second phase will comprise approximately another 200 units, referred to as Sun Central. This phase is likely to start later in 2023.

The start date for Lefika was 29 September 2022 with a completion date of 12 December 2024.

Lefika comprises 56 units. There are 23 clusters with adjoining 3-bedroom units and then a further 10 free standing 4-bedroom units. Each unit is constructed on a prepared platform. Each platform is formed by either cutting and breaking into the rocky slopes or importing fill to create a level working space. The meandering access roads and restricted laydown areas due to the sloping site posed many logistical challenges.

Due to the severe slopes on portions of the site, seven of the four bed units are partly built on “stilts”. This was achieved by mechanically and manually exposing existing boulders in the natural landscape.

All villas are equipped with a closed combustion fireplace, an outdoor entertainment deck with a braai and an entertainment area, and magnificent views overlooking the Pilanesberg mountain range. The designers’ integration with the natural environment is further enhanced by softening harsh structural building edges by strategically placed planters on the building edges. The interior design is distinguished through a collection of materials and textures which reference natural forms, with colour palettes that draw inspiration from the surrounding fauna and flora. Numerous green design principles have been implemented to achieve optimal interior comfort and energy efficiency.

Using natural energy efficient design principles reduces heat gain in summer and minimises heat loss in winter. Large glazed areas allow for ideal natural lighting levels, while strategically placed windows ensure that effective cross ventilation creates the ideal level of comfort for the guest. Water saving sanitary fittings with energy efficient cold start taps, heat pumps for effective water heating and the use of LED lightings all contribute to the energy efficiency of the unit.

Sun International has enlisted the assistance of leading archaeological and heritage experts, including Wits Archaeology Professor Mandy Esterhuyzen, who is also the Director of the Origins Centre at Wits. Professor Esterhuysen will assist with the management and preservation of this and surrounding historical heritage sites.The designers have perfectly captured the brief, to minimise intrusion into the landscape.

WBHO was requested by Sun International to complete a 3-bedroom mock-up unit by 12 December 2022. This allowed WBHO a mere 10 week construction time from breaking ground to completion of all construction work and snags to provide Sun International with enough time to fit the units out in line with its quality standards. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Sun International (South Africa) Limited
- **Main Contractor:** WBHO Construction
- **Architect:** Boogertman + Partners
- **Principal Agent:** Betts Townsend
- **Project Manager:** Betts Townsend
- **Quantity Surveyor:** MLC Quantity Surveyors SA
- **Consulting Engineer:** Struxit Projects

SKY PARK OFFICES

Sky Park Offices, situated next to OR Tambo International Airport in Kempton Park, is a Green Star office building. The project commenced on 13 May 2022 with practical completion being on 14 December 2022. The completed office block offers 6 650 m^2 of gross leasable area.

Sky Park was an intense project to carry out as the project duration was only limited to seven months due to tenant occupation dates which had already been arranged and agreed to. With this in mind, a team of highly competent, committed and driven young professionals was allocated to the project. This team quickly realised that due to being in such close proximity to the airport, approval from the South African Civil Aviation Authority was needed for the erection of a tower crane. The necessary application was made and approval was obtained in time.

One of the biggest wins on the project in terms of allowing early access for finishing trades was the ability of the structural team to complete the entire concrete structure in just six weeks. This allowed the project to be slightly ahead of programme.

The structure of the office block consists of reinforced concrete with a total volume of 4 222 m^3, including 400 m of 1,5 m high off-shutter concrete retaining walls constructed around the site perimeter. The building also consumed a total of 503 546 tons of reinforcing steel bars.

The finish on the office block includes combed plaster, stucco and rigitone cladded walls. The building also features rigitone cladded ceilings, aluminum slatted ceilings as well as exposed soffits. The outside finishes are a combination of glazed façades, painted facebrick façades and timber-finish off-shutter feature walls. This is indeed a sight for sore eyes, more especially during sun rise.

A rather interesting fact is that all façade shopfront sizes were agreed to prior to casting concrete, this meant that the team had very little room for error, so as to avoid manufactured items being out of tolerance.

With Sky Park being a green building, it was accredited for reuse of all timber and wood offcuts.

All site generated building rubble, metal and steel remains, plastic, paper and bottles were recycled. The subcontractor camp was adequately rehabilitated after de-establishment. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Truzen 105 Trust – Zenprop
- **Main Contractor:** WBHO Construction
- **Project Management & Principal Agent:** Morta Project Management
- **Architect:** Paragon Architects
- **Structural Engineer:** Sotiralis Consulting Engineers
- **Civil Engineer:** Zutari
- **Professional Quantity Surveyors:** MLC Quantity Surveyors

THE BIOMEDICAL RESEARCH INSTITUTE (BMRI) AT STELLENBOSCH UNIVERSITY

Stellenbosch University's new Biomedical Research Institute (BMRI) forms a fully integrated and future focused research complex that matches the best the world has to offer.

The project consisted of both new build as well as the refurbishment of the existing Fisan building over three phases. The first phase was to construct a completely new 16 000 m² building in front of the existing structure. Once this building was completed and fully commisioned the research divisions to 50% of the existing building moved across to allow access for the revamp and plantroom extension on the existing building (Phase 2).

Following Phase 2 the balance of the research divisions in the existing building decanted into the newly renovated space to allow access to the third and final phase of the project. The existing building (14 500 m²) was completey gutted and refurbished over both Phases 2 and 3.

As part of the final phase, the new building was tied to the existing building by the construction of an atrium with interlinking bridges and staircases.

At 600 m², the BMRI hosts the largest Biosafety Level 3 (BSL-3) laboratory facilities on the African continent. BSL-3 laboratories are used to study infectious agents or toxins that may be transmitted through the air and cause potentially lethal infections. BSL-3 laboratories are designed to be easily decontaminated.

A system of negative air pressure keeps hazardous fumes or airborne toxins from flowing out of laboratories and into adjacent areas. A powerful ventilation and filtration plant continuously draws air out of laboratories and to the top of the building, where it is filtered and released.

The BMRI boasts advanced energy recovery technology fitted to the air system that reduces the building's carbon footprint compared to other similar buildings.

Due to the large number of resources required to execute the BMRI project over the three phases, a facial recognition access control system was implemented to not only speed up the access and egress to site, but also to assist with identifying individuals whose medical access had expired. The system also undertook personnel temperature readings, which barred access if an individual was running a temperature. The BMRI team identified the need for on site training across various disciplines in order to create a better understanding of Health and Safety, fundamental basics of construction, as well as the commercial impact certain decisions can have on a project.

The architecture of the BMRI is characterised by seamless integration of form and function. The building's exterior features a blend of modernist and contemporary design elements, with clean lines, expansive glass facades, and a harmonious combination of concrete, steel, and glass.

This design choice not only imparts a sense of transparency and openness but also allows for ample natural light, creating a welcoming and inspiring environment for researchers and visitors alike.

Internally, the BMRI is designed to optimise collaboration and interdisciplinary research. The layout is organized around open-concept workspaces, communal areas, and flexible laboratories, facilitating the exchange of ideas and fostering a sense of community among researchers. Complex process driven architecture can be seen as the human facing building avatar or shell that meaningfully hides the critical building services.

With sustainability at the heart of its construction, the BMRI's energy and water systems, material selection, emissions, waste management and use of natural light all contribute to Stellenbosch University's efforts to meet net zero targets. ■

PROJECT INFORMATION

- **Company entering:** WBHO Construction
- **Client:** Stellenbosch Univeriversity
- **Main Contractor**: WBHO Construction
- **Architect**: Roelof Rabe Architekte
- **Principal Agent:** Henry Fagan
- **Project Manager:** Henry Fagan
- **Quantity Surveyor:** HKQS
- **Consulting Engineer:** LTS Heath Laboratory Design Specialists

PEPKOR DISTRIBUTION CENTRE – KEYSTONE PARK – SOIL IMPROVEMENT WORKS

The new main distribution warehouse for Pepkor was is located in the Keystone Park Light Industrial, Warehousing and Logistics Precinct in Hammersdale KZN. This immense 110 000 m² warehouse was constructed as the main, fully automated distribution warehouse for the Pepkor Group.

During construction, the structural engineers noticed an issue with differential settlement of the earth platform. Due to the strict tolerances for the automation of the warehouse, the settlement would cause the robotics operating on the warehouse floor to lose track of position and render a large part of the warehouse unusable.

The size of the warehouse meant a large cut-to-fill exercise was undertaken initially to create the platform (+-500 m x 350 m) for the warehouse. Three fifths of the warehouse footprint was situated on sandstone or shallow fills following the in-situ rock profiles. The remaining two fifths of the warehouse was situated on an outer shell of choked rockfill and a wedge of fill that in some instances was constructed up to a depth of 25 m. This was the area that suffered from large settlements, and SOIL IMPROVEMENT was required.

The client went to tender to acquire a turnkey geotechnical solution to stabilise the platform from further settlement. GEOCIV Group submitted an offer that was not only suitable as a solution but was vastly superior regarding cost, programme, and effectiveness than our competitors. Another "Innovative Geotechnical Solution," says Managing Director Greg Whittaker.

The design for the structure was based on large conventional pad footings as the foundation. The foundations and majority of the superstructure had already been constructed at the time of tender.

Based on further geotechnical studies, it was concluded that the fill consisted of coarse granular material, mainly obtained from the Sandstone in the cut area on site. As a result, the bulk fill has numerous sandstone rock fragments up to 400 mm in diameter, making conventional piling problematic.

The expected settlement for a well-constructed fill platform on incompressible founding can be in the order of 0,25% of the depth of the fill under its own weight alone. We calculated that this would result in settlements in the order of 40 mm to 65 mm in the deepest fill areas. In addition, the floor slab carries a surcharge load of 75 kPa, and the columns a structural load of 150 kPa. Further calculations indicated additional settlements under the floor slab of between 50 mm and 75 mm, and under the columns of 60 mm to 90 mm with the assumption that the fills were constructed correctly as specified.

The tender required a solution to reduce the variable settlement in the fill zone to guarantee a maximum settlement of no more than 25 mm over 20 years.

However, most of these solutions are not viable due to the nature of the structure, the depth of the fill, the nature of the fill, and the limited access within the partially completed Warehouse.

Rigid inclusions – a thin slab was designed to transfer the load to the soil, and a piled solution would therefore not work, as the slab could not span between fixed pile positions. GEOCIV therefore proposed the installation of RIGID INCLUSIONS into the incompressible rock below the fill and in-situ soil. This would require the construction of a 1 m thick soil transfer 'mattress' to transfer the load to the rigid inclusions, evenly spreading the support across the surface bed. Where rigid inclusions overlapped the column bases, reinforced underpinning rigid inclusions would have to be installed through the column bases.

Because of the nature of the fill, the contractor reverted to the installation of rigid inclusions by means of percussion drilling techniques. The nature of the fill and the grouting process would result in a very high friction value on the rigid inclusions, resulting in the full weight of the soil column being transferred to each inclusion. Furthermore, the rigid inclusions would be socketed into an incompressible stratum, which allowed higher loads at each position.

The final design required installation of a total of

THE NEXT LEVEL SOLUTION

GEOCIV GROUP has been a leading specialist in Geotechnical Works, Piling and Lateral Support in Gauteng, South Africa and other SADC nations since 1996. Services and products are on a full design and construct, or construct-only, basis. GeoCiv Group's ability to project manage entirely in-house has enabled us to secure major government and private contracts in the Commercial, Industrial and Residential spheres.
It is GeoCiv Group's objective to further develop our experience, growing in a sustainable, controlled manner, and expanding in terms of both geographical coverage and product offerings.
GeoCiv Group management have a combined sectorial experience of more than 100 years in the piling & geotechnical works field. GeoCiv Group operates in a highly specialised market with a vision of being the most efficient **GEOTECHNICAL** company in the Southern Africa region.
The business consists of an excellent team of motivated, experienced and highly skilled professionals.

GeoCiv GROUP

"DELIVERING INNOVATIVE GEOTECHNICAL SOLUTIONS"

PILING ▼ LATERAL SUPPORT ▼ CONCRETE REPAIRS
GROUTING ▼ MINING WORKS ▼ ROCKFALL MITIGATION

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700 No rigid inclusions installed, and a total of 750 No underpinning piles extending up to 8 m past the footprint of the warehouse externally, to meet the settlement criteria of the fill. To complete the system an engineered soil raft was required to transfer the load evenly across the total area of the treatment zone.

This system was designed in collaboration with Fisheagle Geotechnique and Eco Elementum Engineering. The design was reviewed by Soilmechanics GmbH in Germany as an independent consultant and finally by Jones and Wagener on behalf of the client. It was ultimately approved in all instances.

After the design process and review was completed, the execution of works was like any construction project, but GEOCIV Group was under an immense time constraint. The client, Pepkor, was at this stage unable to occupy the warehouse as its main distribution centre.

The construction programme was based on completion of the 7 710 No inclusions within a 7-month duration; total metres drilled accumulating to 125 000 metres of percussion drilling and grouting through the variable fill stratum.

This, including the soil raft and final floor slab was to be completed in record time to mitigate large financial losses for the client. All critical path milestones were met without fault, even with large quantities of redrilled and re-grouted positions due to localised collapse within the fill.

Record keeping to this scale required a team of site engineers, skilled management, and staff, including the management of an independent third-party testing service to confirm the correct installation and reporting.

Rigorous integrity testing of grouted inclusions as well as static load testing were conducted to prove the system with great results. The difficult execution of this project and soil conditions was further complicated by the “limited access” nature of the existing structure.

In certain areas the contractor experienced headroom constraints, the lowest of which did not exceed 4,5 m, by using our fleet of specialist limited access drilling rigs and custom engineered drilling equipment and grout pumps made the execution of the proposed design possible.

As with most modern construction projects, it is any contractor’s duty to get involved in giving back to the community. With the specialist nature of our company’s field, it is not always possible to employ large quantities of general labour from localised community wards.

To complete the team for the monitoring and quality control to this scale, the contractor required a team of site engineers. The company took it upon themselves to employ five graduate engineers from the KZN region, who under supervision and design training by Fisheagle Geotechnique, kept accurate records of each borehole and multiple tests completed during the project.

Coming across a project like this is certainly a once in a lifetime opportunity, says Jean Breedt, Operations Director - not only to test the limits of an “innovative design”, but mostly the successful execution of the works with Specialist Geotechnical Rigs and Plant, and something that has not previously been done. It also allowed GEOCIV Group to showcase what a team of professionals in their field can achieve if put to the test, to help resolve a very sensitive and urgent problem.

A total of 125 000 metres were drilled and 7 710 No Rigid Inclusions drilled and successfully grouted and tested. The Pepkor Distribution Centre in Hammersdale is currently operating to its full extent and is certainly a masterpiece of engineering prowess and determination, not only with regards to its scope of works, but the majesty of its sheer scale and complexity as a mega structure completed in South Africa. ■

PROJECT INFORMATION

- **Company entering:** GeoCiv Group
- **Client:** Pepkor
- **Main Contractor:** Abbeydale Projects
- **Principal Agent:** Rokwil Property Development
- **Project Manager:** Hobden Development Solutions
- **Quantity Surveyor:** MHS Quantity Surveyors
- **Consulting Engineer:** EDS Engineers

INFRASTRUCTURE REHABILITATION: SARNIA ROAD BRIDGE PROJECT

Sarnia Road Bridge (B112) is a vehicular bridge over the N2 and carries traffic along the M10 route, within the eThekweni municipality, located between the suburbs of Bellair and Hillary.

In 2017, a vehicle accident took place on the N2 Northbound carriageway, beneath the bridge and a fuel tanker truck subsequently caught alight resulting in significant damage to the underside of the structure.

South African Roads Agency Limited (SANRAL) put together the scope of works for the N002-250-2020/3-The rehabilitation of B112, Sarnia remedial works tender, and put the project out to tender in 2022. Afrostructures, a construction company located in KwaZulu-Natal with a Grade 9CE and a Level 1 BBBEE rating, emerged victorious in the competitive bidding process and secured the contract in April 2022. Naidu Consulting Engineers oversaw the engineering works and supervision of the project, while the specialist company Structural Maintenance Works was contracted to handle the repairs for fire damage, spalling, and coating of the bridge.

In the world of construction and infrastructure rehabilitation, innovation is the driving force behind safer, more durable, and longer-lasting structures. The rehabilitation of the Sarnia Road Bridge (B112) serves as testament to how cutting-edge construction technology can elevate the quality and longevity of concrete refurbishment.

Step 1: High-Pressure Cleaning (350 bar pressure)
The process begins with a thorough high-pressure cleaning of the damaged concrete surfaces. At a 350-bar pressure, this technique removes debris, contaminants, and compromised concrete, preparing the structure for restoration.

Step 2: Sounding Survey
Precision is key. A sounding survey is conducted to assess the concrete's integrity. This step ensures that only compromised sections are addressed, optimizing efficiency and resource utilization.

Step 3: Exposing Sound Undamaged Concrete
Breaking out the fire damaged concrete until exposing sound undamaged concrete. This selective approach minimizes the need for extensive reconstruction, reducing both cost and environmental impact.

Step 4: Rebar Preparation and Substrate Dampening
Exposed rebar is meticulously cleaned, and the substrate is pre-dampened to ensure a strong bond. This precise preparation ensures that the subsequent layers adhere securely to the surface.

Step 5: Application of Structural Repair Mortars
Following substrate preparation, Sika MonoTop®-1010 ZA, a bonding primer and reinforcement corrosion protection, cement-based polymer modified slurry containing recycled waste materials, which leads to a reduced carbon footprint, is brush applied.

Step 6: Spalling Repairs
Small parts of the bridge required spalling repairs due to chloride ingress, the substrate preparation process mirrors the one mentioned earlier, with a minor adjustment of Sika MonoTop®-412 NFG now being applied with a trowel to the affected areas. In the case of more extensive repairs, a shutter and pour method was executed using the Sikacrete®-214, a cementitious high early strength structural micro concrete.

Step 7: Addressing Concrete Blistering
Concrete blistering was in the centre of the bridge where the heat of the fire was less intense. This was addressed by following the same preparatory steps, and a layer of Sika MonoTop®-3020 ZA, a R3 cementitious pore filler and levelling mortar with reduced carbon footprint, is meticulously trowelled on in a 1 mm - 5 mm layer thickness.

" Innovation doesn't stop here. Protective coatings also play a vital role in the careful refurbishment of concrete structures. ■

PROJECT INFORMATION

- **Company entering:** Sika South Africa
- **Client:** South African Roads Agency Limited (SANRAL)
- **Main Contractor:** Afrostructures
- **Principal Agent:** Naidu Consulting Engineers
- **Subcontractor:** Structural Maintenance Works

HIGHLY COMMENDED

PROJECT INFORMATION

- **Company entering:** CHRYSO Southern Africa and OMV
- **Client:** South African National Roads Agency (SANRAL)
- **Consultant:** KBK Engineers
- **Architect:** Pieter Matthews (Matthews & Associates Architects)
- **Main Contractor:** Raubex Construction
- **Architect:** Pieter Matthews (Matthews & Associates Architects)
- **Concrete Supplier:** OMV
- **Admixture Product:** CHRYSO® Omega 174

NANCEFIELD BRIDGE – MUSINA RING ROAD PROJECT

Within the scope of SANRAL's Musina Ring Road Project in Limpopo Province, the Nancefield Bridge stands as an architectural marvel. This 77-metre-long bridge, traversed by the N1 highway, embodies a grand vision of hospitality and welcome for travellers between South Africa and Zimbabwe. At the heart of its design, a pair of striking 13-metre-high hands extends from the central piers, symbolising this warm embrace.

The Nancefield Bridge project showcases innovative design and engineering, improving the journey for all travellers. It eases border traffic, reduces Musina town congestion, and redirects heavy trucks, preserving roads and minimising maintenance.

In the vibrant landscape of modern infrastructure, the Nancefield Bridge is a superb tribute to construction innovation technology. The implementation of CHRYSO admixtures, guided by the expertise of Jacques Marais, Senior Plant Foreman at OMV, has ushered in a new era of concrete production efficiency. As the heartbeat of SANRAL's Musina Ring Road Project, this bridge showcases the power of cutting-edge solutions to overcome challenges.

In the face of fluctuating temperatures reaching up to 45°C, measures such as a water-cooling tower and precision sprayers have been harnessed to maintain optimal concrete temperatures, safeguarding against thermal cracking.

A pivotal challenge faced by the engineers was the precise delivery of concrete to the Nancefield Bridge at temperatures below 34°C. This strategic measure was imperative to avert the potential menace of thermal cracking during the pouring of concrete into the bridge's substantial structures. However, the significance of this innovation extends past structural integrity. By maintaining concrete temperatures below the specified threshold, the engineers ensured a robust defence against the infiltration of oxygen and water into the structure, thus mitigating the looming risk of steel corrosion. This approach guarantees the bridge's prolonged lifespan and exemplifies how thoughtful application of technology can transcend immediate challenges to cultivate a legacy of durability and sustainability.

CHRYSO's vital role in this project exceeds mere support; it is a beacon of bespoke solutions. Collaborating closely with the concrete suppliers, CHRYSO harnessed its technical prowess to

meticulously craft the ideal concrete mix, tailored to the engineers' exact specifications. A tangible testament to this commitment is the proactive on-site assessment conducted by CHRYSO's technical experts, who delved into soil analysis to calibrate the ideal quantities of admixture required for the cement blend.

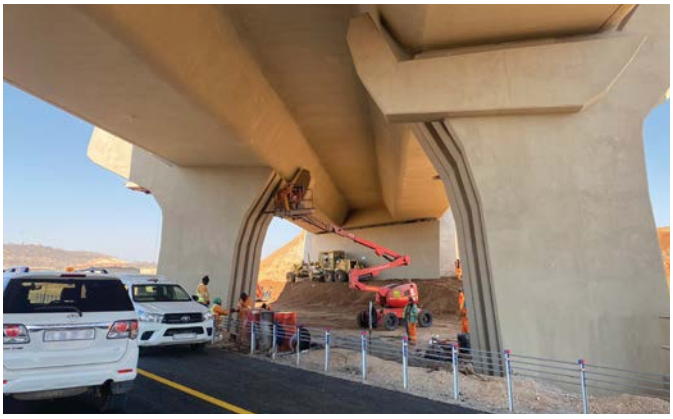
Distinguished by its iconic 'hands' that cradle imagination and invention, the Nancefield Bridge is evidence that design innovation can surpass traditional boundaries. This masterpiece, a focal element of SANRAL's Musina Ring Road venture, embodies a fusion of artistic vision and engineering brilliance.

The use of CHRYSO admixtures has enhanced structural accuracy and enabled the optimisation of concrete mix designs.

Raubex Construction, renowned for its proficiency in conventional road and bridge projects, embarked on a paradigm-shifting journey with the Nancefield Bridge.

Guided by Jacques Marais of OMV, the calculated incorporation of CHRYSO admixtures optimised concrete mix designs, cultivating enhanced durability and quality. CHRYSO's product surfaces as an evolutionary multi-dose admixture that transcends traditional concrete practices, delivering a paradigm shift in the realm of quantifiable time, cost, and quality management.

Collaborating seamlessly with partners and visionaries, CHRYSO has championed the inclusion of advanced water-reducing plasticisers, spearheading concrete mix design to new frontiers. This synergy of innovation isn't just technical; it's a stride towards a future where construction thrives in harmony with environmental considerations. ■



REMEDIAL REPAIRS OF DURBAN HEIGHTS NO 3 RESERVOIR

Durban Heights Reservoir No 3 is a 340 megalitre structure built in 1971 in the area known as Reservoir Hills, which lies within the eThekwini Metro. Reservoir 3 feeds eThekwini Metro's reservoirs that supply consumers in the northern parts of Durban, specifically the INK region (Inanda, Ntumzuma and KwaMashu) and Phoenix. Its capacity is 340 megalitres, making it one of the largest potable water storage facilities in South Africa. The large number of households, businesses and industry that receive water from it illustrates the importance of this infrastructure.

In November 2021, Con-Solve Civils was awarded the waterproofing contract to rehabilitate the reservoir's highly unusual domed roof structure of approximately 24 000 m^2. Con-Solve Civils is a respected multi-disciplinary construction company, specialising in the protection and rehabilitation of concrete structures nationwide.

Prior to the design, supply and installation of waterproofing awarded to Con-Solve Civils for the roof structure, structural repairs were carried out within the reservoir.

The waterproofing project, for which a wide variety of specialised a.b.e. Construction Chemicals products was used, including removal of the original torched membrane system. This was replaced with a new waterproofing specification based largely on abe Unigum 4 mm bitumen-polymer reinforced plastomeric waterproofing membrane supplied to Con-Solve Civils by a.b.e. KZN operations.

Negative water pressure through the concrete joints at the time of repair could not be sealed with traditional sealant systems. Therefore, a.b.e.'s innovative product The Works was specified for this project. This superior construction sealant and adhesive handles applications impossible with traditional solvent or water-based adhesives.

The Works can be applied in wet or dry conditions on virtually any substrate to achieve a secure fix without shrinkage, staining, or solvents, with no need for additional fixings for most applications. It resists mould growth, is flexible and over-paintable. This unique sealant saved time and money for the client eliminating the need to dewater the 340 mega litres reservoir or wait for the water table to drop for ground water to not seep through. The Works is also a primerless sealant, which offers a lower labour-intensive solution.

Saint-Gobain and its brands' exemplary role in the territories where we operate, our actions to promote employment and training in the communities around us, and the commitment of our teams within the Saint-Gobain Foundation, are all examples of how we participate in building a fairer and more sustainable world.

Con-Solve Civils continuously launches projects that contribute to social upliftment and the same at the Durban Heights reservoir project, with local employment and upskilling.

The reservoir is an existing structure that requires remedial repair, protection, and waterproofing that offers superior and cost-efficient solutions ensuring long-term serviceability.

The project ensured the continuation of the supply of drinking water to at least 500 000 members of the population and was an integral part of the complete water articulation for KZN fresh water supply.

Together with Con-Solve Civils, a specialist contractor in the industry, and the asset owner Umgeni Water, close cooperation and a good relationship were also important for the successful completion of the critical rehabilitation of this infrastructure - 340 megalitre structure built in 1971, one of the largest potable water storage facilities in South Africa. ■

PROJECT INFORMATION

- **Company entering:** a.b.e. Construction Chemicals
- **Client:** Umgeni Water
- **Main Contractor:** Con-Solve Civils
- **Principal Agent:** Umgeni Water
- **Project Manager:** Umgeni Water
- **Quantity Surveyor:** Umgeni water

Revolutionizing the Industry: Unveiling the Award-Winning Excellence of Con-Solve Civils in Civil Construction

Step into a realm of innovation and mastery with Con-Solve Civils, a powerhouse in the construction industry. Specializing in the Protection and Rehabilitation of Concrete Structures, we've recently embarked on an exciting venture in minor civils and new construction, catering to the diverse needs of our long-term clientele.

Since its inception in 2002, Con-Solve Civils, led by the visionary Rajesh Raghubir, has been a trailblazer in the field. Born out of a keen insight into the industry's demands, our company has grown to become a Level 1 BBBEE enterprise with an impressive CIDB rating of 7CE/PE, 7GB/PE, and 6SN/PE.

Distinguished by our ISO 45001:2018 & ISO 9001:2015 accreditations, we embody a zero-tolerance approach to safety and an unwavering commitment to delivering top-notch quality throughout every project. This commitment ensures the longevity of our business even in challenging times, setting us apart in the competitive landscape.

Our recent triumph in the Construction World's Best Projects Awards, where we secured a podium finish in the specialist contractor division for our outstanding work at Umgeni Heights Reservoir in Durban, speaks volumes about our dedication. At Con-Solve Civils, we don't just talk about safety; we live it. The award is a testament to our team's collaborative spirit, where "Safety first in all we do" is more than just a mantra—it's a way of life.

Embark on a journey with us and discover our core functions that redefine excellence:

- Concrete Repair
- Structural Strengthening of load-bearing concrete elements
- Acid-Proof Linings to concrete
- Grouting (cementitious & epoxy)
- Joint Sealing Systems
- Waterproofing Systems
- Concrete Cleaning
- Epoxy/Polyurethane Coatings & Screeds
- Civil Construction

At Con-Solve Civils, we're not just builders; we're architects of success, ensuring that every project reflects our passion, commitment, and drive for excellence. Join us as we continue to shape the future of civil construction with our award-winning approach.

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DUBAI SILICON OASIS

These long, up to six-metre high Terraforce L16 rock face retaining walls were skilfully installed at Dubai Silicon Oasis in Dubai by Al Aamal Construction. The retaining walls were necessary due to the substantial differences in levels on site, and to provide access to a leisure area on ground level, with access stairs and ramps leading to the residences at top level.

Says Sinan Awad, Al Aamal Construction: "The site consists of set-back and vertical walls, as well as multiple 90-degree corners that were achieved by carefully cutting the Terraforce L16 rock face blocks. For additional stability the blocks were concrete filled, reinforced with rebar and we used double block rows with the rock face finish facing outwards either side for some of the vertical walls adjoining the two grand staircases and ramps. Where the walls joined other structures, dowels were used to secure the connections. In total, 41 100 Terraforce L16 and 2 000 Terraforce 4x4 Step blocks were installed on site."

Overall, the fantastic multi-level corner details, inset planter boxes, ramps with rails and grand 4x4 Step block staircases make a notable visual statement and create effective breaks in what could have been a sheer and vast, grey surface otherwise. ■

PROJECT INFORMATION

- **Company entering:** Terraforce
- **Client:** Dubai Silicon Oasis Authority
- **Engineering Consultant:** KCE Consulting Engineers
- **Main Contractor:** Water in Motion
- **Sub Contractor:** Al Aamal Construction
- **Terraforce Licensed Manufacturer, Dubai:** Consent Concrete Products

KEMPEGOWDA INTERNATIONAL AIRPORT, BENGALURU

Terraforce®, a longstanding (CMA) Concrete Manufacturer Association member, supplied over 110 000 L12 blocks for the construction of retaining walls on both sides of Terminal Boulevard, a newly constructed 10-lane thoroughfare which feeds directly into India's Kempegowda International Airport at Bengaluru.

Completed in November 2022, Terminal Boulevard has been widened from an existing two by two lanes to five by five lanes to cater for the addition of a second airport terminal and an anticipated increase in traffic. Approximately 12km of the road has been lined with retaining walls on both sides which cover a total surface area of 9 000 m².

Running on an east/west axis, the new road was constructed by cutting a corridor, which at its deepest, is nine metres below existing ground level. This has enabled the new road to pass under the airport forecourt roads to facilitate junction-free traffic flows.

The slopes were cut to allow for the insertion of 5m hume pipes to facilitate planting of trees on the vertical slope at every 4 m. Placed on concrete foundations, the pipes were filled with soil and the bottom ends of the pipes were kept open to allow for root penetration into the soil below.

One of the main challenges of this project was the fact that additional cutting into the embankments for the installation of geogrid reinforcement was not possible. This was because the top sections of the excavated embankments were only 2 m from the upper-level roads and there was no space for the additional cutting. ■

PROJECT INFORMATION

- **Company entering:** Terraforce
- **Client:** Bangalore International Airport
- **Layout and concept:** Prasenjit Biswas, Prasannamurti Desai, Monnappa BC (BIAL) & Fred Laker (Terraforce)
- **Landscape Architect:** Grant Associates and Design Accord
- **Consulting Engineer:** Fred Laker/Terraforce, Maccaferri, Struct Geotech, Smart Minds, STUP India Pvt. Ltd
- **Quantity Surveyor:** BIAL Inhouse Team
- **Main Contractor (Civil):** Balajee Infratech & Constructions Private Limited
- **Terraforce supplier:** Prayosa Buildmat

DE AANZICHT

May 2022, KCE Consulting planned a Terraforce wall design that allows successful interfacing with the environment, by creating space for vegetation in the near vertical terraces and “shelves” with plant pockets constructed by turning the L12 blocks round face outwards at regular intervals.

The project is located in the north-eastern quadrant of this new residential development by Balwin Properties in Richwood, Western Cape. The retaining wall acts as the buffer between the engineered platforms on the lower level and the protected nature conservation area to the east.

Says Nigel Barr, KCE Consulting Engineers: “The residential scheme of De Aanzicht in Atlantic Hills nestles up against a large Rhenosterveld reserve. With slopes of up to 12 m high which included soft rock outcrop, creating a "soft" interface required the use of an undulating retaining system - Terraforce - combining access, planting and stormwater management. When finished this slope treatment will disappear behind planting - hiding the "under the skin" engineering of soft soil anchors, tied back foundations and the clever use of the mixed pattern Terraforce block facings.”

Barr elaborates on the design of the overall retaining system: “In order to create the embankment required within the restricted footprint area, KCE designed and detailed a two-part system to adequately secure the embankment whilst taking great care to avoid encroachment into the environmental buffers and restricted no go zones around the conservation area.”

“A series of soil nailed terraces with the front faces stabilized with a gunnite shotcrete was created as the initial lateral support system for the embankment, with a series of terraced Terraforce retaining structures constructed in front of the lateral support, providing the aesthetics and landscape friendly portions for the face of the embankment. The Terraforce walls act as a cladding for the otherwise harsh and rustic finish of the lateral support system whilst also providing planting pockets, accessible terraces and maintenance access routes throughout the embankment area.”

When asked why Terraforce was chosen, Barr highlighted that, “Terraforce is the “go to” block for almost all the gravity solutions throughout the region. The aesthetics appeal of the rock face finish blocks suited the overall environment and blends into the surrounding landscape with ease. The blocks are both familiar, proven and readily available making it the obvious choice for this job. The design and engineered flexibility the Terraforce system provides was also a huge plus - to suit the intricate nature and shapes of the terraced embankment.”

A total of 1 620 m^2 of Terraforce walling was installed, and planting of the wall was completed early 2023. The vegetation is establishing well and already creating the desired effect. ■

PROJECT INFORMATION

- **Company entering:** Terraforce
- **Client:** Balwin Properties
- **Architect:** dhk Architects
- **Engineer:** KCE Consulting Engineers (Civil & Structural engineers on project)
- **Quantity Surveyor:** Balwin Properties in house
- **Main Contractor:** Balwin Properties
- **Subcontractor:** PK Civils (Civils and walling contractor)
- **Subcontractor:** Geociv Group (Lateral support contractor)
- **Installation by Terraforce Recommended Contractor:** Decorton Retaining Systems
- **Blocks supplied by Terraforce licensed manufacturer:** Klapmuts Concrete

PROJECT INFORMATION

- **Company entering:** Corestruc
- **Client:** Vhembe Municipality
- **Project manager:** Infraburo Civil and Structural Consulting Engineers

PHIPHIDI 10 Mℓ RESERVOIRS

Vhembe District Municipality has harnessed the many benefits of precast concrete to deliver critical infrastructure faster than would be possible using conventional cast-in-place methods. The absolute control provided by prefabricated concrete also facilitated a higher quality final build.

The technology was successfully deployed to build two new reservoirs that form part of the upgrade of the Vondo Regional Water Scheme.

The reservoirs were designed by Infraburo Civil and Structural Consulting Engineers and Corestruc. Corestruc was also tasked with erecting the system while working alongside principal contractor, Morawa Building and Civils. The various precast-concrete elements that make up the system were manufactured by Coreslab, one of Corestruc's approved manufacturers.

The upgraded scheme will provide a reliable and secure source of drinking water to about 500 000 people who reside in Phiphidi.

Located along the road to Sibasa to Nzhelele, the scheme consists of the Vondo Dam and water-treatment works (WTW). From here, water is pumped to two command reservoirs that supply specific areas within the scheme. Water is also pumped and gravitated to the WTW from two other reservoirs where it is distributed to various areas.

Infraburo Civil and Structural Consulting Engineers commenced with the preliminary design of the upgraded scheme in 2012. Financed by the Municipal Infrastructure Grant, construction work went out to tender in 2017 and was awarded to Morawa Building and Civils, the principal contractor.

The project entails upgrading the WTW and associated infrastructure. This includes the gravity-feed pipeline from Vondo Dam, as well as a pipeline from the WTW to a command reservoir. Moreover, a new command reservoir was constructed and work on the second water retaining structure was recently completed. This is to supply the 10 Mℓ daily water demand with an additional 10 Mℓ of water held in reserve. The construction of the two reservoirs was undertaken in phases. One of the reservoirs had to be commissioned before an existing water-retaining structure could be demolished to make space for the construction of a new reservoir on the restricted site.

Morawa Building and Civils introduced Infraburo Civil and Structural Engineers to the system, noting the role it could potentially play in keeping this aspect of the work scope on track, while also providing two reservoirs of an unrivalled quality.

Infraburo Civil and Structural Engineers initially designed conventional pre-stressed reservoirs for this project. However, the principal contractor had undertaken extensive research into Corestruc's system and put forward the idea to use it to construct the two reservoirs. Representatives of the consulting engineering firm visited one of the company's approved manufacturers' factories and spent time with representatives of Corestruc to gain a greater understanding of the system.

Especially impressed with the quality control processes deployed in the factory, use of the system was motivated to the client.

Vhembe District Municipality was also already aware of the technology considering that it had previously been successfully deployed in several other municipal jurisdictions. ■

SKA MEERKAT EXTENSION PROJECT

Upon completion, the SKA (Square Kilometre Array) telescope will be the world's largest radio astronomy telescope, giving scientists the ability to map the universe with more sensitivity and speed and over a greater area and distance. This mega-science project is truly transformational and will change our understanding of the universe. It is no surprise then, that this project tests the limits of engineering and requires cutting edge technology and innovation.

The MeerKat Extension project comprised the expansion of the existing MeerKAT array with 20 dishes and the establishment of the first four dishes for the SKA-MID Array. For this Design and Construct project, Zutari was appointed to conduct preliminary and detailed design, verification, and construction monitoring for the dish foundations, as well as the power and fibre needed to collect and relay data over vast distances. Zutari was also responsible for supportive access roads and platforms, buildings, a wastewater treatment plant and a construction camp with water supply and accommodation for 250 people, each requiring a vast array of expertise across disciplines.

The project required each dish to point into space with extreme accuracy and stability. The dish foundations, therefore, were no ordinary structures, but had to meet exceedingly strict requirements with regards to stiffness and movement tolerances, as well as the orientation to true north; requirements which directly affected the larger telescope's operation. In fact, the requirements for the foundations were so specific and strict that they could not be met using conventional design methods.

In addition, the team encountered a significant challenge related to changing ground conditions across the vast site. This could radically impact the strict requirements regarding stability and orientation of the dish foundations, and required innovative solutions. In response, the design team utilised an innovative approach based on advanced technical theory. This approach utilised soil-structure assessment using strain in the ground and the resultant ground stiffness.

Advanced 3D numerical modelling was also utilised by both the structural and geotechnical design teams. In order to analyse and understand realistic foundation behaviour the geotechnical and structural models needed to interface seamlessly.

The vast extent of the site created a challenge for the design and construction team. The available data for design was impacted due to the large distances between dish locations as well as access constraints to locations. This limitation in available data creates risk where changes on site during construction could relate to time delays and increases in cost. The available ground data was part of this associated risk where changes in ground conditions at dish foundation locations could impact the foundation meeting the client's strict requirements or impact the type of foundation applied or result in a significant increase in works and quantities for the contractor. To model the geotechnical conditions on such a vast site required creativity. Through this innovative work with data and modelling, the foundation team was able to derive expected ground conditions and rock level with improved accuracy, and to model effective solutions with greater confidence. The project made an important contribution to a radically innovative and prestigious project with diverse applications and far-reaching positive consequences for South Africa and the world.

- The project successfully met all the very stringent client requirements, despite complex challenges.
- The project's use of innovative, technically complex 3D modelling and advanced design approaches and other digital solutions radically improved project planning, analysis and design - ensuring the client's strict performance requirements were achieved.
- The project's adaptive use of on-site materials, and unusual material and equipment solutions, in response to shortages and site restrictions.
- The project's excellent safety track record, despite several challenges.
- The project's inclusion of environmental considerations, including birds, protected species and existing river systems.
- Radical collaboration among the clients, contractors and designers, which ensured successful delivery of the project. ■

PROJECT INFORMATION

- **Company entering:** Zutari
- **Client:** COP Consortium (Consortium of Concor and OptiPower)
- **Civil Contractor:** Concor-Optipower Consortium
- **Mechanical and Electrical Contractor:** Optipower
- **Geotechnical Subcontractor:** GeoCiv Group
- **Consulting Engineer:** Zutari

GROOTE SCHUUR REFURBISHMENT

At approximately 52 hectares, the Groote Schuur Estate in Cape Town houses a museum, police station, and 25 houses for government employees, dignitaries, and staff – including the Cape Town residence of the President of South Africa. Zutari, appointed as civil and electrical engineers as well as principal agent, was responsible for upgrading and refurbishing the existing civil and electrical infrastructure within the Estate.

This project was highly complex and required considerable technical mastery to ensure its reliable and efficient completion. Hardly any typical designs, or designs from other projects, were used. Instead, each design was created to fit a specific and unique purpose within the constraint of the existing facility and landscape. To achieve efficiency despite these highly customised designs required the use of innovative and technically superior solutions, combined with the expertise of eminent practitioners, and a deeply collaborative mindset.

Throughout, the project benefitted greatly from digital solutions that enabled faster, more reliable delivery, better use of data, and more efficient use of resources. One such example is the use of Building Information Modelling (BIM) technology (AutoCAD Civil 3D). The team created 3D digital representations of the project's physical and functional design characteristics, which empowered the team to design, analyse and simulate solutions before construction began. The extensive network of stormwater open-channels, pipework and detention facilities were hydrologically optimised using digital simulations.

Digital models also facilitated clearer communication of the intended design to all stakeholders, creating a shared understanding that facilitated input by all relevant parties during the design phase. The use of these digital twins facilitated more efficient delivery by reducing the time and cost associated with design changes during construction.

One of the site's major challenges was related to water. Ageing water and sanitation infrastructure was resulting in wastage and pollution, as well as exorbitant maintenance costs. In addition, the use of potable water for the irrigation system was unsustainable. To add further complexity, the site is situated in a heavy rainfall area, and the quantity and quality of stormwater was not being safely controlled.

In response, the team successfully refurbished, and improved, the entire fire and domestic water system. All sewer pipes were relined or replaced using innovative 'trenchless technology' methods - chosen to avoid disruptive excavations on the Estate, which continued to function throughout.

The irrigation supply and distribution system were also completely redesigned. A mix of sustainable and renewable water resources were cleverly exploited to meet the Estate's irrigation demands. An irrigation water reservoir and a sophisticated telemetry system now smartly control this irrigation infrastructure.

To deal with stormwater, Zutari implemented sustainable urban draining principles. The team formalised a swampy area into a constructed wetland, attenuating larger floods through weirs and overflows and releasing cleaner water into the river courses. An extensive network of open-channel stormwater conveyance was refurbished.

- Zutari's multi-disciplinary team co-created cost-effective, customised solutions to the many anticipated and unanticipated challenges of the project. The fact that the project was delivered to the satisfaction of the client - safely, on time, and within budget - is an unusual feat for such a large and complicated government project.
- The project's handling of environmental issues was exceptionally successful. The project made use of sustainable materials and developed well-considered environmentally friendly solutions which led to significant water savings and has reduced sewage and stormwater pollution.
- The project's handling of social issues was particularly successful and empowered young EPWP learners and local SMMEs.
- Despite the long period and extensive scope of the project, no serious injuries or loss of time due to injury were recorded.
- Aesthetics on the project were exceptionally well handled.
- The team employed several innovative and technically complex solutions for planning and construction. ■

PROJECT INFORMATION

- **Company entering:** Zutari
- **Client:** Coega Development Corporation
- **Contractor:** Martin & East
- **Consulting Engineer:** Zutari
- **Implementing Agent:** Coega Development Corporation
- **Landscape Architect:** FC Holm Landscape Architects

YUSUFELI DAM

Yusufeli Dam is a 275 m high concrete arch dam on the Coruh River in the Artvin Province of Turkey. The dam has a developed crest length of 540 m and a section thickness of 8 m at the crest and 90 m at the base on the central portion of the arch. Yusufeli Dam is the highest dam in Turkey, the fifth highest double curvature arch dam in the world and ninth highest dam in the world.

The dam was constructed with conventionally vibrated mass concrete and the structure contains 4 million cubic metres of concrete. The average concrete placement rate of the order of 140 000 m^3 per month achieved at Yusufeli Dam represents a world record for conventional mass concrete.

The Yusufeli hydropower project includes an underground power station located beneath the right abutment immediately downstream of the dam, with an installed generation capacity of 558 MW and an average annual energy production of 1,8 billion kWh. It is predicted that the dam will contribute an annual amount of 1,65 billion Turkish Lira to the Turkish gross domestic product.

As the central component of the Çoruh River hydropower development, Yusufeli Dam and HEPP is a landmark achievement for Turkey and a significant contributor in the country's progress towards carbon-neutrality.

The dam was constructed with conventionally vibrated mass concrete and the structure contains 4 million cubic metres of concrete, impounding 2,1 billion m^3 of water at full supply level. Excavation for Yusufeli Dam commenced in 2014 and the final concrete lift in the dam body was placed in 2021. Impoundment was initiated at the beginning of 2023 and the water depth had reached 256 m by early September. With an underground power station located beneath the right abutment, the project has a hydropower generation capacity of 558 MW and annual energy production is anticipated at 1,8 billion kWh.

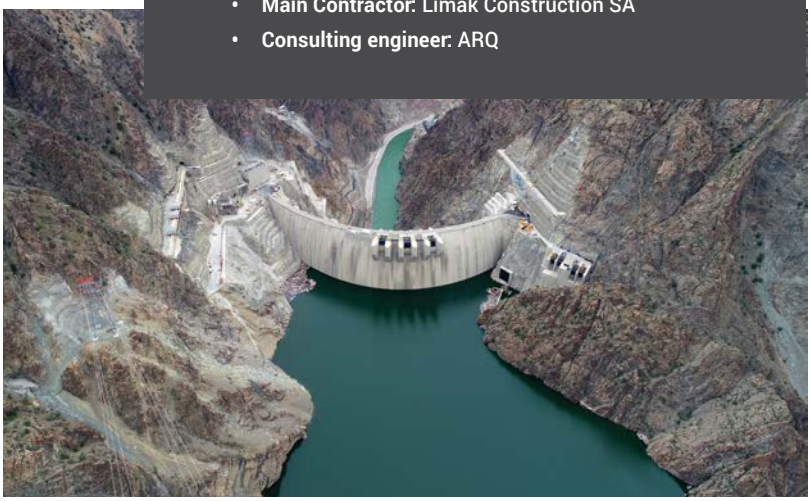
The dam has a controlled crest spillway, with three gates, which is supplemented by two controlled spillway tunnels on the right flank discharging into the river approximately 1 km downstream of the dam. The dam has a system of four mid-level outlets, which discharge into the spillway plunge pool immediately downstream.

The key innovations for Yusufeli Dam were:

- The use of "cushion concrete" as a stiffness transition between the high strength and high elastic modulus concrete of the arch and the lower strength, lower elastic modulus foundation rock mass.
- The stress-relaxation creep of the fly ash rich CVC was lower than would normally be the case, allowing more rapid cooling without cracking.
- Low stress-relaxation creep and proactive modelling of the concrete post-cooling and joint grouting process in conjunction with instrument monitoring allowed more rapid concrete cooling and consequently more rapid concrete placement.
- The foundation modelling using Leapfrog allowed a very detailed understanding of the foundation rock mass, which could then be modelled accurately thanks to modern Finite Element analysis software.
- Developments in the understanding of mass concrete that came through Roller Compacted Concrete technology were put to good use at Yusufeli Dam to allow a concrete mix with lower total cementitious materials content.
- Secondary issues were discovered in the generic relationships between tensile and compressive strength in concrete when applying the aggregate requirements that allowed a reduction in cementitious materials content.
- A comprehensive system of foundation improvement and verification of the improvement achieved was applied.
- A comprehensive monitoring and behaviour verification through analysis was implemented to assure safe impoundment.
- The analysis stages and processes were more comprehensive than usual, reflecting the size and importance of the dam.
- A very comprehensive process of design evolution with foundation excavation was followed.
- All aspects of the construction were fairly exceptional and the record-breaking concrete placement rates were achieved thanks to a very well-organised construction team and the incorporation of two additional concrete plants, feeding concrete to the placement location by conveyor, enhancing the delivery capacity of the three cable cranes, particularly for the lower sections of the dam. ■

PROJECT INFORMATION

- **Company entering:** ARQ Dams
- **Client:** Limak Construction SA for DSi (Turkish State Hydraulic Works)
- **Main Contractor:** Limak Construction SA
- **Consulting engineer:** ARQ



THE CONSTRUCTION OF SHONGWENI RESERVOIR 6Mℓ REINFORCED RESERVOR AND ANCILLARY WORKS

Located at the highest point in Ntshongweni within the eThekwini Municipality is the successfully completed Shongweni reinforced concrete water retaining structure. This reservoir plays a key role in supplying Ntshongweni, Ofudu, Salem, Clifton and Zwelibomvu reservoirs with sufficient portable water. The completion of the project has not only improved the level of service delivery for the Ntshongweni and neighbouring communities by providing water security, 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 has exceeded the contract goals in all areas of community-based activities such as Job Creation by providing accredited and on-the-job practical training to local community members. This was realized via meticulous planning and social facilitation by eThekwini Municipality (Water & Sanitation), Naidu Consulting, and Afrostructures to display the art of Civil Engineering in rural KZN. Despite the complexities associated with the construction of reinforced concrete structures and the social challenges faced following the KZN April 2022 floods, the main Contractor, with extensive co-operation from local labour and local contractors, was successful in overcoming challenges and achieving practical completion on 20 April 2023. Whilst strictly adhering to quality, safety and environmental constraints the project was completed prior to the initially planned Practical Completion date. ■

PROJECT INFORMATION

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

TONGAAT WATER TREATMENT WORKS EMERGENCY REMEDIATION WORKS

The Tongaat Water Treatment Works (TWTW) is situated in the North Coast of KwaZulu-Natal. At present, the Works provides potable water to the greater Tongaat area through seven neighbouring reservoirs. The design capacity of the works is 21Mℓ/day, with current operating capacity of 19 Mℓ/day. On the 11th April 2022 KwaZulu-Natal experienced unprecedented torrential rains which caused substantial damage to municipal and private infrastructure, consequential risk to life, interruption to essential services as well as severe access limitations to residents and businesses alike.

The flood damage to the TWTW rendered it non-functional and prevented the supply of piped potable water to approximately 90 000 residents from 12th April 2022.

Naidu Consulting were appointed to provide professional services including identifying repairs, replacements and reinstatements on various civil, mechanical, process, control & instrumentation and electrical infrastructure. Notable impacts of the flooding included the flooding and submergence of the Motor Control Centre (MCC) panel, all pumps & motors (no. 20), electrical & instrumentation equipment (including some 15 km of cabling); as well as critical structural damage. The project was classified as an emergency and the Works was to be recommissioned to 21Mℓ/day capacity within 105-days. Naidu Consulting has always strived to provide innovative and sustainable solutions throughout any project life cycle. This philosophy, combined with a highly skilled and experienced professional team enabled Naidu Consulting to ensure each element of the project was assessed based on risk, timeframes, applicability and innovation in order to meet the 105-day mandate.

Naidu Consulting, in collaboration with eThekwini Municipality, implemented complete transparency to all stakeholders, including local leadership, to ensure the project received community support and met CPG and local labour targets, whilst also achieving skills transfer/upliftment to Local Emerging Contractors. Through continuous and dedicated collaboration between the Client, Contractor, and Engineer, the Professional team ensured that delays and risks were minimized, resulting in optimal and innovative engineering solutions. Naidu Consulting were actively involved in the commissioning activities of all pumping systems and aided EWS throughout the process of the pumping system restoration including situational assessments and identification of bursts for EWS Operations to resolve.

The project successfully provided potable water to the community within the near impossible 105-day period, with the Treatment Works restored to an optimised operating condition. ■

PROJECT INFORMATION

- **Company entering:** Naidu Consulting
- **Client:** eThekwini Water & Sanitation
- **Main Contractor:** Icon Construction
- **Project Manager:** Naidu Consulting
- **Consulting Engineer:** Naidu Consulting

EAST LONDON INDUSTRIAL DEVELOPMENT ZONES

Industrial Development Zones (IDZs) in South Africa are designated geographic areas with a specific focus on promoting and supporting the growth and development of targeted industries. The primary purpose of IDZs is to attract local and foreign investment, create jobs, and increase the country's competitiveness in the global economy. Overall, IDZs are a critical tool for South Africa's economic development strategy, and they play a vital role in attracting investment and creating employment opportunities in the country.

The East London Development Zone(ELIDZ) is home to automotive industry manufacturers and many other industries. In 2015, the upgrade of the Mercedes Benz South Africa Plant was undertaken to cater for the production of the all-new W206 C Class Mercedes Benz. This attracted funding from Daimler AG for an amount of R2b to expand their production line. The effects of this investment followed the need for expansion of the Automotive Supplier Park within the ELIDZ which triggered the need for additional firm power.

In 2016, through a successful bidding process, Bigen was appointed to complete the Master planning investigation, implementing the electrical infrastructure upgrade released from the master plan recommendations and lastly implementing a load curtailment & energy efficiency system. The Master plan completed aided the ELIDZ to realize the short medium and long-term infrastructure required and the associated costs to be equipped to meet the manufacturing demand of Mercedes Benz South Africa Plant.

The short-term Electrical upgrades led to Bigen commencing with the detailed design of Part B of the project and subsequently administrating the project during construction until finally closing it out. The scope of Part B of the project involved the upgrade of 3x 11kV switching stations, strengthing the MV feeder network within the Zone and lastly upgrading the infeed Eskom Substation. This project required detailed and advanced planning solutions to ensure minimal interruption to the current production lines. The Eskom Leaches Bay infeed substation scoping involved upgrading the existing 11kV Board which uses onboard protection. Bigen in collaboration with Wood Beam had re-engineered the protection scheme with newer protection relays to build the 1st 3CF-4100F Eskom protection scheme for an indoor 11kV Vacuum indoor circuit breaker.

Upon completion of Part B of the works, Bigen commenced with the Load Curtailment programme implementation offered by Eskom. Load Curtailment is a term used to describe the process of reducing or shedding electrical load during periods of high demand on the South African power grid. It is a strategy used by Eskom, South Africa's state-owned power utility, to prevent blackouts or rolling blackouts during times of electricity supply shortage. The advantage of the programme is that through load shifting, the industries within the ELIDZ only need to shed 20% of the load while still maintaining they ability to continue with manufacturing during load shedding events. This effectively contributes to providing a sustainable operation for the manufacturers within the ELIDZ therefore minimizing the negative impact of our power crisis on our economy.

Bigen undertook an investigation to implement the load curtailment system using the conventional

ripple frequency. However, ripple frequency has many pitfalls, the main being not aligned to the general machine regulations. This gave way to Bigen pioneering a load curtailment system that would meet the needs of the ELIDZ and align with the power utility's requirements and fulfil the mandate to shed power in accordance with the general machine regulations and SANS codes. ■

PROJECT INFORMATION

- **Company entering:** Bigen
- **Client:** East London Industrial Development Zone
- **Consulting Engineer:** Bigen

DISTILLERY ROAD BRIDGE REHABILITATION PROJECT

The Distillery Road Bridge crosses the Plankenbrug River and serves as the only public access road to Bosman's Crossing, a small mixed development community within Stellenbosch. Its location has historic significance since the original bridge was constructed in 1691. It was the first formalised entrance from the Cape to Stellenbosch along the old Cape wagon road, with the last bridge upgrade dating back to the mid-20th century. Due to concerns regarding the structural integrity of the existing bridge, it was decided to replace the bridge with the careful retention and detail integration of the existing central stone pier and stonework salvaged from the embankments.

Phased demolition of the existing structure allowed traffic accommodation during half-width construction. The bridge was supported on deep piled foundations and was successfully upgraded to a single carriageway with two cantilever pedestrian walkways.

Additional upgrades included the water main supplying potable water to the area and new stormwater, electrical and fibreoptic infrastructure. Erosion protection measures and river rehabilitation efforts were implemented during construction.

AECOM was appointed in August 2019 by the Stellenbosch Municipality to design and upgrade the new Distillery Road Bridge.

AECOM developed several options for the proposed remedial works and established its associated viability in terms of technical and cost considerations for each option. In conjunction with Stellenbosch Municipality, it was confirmed that, due to the overall condition of the existing bridge, its replacement was considered the most feasible solution.

AECOM provided the following engineering services on this project:

- Geotechnical design (analysis, reporting, preliminary and detail design)
- Bridge design (visual bridge inspections, detailed assessment report, preliminary and detail design)
- Pavements and materials (full services)
- Geometric design (preliminary and detail design)
- Two-dimensional flood study of the Plankenbrug River and Bosman's Crossing area and hydraulic design of all road drainage infrastructure (visual inspections, analysis, reporting, preliminary and detail design)
- Documentation and procurement
- CMCS (construction monitoring, client's representative, project management)

Stellenbosch Municipality received initial concerns about the structural integrity of the Distillery Road Bridge, setting in motion the process to rehabilitate or upgrade it.

The bridge crosses the Plankenbrug River and is located on the western edge of Stellenbosch, near the point where Adam Tas Road/R310 crosses the railway line. The Distillery Road Bridge is about 20 m in length and consists of a single carriageway. It is the only access road into Bosman's Crossing, a small mixed development area within Stellenbosch comprising various commercial developments and apartment complexes.

The original Steenenbrug at Bosman's Crossing was constructed in 1691 as the first public works project in the Stellenbosch District. It was the first formalised entrance from Cape Town to the growing town of Stellenbosch along the old Cape wagon road leading to lower Dorp Street. The site sits adjacent to the Stellenbosch Archaeological Reserve. Over 300 years later, the bridge has been upgraded on several occasions, with the most recent upgrade dating back to the mid-20th century.

The upgraded bridge design has been duly informed by the heritage significance of the structure. Heritage considerations included the retention and detail integration of the existing central stone pier (non-structural), reuse of the stonework salvaged from the embankments for landscaping and design of cantilever walkways that are a visual reminder of the original bridge. An existing bollard at the approach of the existing bridge was repainted, reinstated and used as a spatial marker, with a plaque conveying the historical importance of the site and the retention of the stone pier. ■

FUTURE EXOTICS - MIRAGE FIGHTER JET

"Future Exotics" is a supercar and luxury car retailer that has recently entered the South African market. The brand have decided to set up their new state of the art head office and showroom in Sandton and have thus bought over an existing building located on Sandton drive and have began an intense revamp project to repurpose the building to meet their needs.

The renovation project involves the addition of a new floor level within the existing building, the addition of a full car detailing centre in the buildings basement, the alteration of the main entrance into a full out car showroom and the introduction of a two storey car lift to carry supercars and luxury vehicles up and down the building.

The aim of the renovation was to reinvent the building in such a way that it would make a statement and also show off the brand's commitment to innovation, speed and high performance engines. As such, they took the bold decision to mount an actual Mirage Fighter Jet to the roof of the building.

The Mirage Fighter Jet is a combat Jet that was used by the South African defence force. It is capable of reaching speeds of 2 555 kph and weighs approximately 15 tons.

Aspire Consulting were appointed as the structural engineers on the project and were given the task of mounting the Jet on the roof of the building. This project award submission focuses on this element of the renovation project.

Everything about the Mirage Jet is geared towards it flying. As such wind forces that blow over the structure and its wings have a tendency to create large uplift forces. Since the entire Jet had to be completely stripped internally for national security purposes, its dead weight was reduced from 15 tons to 7 tons. This meant that the effect of uplift forces was magnified even further.

The holding down frame and bolt system employed thus had to be carefully designed in order to hold the Jet on the roof. The first challenge that we faced as design engineers on the project was to ascertain whether or not it would be structurally possible to place the 7 ton jet on the roof of the building. In order to do this, we mapped out the entire structure and carried out rebar scanning and exposures in order to understand the load carrying capacities of the slabs, beams, columns and foundations of the building. It was our finding that the roof slab was not capable of withstanding the upward or downward forces of the Jet installation. Furthermore, the beams could not handle point loads and needed all loads to be spread over their length for them to work.

Aspire Consulting therefore created a full steel mounting frame that was bolted to the columns and beams and suspended above the slab itself. The frame then had three main anchorage points that were to be used for connecting and holding down the Jet. The fixing of the Jet to the plane was challenging in that the Jet fuselage is only a few milometres thick and any bolt drilled through it would simply tear the frame.

Aspire cConsulting therefore decided to mount the Jet at its wheels instead and created a fixing that went through the wheel holding points that can lock the jet in place.

We then worked closely with Hilti SA to find a suitable chemical anchor that could withstand the high upwards forces bring imposed. This is another area where design innovation on Hilti's side was used. ■

PROJECT INFORMATION

- **Company entering:** Aspire Consulting Engineers
- **Client:** Moti Group (Future Exotics)
- **Main Contractor:** Moti Group
- **Principal Agent:** Moti Group
- **Consulting Engineer:** Aspire Consulting

PROJECT INFORMATION

- **Company entering:** Roelof Rabe Argitekte
- **Client:** Stellenbosch University
- **Main Contractor:** WBHO Construction
- **Architect:** Roelof Rabe Argitekte
- **Principal Agent:** Henry Fagan Consulting
- **Project Manager:** Henry Fagan Consulting
- **Quantity Surveyor:** HKQS
- **Consulting Engineer:** LTS Heath Laboratory Design specialists

WINNER

THE BIOMEDICAL RESEARCH INSTITUTE (BMRI) AT STELLENBOSCH UNIVERSITY

The scope was comprehensive and multifaceted and multi-phased. It aimed to create a cutting-edge research facility that would serve as a hub for biomedical research and innovation, encompassing a wide range of disciplines within the medical and health sciences field.

The project originated from the need to refurbish the existing FISAN building.

To do so, it was needed to decant many highly specified research laboratories.

Instead of temporarily decanting these facilities, it was decided to permanently move them over to a new building right in front of the FISAN building.

The architecture of the BMRI is characterised by seamless integration of form and function. The building's exterior features a blend of modernist and contemporary design elements, with clean lines, expansive glass facades, and a harmonious combination of concrete, steel, and glass. This design not only imparts a sense of transparency and openness but also allows for ample natural light, creating a welcoming and inspiring environment for researchers and visitors alike. The brief from the client was to renovate and enlarge the existing Fisan Building at the Tygerberg Faculty of Medicine and Health Sciences to accommodate current users as well as projected growth.

As most of the existing laboratory and research environments operate on a 24 h basis, it was of utmost importance that the sequence of the works be planned properly and be integrated into the design to minimise the impact on current operations. The conservative analysis the need for an additional 16 000 m. The brief also included a new state of the art automated -80° storage facility and a large BSL3 Facility.

The proposal from the Architects was to add as Phase 1, a new building In front of the existing Fisan and move some of the research divisions, including their anticipated growth areas, into the new building permanently. The spaces in the existing building, could then be vacated and upgraded as a second and third phase.

Phase 2 Levels 4 and 5 moved over to the new building and refurbishment for the top 3 floors and new plantrooms on the roof. It Includes a new

Morphological Learning Centre, Cafeteria and the Atrium that links the complex together.

The project also incorporates an atrium Bridge walkway and raised garden to establish a link between the existing, refurbished, and new.

The architecture of the BMRI is characterised by seamless integration of form and function. The building's exterior features a blend of modernist and contemporary design elements, with clean lines, expansive glass facades, and a harmonious combination of concrete, steel, and glass.

This design choice not only imparts a sense of transparency and openness but also allows for ample natural light, creating a welcoming and inspiring environment for researchers and visitors alike.

Internally, the BMRI is designed to optimise collaboration and interdisciplinary research. The layout is organised around open-concept workspaces, communal areas, and flexible laboratories, facilitating the exchange of ideas and fostering a sense of community among researchers. The incorporation of adaptable spaces allows for easy reconfiguration as research needs evolve over time, promoting versatility and efficiency within the facility.

Complex process driven architecture can be seen as the human facing building avatar or shell that meaningfully hides the critical building services.

The Faculty of Medicine and Health Sciences of Stellenbosch University has, as one of Africa's top medical and health sciences institutions, an immense responsibility to lead the endeavour to ensure healthy lives and wellbeing for all, inter alia through high-level biomedical research.

The Biomedical Research Institute (BMRI) which was completed this year on the Tygerberg Campus of Stellenbosch University, is a world-class, future-focused research complex that, in many ways, exceeds the best the world has to offer. This building, designed by Roelof Rabe Architects, is considered one of the top biomedical research facilities on the African continent, and houses leading South African researchers and students who are investigating diseases that have the greatest impact on South Africa and the rest of Africa.

The ultimate aim of the advanced research done in this building is to improve the diagnosis, prevention and treatment of illnesses such as tuberculosis, HIV, diabetes, heart disease and neurological disorders. The BMRI is also one of the country's greenest buildings of its kind to have been completed over the course of the past two years, with a Green Building Council 4 star rating by design.

With sustainability at the heart of its design, the BMRI's energy and water systems, material selection, emissions, waste management and use of natural light all contribute to our efforts to meet net zero targets. With a price tag of R1,2b, the BMRI is the largest single infrastructural investment in biomedical research in Africa and allows for the immediate expansion of the faculty's current research activities as well as the strengthening of research and teaching capacity in the fields of inter alia, bioinformatics, genomics, anatomy, neurobiology, advanced surgical sciences and biobanking.

Apart from a range of research laboratories, the BMRI is also host to a bioinformatics hub, electron microscopy labs, proteomics and FACS labs, a Medical Morphology Learning Centre, a biorepository, the Sunskill lab and our Clinical Research Unit.

The building was designed according to the client needs and involved an extensive years-long process of engagement and interaction between the architects, laboratory infrastructure consultants, the researchers and faculty management, to deliver a product which is tailor-made for biomedical science in the post-digital age. ■

VARSITY COLLEGE, PRETORIA CAMPUS

Nestled at the intersection of Clearwater Road and Glenwood Road in Lynwood Glen, Pretoria, the Varsity College Pretoria campus emerges as a distinctive beacon of education.

The campus consisted of an existing facebrick lecture building, admin block, canteen and temporary classrooms to accommodate the demand for additional seats.

Historically, vehicular access predominantly flowed from Clearwater Road, while pedestrians entered the campus via Glenwood Road. However, a pivotal transformation was introduced to enhance accessibility. The new wing of the campus boasts a library, computer labs, and intimate study spaces. On the ground floor, two lecture venues each accommodating forty-five students and a library offer a break out space.

The campus was transformed with an architectural touch that's both contemporary and timeless. The latest additions showcase A-framed steel structures with face brick infill "bookends".

For ease and speed of construction, post-tensioned slabs were introduced for all floor plates. Side cladding was used as an extension of the roof sheeting creating cavities for a ventilated façade.

In the pursuit of a design that considers the potential for future renovations to the existing buildings, materiality choices had to consider specific applications of materials and cladding.

Drawing inspiration from the lush natural surroundings and the nearby spruits, our landscaping design was conceived not only to enhance the beauty of the environment but also to seamlessly connect the landscaped courtyard with the building itself.

Student well-being and safety are paramount to our client, and this is reflected in the design's thoughtful considerations.

The floor plan has been designed with flexibility in mind, allowing for potential future rearrangements.

A range of eco-conscious solutions were implemented that not only reduce the environmental

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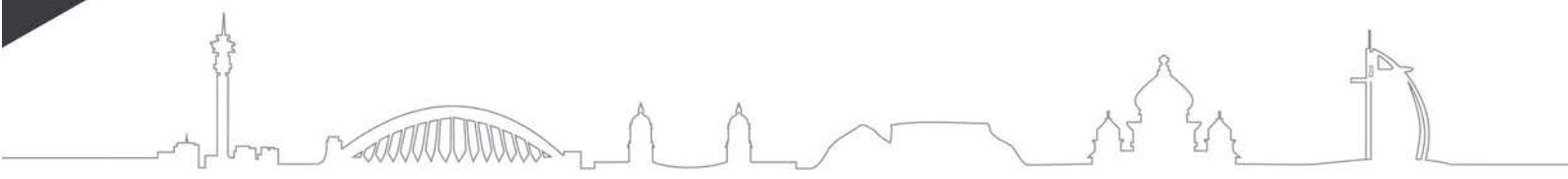

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impact but also enhance the functionality of the respective spaces. Solar panels were introduced to supplement electricity usage and all the common spaces and ablution lights are connected to motion sensors to reduce electrical consumption. Waterwise sanitary fixtures were specified for implementation.

The façade treatments are strategically designed for optimal orientation responses. With the building positioned in a north/south orientation, the southern façade is open to allow natural light and ventilation of the walkways. Meanwhile, the northern side is designed with smaller deeper recessed openings and screening, while the eastern and western ends are free of openings.

In a groundbreaking departure from traditional clinical education, the new approach to the campus building is nothing short of revolutionary. Gone are the sterile, cold environments of the past, replaced by a warm and inviting atmosphere that encourages learning like never before.

One of the standout features of this campus is its breathtaking landscaping. Positioned alongside picturesque spruits and lush greenery, it is a sight to behold. The landscaped areas incorporate planter walls that double as seating, inviting students to embrace the great outdoors.

Preservation was at the heart of the design process, as every effort was made to save and relocate as many of the established trees as possible. This not only ensures the continuity of the campus's green legacy but also demonstrates a strong commitment to responsibility.

An emphasis on waterwise plant selection adds an eco-friendly touch to the landscape, promoting responsible water usage. For those seeking a mental challenge, a strategically placed chess board awaits enthusiasts, offering a cerebral break.

In addition to these innovative features, the campus also boasts quiet nooks thoughtfully designed for students to study outdoors. These serene spots provide the perfect environment for focused learning, away from the typical classroom hustle and bustle. ■

PROJECT INFORMATION

- **Company entering:** Boogertman + Partners
- **Client:** Independent Institute of Education [IIE]
- **Architect & Landscape Architect:** Boogertman + Partners
- **Contractor:** JC Van der Linde & Venter
- **Quantity surveyor:** Rider Levett Bucknall
- **Project Manager:** Origin
- **Consulting Engineer:** CKR Consulting Engineers
- **Electrical Engineer:** Plantech Consulting Engineers
- **Mechanical Engineer:** Plantech Consulting Engineers
- **Wet Services Consultant:** CKR Consulting Engineers

SPACE WEATHER CENTRE FOR THE SOUTH AFRICAN NATIONAL SPACE AGENCY

The building was inspired by the beautiful magnetic fields that are observed by its scientists. These evocative elliptical curves and solar flares informed a unique building typology. Curved shapes and vertical planes break the building's façade into portions, with key areas being celebrated with sculptural volumes and spaces which can be seen in the main entrance, lecture hall and boardrooms.

The building needed to accommodate SANSA scientists and staff members and cater for visits by the public. SANSA hosts many school children of all ages every year, to teach and educate them about science and space. SANSA provides tours for the public and hosts monthly lectures, for a wide audience.

The building is divided into a public area and includes the lecture hall, and a large foyer for events. The private office area is access controlled and comprises offices and boardroom facilities. These areas are distinguished through different colours. The public areas have bursts of bright colours to create a stimulating and exciting space to visit. The office wing has a toned down colour scheme of blues and greys with soft timber joinery, to create a calming environment in which to work.

The construction of all buildings within the observatory needed to be non-magnetic. Therefore, the use of metal and steel products were kept to a minimum. Fibre cement roof sheeting was used to replace standard metal roof sheeting. All roof trusses were carefully designed using timber. This was especially challenging with the larger spans inside the foyer and lecture hall.

The new Space Weather Centre building is one of five designated space weather information providers for the aviation sector in the world.

The construction of all buildings within the observatory needed to be non-magnetic. This is due to the sensitive equipment around the site that monitors magnetic data, this data needs to be accurate and tracked over a 24-hour period.

All roof trusses were carefully designed using timber. This was especially challenging with the larger spans inside the foyer and lecture hall. The site was constantly monitored for magnetic interferences, and specialized tests were undertaken regularly to check the building works were not interfering with the readings.

The new Space Weather Centre building is one of five designated space weather information providers for the aviation sector in the world. The first one of its kind on the African Continent and greater Southern Hemisphere.

The project aimed to follow a different type of architecture to highlight the interesting work the scientists study - the sun's impact on the earth's magnetic fields. This inspired a sculptural type of architecture with curved walls and features throughout the building.

The building was designed to sit in the fynbos landscape comfortably, with its sculptural shapes emerging from the fynbos vegetation. Before site preparation a full botanist study was undertaken to ensure that no endangered plants were discovered on the site. All tortoises were carefully relocated to a safe location before construction began.

Protection of all the large Proteas and fynbos bushes was ensured during the length of construction. All new landscaping introduced at the end of the project was local endemic and water wise species for the drought prone area. ■

PROJECT INFORMATION

- **Company entering:** AVNA Architects
- **Client:** South African National Space Agency
- **Architect:** AVNA Architects
- **Project Manager & Principal Agent:** Schoonraad Architects
- **Quantity Surveyor:** Farrow Laing
- **Engineering:** NWE Consulting Engineers
- **Contractors:** Edge to Edge
- **Landscaping:** Revive Landscaping

SPECIAL MENTION

PROJECT INFORMATION

- **Company entering:** Boogertman + Partners
- **Client:** Balwin Properties
- **Architect and interior:** Boogertman + Partners
- **Main Contractor:** Balwin Properties
- **Project Manager:** Balwin Properties
- **Civil Engineer:** Kantey & Templer Consulting Engineers

THABA ECO VILLAGE – LIFESTYLE CENTRE

Nestled at the base of the Klipriviersberg Nature Reserve, Thaba-Eco Village is an innovative residential community that harmoniously blends nature, sustainability, and modern living. Spread across 300 hectares of pristine wilderness, it offers homeowners and visitors an exceptional opportunity to connect with the environment through hiking, running, and cycling. One of the hallmarks of Thaba-Eco Village is its commitment to minimizing its carbon footprint. The residential blocks, comprising 1, 2, and 3-bedroom units, are thoughtfully designed to optimize human-scale living while prioritizing eco-friendly principles. The integration of extensive glazing in each apartment maximizes natural light and ventilation, creating a sense of spaciousness and connection to the outdoors, further enhanced by large private balconies or gardens.

Boogertman and Partners Architects were tasked with designing a four-storey walk-up residential block catering to the upper-middle-class market. The design needed to accommodate a specific apartment mix, catering to various needs: 1-bedroom, 1-bathroom apartments, 2-bedroom, 2-bathroom apartments, and 3-bedroom, 2-bathroom apartments. The ground floor apartments are primarily 3-bedroom apartments on either side of the 1-bedroom

apartments, each featuring its private gardens.

On the first and second floors, the plan was to house the 1 and 2-bedroom apartments, while the top floor would be reserved for luxurious penthouse apartments.

The architectural vision for the blocks aimed to incorporate elements of the old farm-style architecture of the region's heritage. This would involve the use of red face-brick, vertical sheeting, expansive shaded balconies, and pitched roofs, all in line with the desired aesthetics. A strong emphasis is placed on ensuring the application of eco-friendly and sustainable building methods and materials are incorporated to ensure an eco-friendly development.

The arrangement of these blocks across the site would follow an organic, site-responsive approach, conforming to the natural contours of the land and taking neighbouring properties into account. The landscaping design would play a crucial role in seamlessly integrating the architectural structures and softening the overall design.

In addition to the residential blocks, the development would feature essential amenities such as a lifestyle centre, a Montessori school, and a sculpture park, enriching the community's experience across the proposed site.

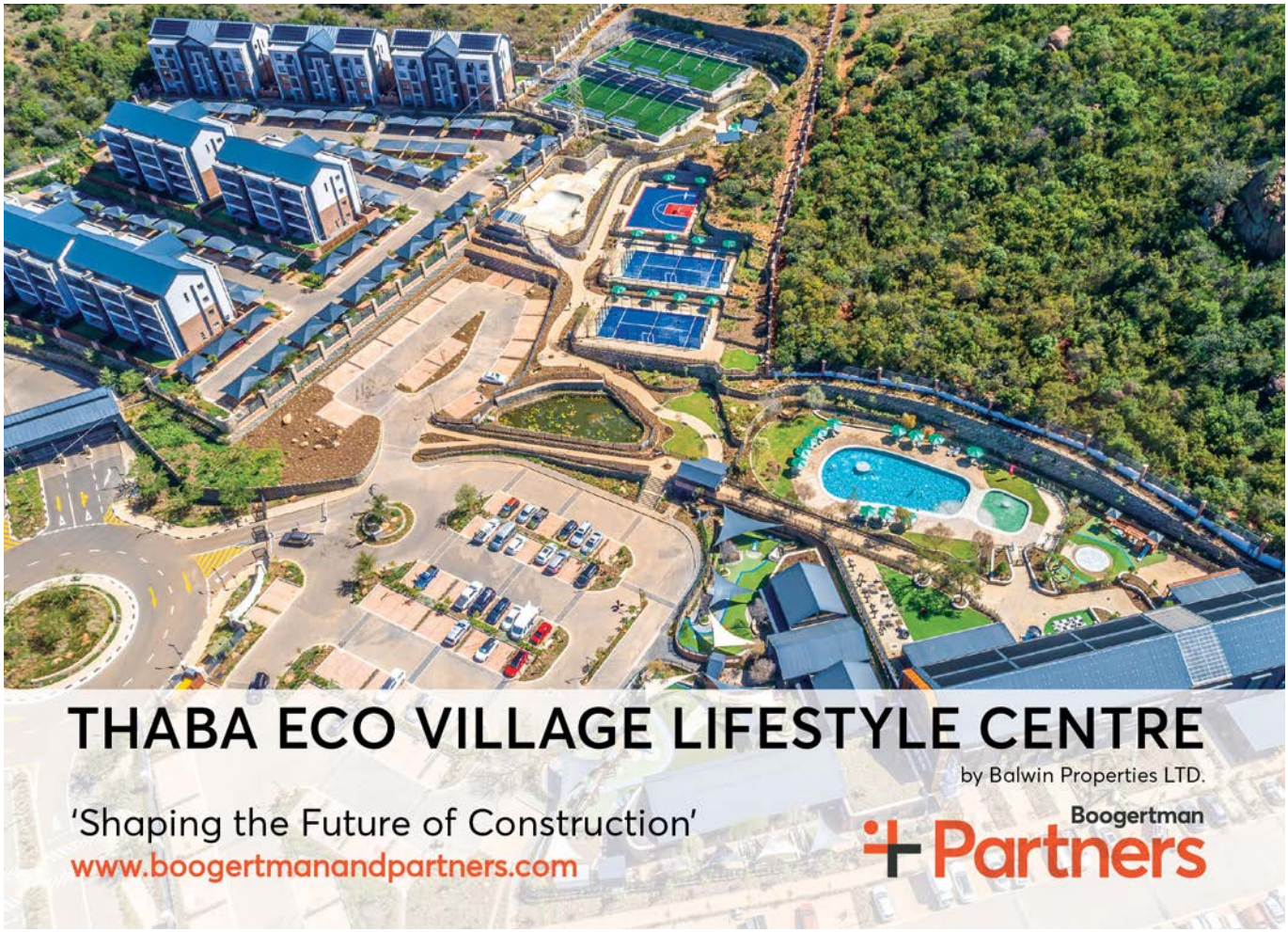
Balwin as the contractor, client, quantity surveyor and procurement manager, have the luxury of procuring products aligned with their ultra-green vision for these structures. Building materials are carefully selected to ensure high-quality content, with Balwin committing to using steel with over 90% 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.

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.

Targeting EDGE advanced apartments and GBCSA 6 Star Green Star New Build and Net Zero Carbon ratings for their lifestyle centres and Montessori's.

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 had 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. ■



CAVGOLD

CAVGOLD is the name given by Boost Property Management to the building that was entered. They are committed to uplift the poorer suburbs of old Johannesburg like Hillbrow, Berea, Bellevue and parts of the CBD itself. CAVGOLD is the third new build apartment building for the client. Situated just off the corner of Goldreich and Edith Cavell Streets (hence the name), it now forms a formidable backdrop to a little cluster of heritage houses, bought and lovingly restored by Boost Properties.

The building comprises 130 low-cost apartments over nine floors with retail at street level. The complex's location on the edge of Hillbrow was originally three adjoining sites. The existing garage/ workshop on the one site was retained and now forms part of the apartment building.

The balance of the building was built on adjacent vacant land and the cluster of heritage houses facing Edith Cavell Street and Clarendon Place was retained and restored. The project value was in the order of R50m.

The building's location is in an extremely poor area with a high crime rate. During construction this posed considerable risk from a material, plant, and equipment perspective as well as the health and safety of the contractors themselves.

High levels of physical security have had to be maintained during and after construction to ensure a safe environment.

As is the case with urban renewal projects of this nature, once the building is complete the environment immediately surrounding the building is automatically enhanced by the building itself.

There is almost no financial risk associated with the project, as demand way exceeds supply of new build flats in the area.

Considerable innovation was required to achieve a build cost sustainable in the low-cost market, without compromising the quality, while achieving a sufficiently robust product to withstand the anticipated use level of the building.

In order to achieve a proper investment return from the achievable rentals in the area, finance costs needed to be maintained at the lowest possible level and project timelines and cash flows properly maintained to achieve this in an extremely cost sensitive market.

In spite of the risks associated with building in a high crime area, the project has a two-year accident-free record from inception to completion. Several incidents of plant and material theft did however occur during construction.

The preconstruction environment in which the building was to be erected was one of poverty, neglect, and ill hygiene. The introduction of this building has resulted in a visible upliftment of the area as a whole.

The design and construction of the building makes use of high-speed water heating technology, a state of the art bore hole filtration system, and LED lighting throughout. As a result, the building is able to operate completely off the JHB municipal water system and draws only in the order of 120 KVa at peak demand, equating to approximately 1,5 kW per apartment.

The installation of a solar system to reduce the building's environmental impact even further is currently in progress. ■

PROJECT INFORMATION

- **Company entering:** Messaris Wapenaar Cole Architects
- **Client:** Boost Properties
- **Main Contractor:** Lemay Construction
- **Architect:** Messaris Wapenaar Cole Architects
- **Principal Agent:** Messaris Wapenaar Cole Architects
- **Quantity Surveyor:** Profection QS
- **Consulting Engineer:** PBA Africa

APEX STUDIOS – STUDENT ACCOMMODATION

The development houses 901 students over 13 storeys in a new residential building which consists of a variety of unit types, each with private shared bathroom and kitchen lending itself to an apartment style of living. The units range from 1,2,3 and 4 bedrooms with minimal shared rooms in the overall scheme. In this regard the students connect with fellow roommates whilst benefitting from a more private communal area.

The existing heritage building has been restored and extensively refurbished to create a communal hub for the scheme with a variety of study and social spaces for different activities and group sizes. The raw, modularised materials of the existing building influenced the new residential building. The use of concrete, facebrick and colour, create a sophisticated yet playful new architectural language, interpreting the geometry of the existing architectural style through a contemporary lens.

Whilst the indoor common areas become the hub, the external zones are interwoven between the common and residential areas to allow for constant access to nature. Students traverse the site horizontally and vertically to occupy these break out, play and socializing areas. Thus, the scheme is constantly activated, creating the opportunity for more connections between students to develop.

The fully let student accommodation scheme is testament that not only is student accommodation a necessity in this area but, that this proposal has provided an affordable, aspiring and sustainable lifestyle option to these students.

Due to the cost and time constraints of the project, it was critical that the structure of the new building was designed to be both cost effective and allow the contractors to build at an unusually fast pace. The slabs are designed to be a minimal thickness to ensure it was cost sensitive and this also allowed for pouring times to be reduced.

Located 300 m from the WITS main entrance makes it ideal from a safety point of view. The location also encourages an integration between WITS and the scheme – Discussions have already been held between the parties as to how they can work collaboratively to mutually benefit the students.

The concept for the existing building was to create a communal hub for the scheme with a variety of study and play spaces for different activities and group sizes. Individual tasks require different atmospheres, and these spaces have been positioned with adjacencies to support the various activities.

Flexibility within a student community is key to enable the students and operators to appropriate and customise their personal and common spaces. Fixed furniture is limited so that spaces can be easily transformed as needed. A consistent palette throughout means the furniture can be repositioned in other areas and still look appropriate. The courtyard is also multi-functional with bench seating on the perimeter and a platform to the side creating a central events space.

It was of utmost importance that the building would achieve full accreditation with the University of the Witwatersrand, as well as EDGE accreditation/rating (similar to GBCSA rating) as this was the benchmark for any projects to be part of the portfolio. The heritage aspect of the site was critical as the development needed to respond and celebrate the existing building and this drove many of the design decisions. ■

PROJECT INFORMATION

- **Company entering:** GASS Architecture Studios
- **Architect:** GASS Architecture Studios
- **Developer:** Growthpoint Student Accommodation Holdings
- **Project Manager:** Betapoint Management Consultants
- **Structural Engineer:** Sutherland Engineers
- **Civil Engineer:** Sutherland Engineers
- **Quantity Surveyor:** DelQS
- **Main Contractor:** Concor Construction

BOARDWALK SHEDS

The site for this project is located on Olympus Drive in the east of Pretoria. It is adjacent to Plantland the Wilds Garden Centre on the corner of Atterbury Road and Olympus Drive. The majority of the surrounding area comprises residential complexes and educational facilities. It borders on the start of the Faerie Glen small holdings on the way to the well-known Silver Lakes residential area.

Boardwalk Sheds is a +- 4 000 m² shopping centre with a Pick n Pay Supermarket, PnP Clothing and PnP Liquor as well as a Crazy Plastics and Crazy pets. This will offer the community a convenient local neighbourhood centre to shop in. The current context and location were considered and investigated by the developer. This informs a possibility of the centre forming part of a larger commercial development in future. Currently the site has an existing warehouse building with parking shared with the Garden Centre. One of the challenges for the site on its own, was to accommodate ample parking as well as a functioning delivery yard for the anchor. The fall of the site contributed to the delivery yard problem of finding a flat enough piece of land to do deliveries on grade. The only position that made commercial sense was right in the back corner of the site where the site gradient is at its steepest. A professional team of engineers and architects put their heads together to come with a workable plan. Vehicular access and movement on the site were an important consideration to enhance ease of traffic flow. Due to the limited size of the site, while planning the building, the architect was faced with another

challenge; to design a building with a feasible lettable area, enough parking and the workable delivery yard. The answer was a very functional and economic layout. Possible future expansion had to also be taken into account while planning the development.

Due to the fact that the site is situated in the Olympus small holdings area, a minimalist “farm style” architecture was considered. The structure of the building is an industrial warehouse with a contemporary interpretation of the pitched roof farm shed. This speaks to the vernacular of the area, historically and now. The external finishes will be a combination of metal- and timber cladding with well-placed lighting and greenery. The construction of a steel structure also attributes to a quicker assembly time of the structure. With the brickwork only going up to a lower height and the rest being steel cladding increases the construction time. This has financial implications for the developer so future tenants can start trading sooner.

The client wanted to develop a contemporary building that was easily accessible by patrons with the convenience of enough parking. Together with a supermarket and liquor store, clothing store, pet shop and household items, there will also be a coffee shop with outside seating. This offers the visitor a one stop shopping experience but also space to socialise. ■

PROJECT INFORMATION

- **Company entering:** Bentel Associates International
- **Client:** Ilungile Consulting Services
- **Main Contractor:** Barrow Construction
- **Architect:** Bentel Associates International
- **Project Manager:** Ilungile Consulting Services
- **Consulting Engineer:** Struxit Projects

DEPARTMENT OF AGRICULTURE, LAND REFORM AND RURAL DEVELOPMENT

Eleven years in the making, the new home of the Department of Agriculture, Land Reform and Rural Development (DALRRD) in South Africa's capital city, Pretoria, adds a glittering landmark to the city's (and the country's) tradition of civic architecture.

The central design concept was inspired by the land itself, which lies at the very heart of the department's activities: agriculture, forestry, rural development, and land reform. The curved, organic shapes of the building and its low-slung form take their cue from shapes moulded by nature itself. The architecture literally hugs the ground rather than towering vertically over it, almost as a refined or abstracted landform. Its edges rise and fall like curves and carved hollows sculpted by natural forces. Its dimensions and scale, too, are intentionally respectful of its context, with the city and the Magaliesberg mountain range forming its backdrop.

The distinctive identity of the building, however, is most emphatically defined by its shimmering façade, which is essentially an artwork in its own right: a complex unitised façade system of individually machined aluminium and glass panels etched with a powerfully symbolic design.

The façade concept aims to create an artwork that visualises the various focuses of the department: agriculture, forestry, rural development and land reform. Profiles of the most iconic mountain peaks from each of the country's nine provinces are fused together to create an image of a unified landscape that encompasses the whole country. This hand drawn artwork was transposed into a digital array of pointillist and linear patterns to be laser cut into the aluminium facade panels and glazing systems. The use of a vertical line work pattern on the glazed panels references South Africa's urban landscapes, whereas the pointillist approach on the metallic sections signifies rural South African landscapes. This glass surface slips behind the skirts of the golden façade as it rises and falls, as a symbolic depiction of South Africa's urban and rural landscapes intercepting each other.

The DALRRD office building was awarded a GBCSA 4 STAR Green Star rating for its sustainable design features. The building's complex facade system was designed to minimize internal glare, with specialized vision glazing portions and blinds on all external windows. The office area and floor plan were optimized to ensure that 60% of the floor area is within 8 m of an external facade, window, or atrium. This provides ample natural light, reducing the need for artificial lighting and cooling. All lights in the building are activated by motion sensors to ensure they only operate when required.

The building's materials were also carefully selected to reduce its environmental impact. Carpets, paints, and all interior adhesives and sealants are low-VOC emitting. Fuel-efficient transport is encouraged with 5% of all parking spaces labelled for fuel-efficient cars and carpools. Dedicated recycling and waste storage facilities are provided for separation and collection. All external and atrium lighting is designed to keep light pollution to the minimum. The building consists of five nodes or wings leading off a central spine that bends along a curve in the Apies River, which runs along the edge of the site. This long, low form creates the wide floorplates that facilitate a light, open, friendly, hospitable and spatially connected environment in line with the department's values of inclusivity and progressive organisational culture. Overall, the DALRRD office building is a well-designed and sustainable building that sets a high standard for other office buildings in South Africa. ■

PROJECT INFORMATION

- **Company entering:** Boogertman + Partners
- **Client:** WBHO
- **Main Contractor:** DRD D&C Joint Venture (JV between WBHO and Mhlaba Properties)
- **Project Manager:** DRD D&C Joint Venture (JV between WBHO and Mhlaba Properties)
- **Landscape Architect:** The Landscape Studio
- **Quantity Surveyor:** AECOM
- **Structural Engineer:** PURE Consulting
- **Civil Engineer:** PURE Consulting

ELLIPSE - WATERFALL

In response to the brief from clients Tricolt and Attacq, dhk moved away from the traditional rectangular apartment block design and decided to take on a more unconventional form. To make best use of the property's unobstructed views, dhk proposed four separate elliptical towers. The buildings' shape takes inspiration from an ellipse (a mathematical term for a curved plane surrounding two focal points), which is highly efficient in terms of ratio of surface area to internal volume.

The towers sit on a raised podium, creating an elevated ground floor with a parking garage and services infrastructure underneath. Extensively landscaped, the podium level includes a central piazza, running track, active and passive parks, lap and leisure pools, verdant gardens and 'The Luna Club' to engage residents and encourage community activity. The elegant form of the Ellipse Waterfall towers will deliver a distinctive and highly recognizable landmark in the heart of Waterfall City. The architecture is both bold and discreet, featuring a striking façade of glass and solid panels that allow the buildings to be presented as a singular, legible architectural form. The design moves away from simple all-glass towers and will be recognized as an enduring and site-responsive addition to Waterfall City. The curvilinear façade is complemented by a mix of moveable and fixed screens which serve to animate the elevations. This produces an ever-changing collage resulting from the movement of the sun and the moods of its occupants.

Approval for the Ellipse project was required by various Waterfall and local authority bodies. Of particular importance to Attacq was the approval of the scheme by the Urban Design Committee. Their main concerns rested on how the building related to the pedestrian at street level. The team took great care to articulate the base of the building by stepping the façade back from the site boundaries as well as to soften the harsh structure using vegetation, landscaping and mesh screens.

Ellipse Phase I, towers Newton and Kepler, is targeting a 4-Star Green Star Multi Unit Residential Certification, recognised as ' Best Practice'. The project has completed a combined multiple building certification for the two towers, and has successfully submitted the Round 1 submission to the GBCSA for certification. Phase II and Phase III will target the same Green Star Certification. ■

PROJECT INFORMATION

- **Company entering:** dhk
- **Client:** Tricolt and Attacq
- **Main Contractor:** Barrow Construction
- **Principal Agent:** Tricolt
- **Project Manager:** Tricolt
- **Consulting Engineer:** Arup

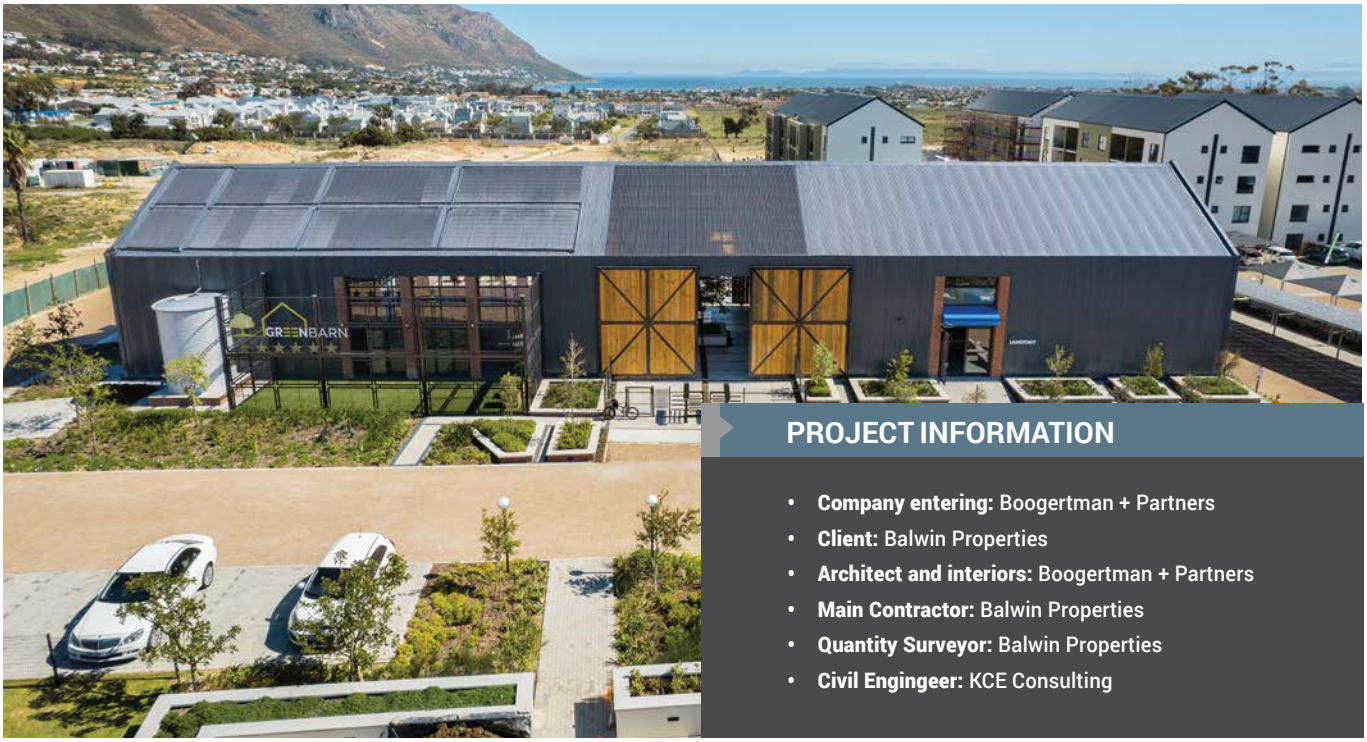
GREENBAY RESIDENTIAL ESTATE

Architecture has the unique potential to positively impact society at various scales. The careful application of numerous design principles such as an appropriate architectural response, environmental sensitivity, urban design and space planning principles, landscaping, and water-sensitive design, all contribute to a high-density housing solution that aims to enhance the well-being of the residents and the context and environment.

Greenbay is a high-density secure living residential estate and is part of the Green property portfolio developed by Balwin Properties situated in Gordon's Bay, Western Cape.

Each of this portfolio's developments provides a healthy family lifestyle offering that includes landscaped running trails and parkland that promotes walking within the estate. Its communal core features a Green Barn Lifestyle Centre with an indoor gym, green café, multi-purpose sports field, and more.

As the functional quality of the development is enhanced, a variety of separate pedestrian, vehicular and cycling routes and travel options further allow for easy accessibility throughout the development. Efficient travel routes and improved accessibility aid in preventing negative spaces and further activate public space, in turn enhancing community building and interaction. ■



PROJECT INFORMATION

- **Company entering:** Boogertman + Partners
- **Client:** Balwin Properties
- **Architect and interiors:** Boogertman + Partners
- **Main Contractor:** Balwin Properties
- **Quantity Surveyor:** Balwin Properties
- **Civil Engingeer:** KCE Consulting

HARBOUR ARCH

The brief from the client was to design a world class Mixed Use development in the Foreshore District of Cape Town. There is a phased approached to the development that will total, on completion, 200 000 m of usable area and six buildings. These six buildings are placed on a seven storey plinth; with an eighth floor central park.

The pedestrian interface on an Urban Scale is very important and therefore the ground floor has retail and restaurants. These functions surround a public piazza in the middle of the ground floor. The piazza becomes a convergence space for all the pedestrian routes crossing the site.

From the first floor to the seventh floor is structured parking that provides cyclical parking for the whole development. Various ramps in and out of the structure enhance ease of movement and link up with the existing road structure of the precinct. The provision of parking also eases Cape Town's problem with vehicular parking at present.

From ground floor to the eighth floor there are various vertical circulations to take the public up to the central park. On this eighth level there will be restaurants and amenities for both inhabitants of the building and the public. This public space is surrounded by two apartment buildings, two hotels, and two office buildings.

A total of 482 apartments are provided in the first phase and 482 additional in the second phase. The hotels and office buildings will follow in the subsequent phases. A 10 year development plan is foreseen to complete the whole development.

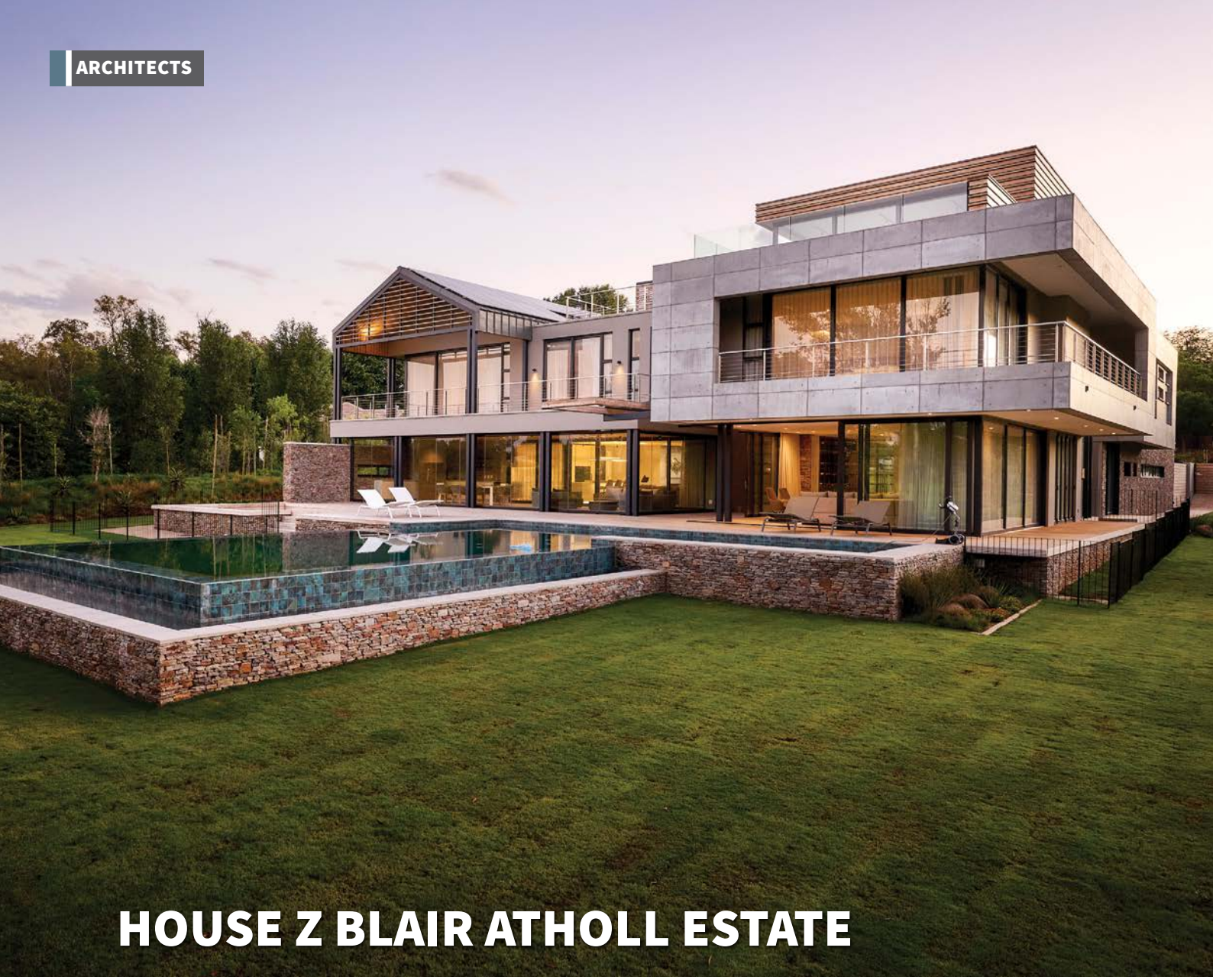
A precinct will be formed as the gateway into Cape Town where people can live, work and socialise. This development will accommodate and attract many tourists because of its location close to many attractions and the CBD.

The brief from the client was to create a contemporary, urban and pedestrian friendly development. Although this development can be seen as a precinct consisting of six buildings, it can be read as one building over four city blocks. Three streets, Martin Hammerschlag Way, Louis Gardner Street and Jack Craig Street, dissect the site and ground floor of the building in an east- west direction. The pedestrian movement at the moment is non existing and by creating an active edge along these streets, people will be pulled into the development. This east west movement is connected by a north south arcade underneath the building with a public piazza in the middle. Restaurants and retail activate all edges of the ground floor.

The vertical circulation to the 8th floor is placed within the central arcade either side of the piazza. People can easily access the 8th floor with its park, retail and restaurants. All users, including occupants of the apartments and hotels, get out of the vertical circulation on 8th floor and walk through the park and shops to another set of lifts to take them into the 6 buildings. This ensures that the urban environment is used and a pedestrian culture encouraged as per the New Urbanism theory. Excellent views towards Table Mountain and the ocean can be experienced on the eighth floor and rooftop viewing decks in all the buildings. Various types of apartments are provided with the bigger units taking advantage of the views. ■

PROJECT INFORMATION

- **Company entering:** Bentel Associates International
- **Client:** AMDEC
- **Main Contractor:** AMDEC
- **Architect:** Bentel Associates International
- **Principal Agent:** Orion
- **Project Manager:** Amdec
- **Quantity Surveyor:** D'Arcy Hedding



HOUSE Z BLAIR ATHOLL ESTATE

From the meticulously measured steel beams, constructed perfectly and creating the pristine frame that is clad with Rheinzink, every detail, the stone clad walls, the framing of the main dwelling areas, the large concrete-clad room jutting out the top of the building, all required careful detailing from the architect. A wonderful mix of reinforced concrete slabs and hidden columns create wide open spaces at the ground floor level and structural steel portal frames open up the first floor, taking advantage of the roof voids in areas.

Without careful construction, none of the detailing would be so beautifully presented.

The residence comprises two magnificent structures that exude a rustic yet refined charm, effortlessly blending with the idyllic country surroundings. These structures feature exquisite RheinZink cladding, flawlessly flowing from the roofs to the walls. The 'Barn Type' architecture, which has become a trend in worldwide architecture, suits the RHEINZINK roofing and façade application perfectly.

For architects, developers and building owners, in today's age of sustainable construction, there is a new dimension of appreciation and application for architectural detail and materials. Being an innovative contemporary building material zinc, with its natural surface, has for decades played a major role in international architecture. RHEINZINK – an alloy consisting of 99,995 % high purity zinc with precisely defined additions of titanium and copper, is an ecological material that over time, develops a patina that protects its inner zinc core, making the material last for generations.

Known for its quality, durability and lasting value, RHEINZINK allows design ideas to be implemented, giving a cost-effective answer to façade cladding and roofing.

Large glazed panels grace the sides of these structures, inviting an abundance of natural light. The main structures are interconnected by the common areas such as the kitchen, dining area, and TV lounges. These shared spaces are adorned with floor-to-ceiling windows that bathe the rooms in a gentle cascade of sunlight. Upon entering the house, a glass-roofed

PROJECT INFORMATION

- **Company entering:** AMA Architects
- **Main Contractor:** PanAcht Construction
- **Architect:** AMA Architects
- **Principal Agent:** AMA Architects
- **Consulting Engineer:** BSM Baker

walkway guides you from the front garden's water feature, through the dwelling, and seamlessly extends to the pool area. This magnificent feature allows the breathtaking views from the pool to captivate you as you step inside

Set on a sprawling 4 085 m^2 site, the house spans an impressive 846 m^2. The homeowner's desire for a relaxing retreat that celebrates life's offerings while fostering social connections is effortlessly fulfilled within these walls.

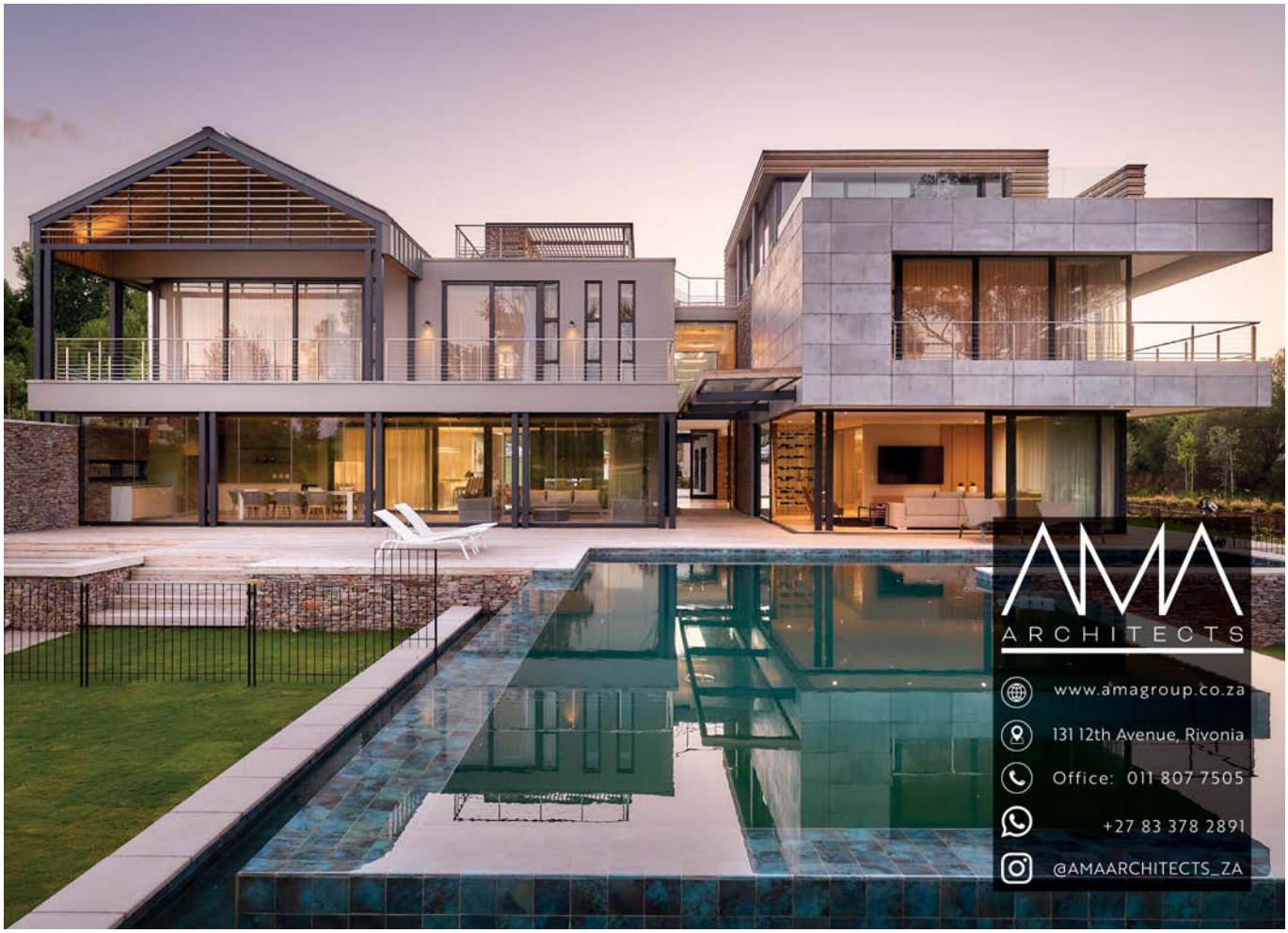
Designed to offer tranquillity and luxurious comfort, the house also incorporates private rooftop spaces that provide moments of solitude if desired. These rooftop havens include a bar and lounge area with a spacious terrace, perfect for revelling in the awe-inspiring vistas.

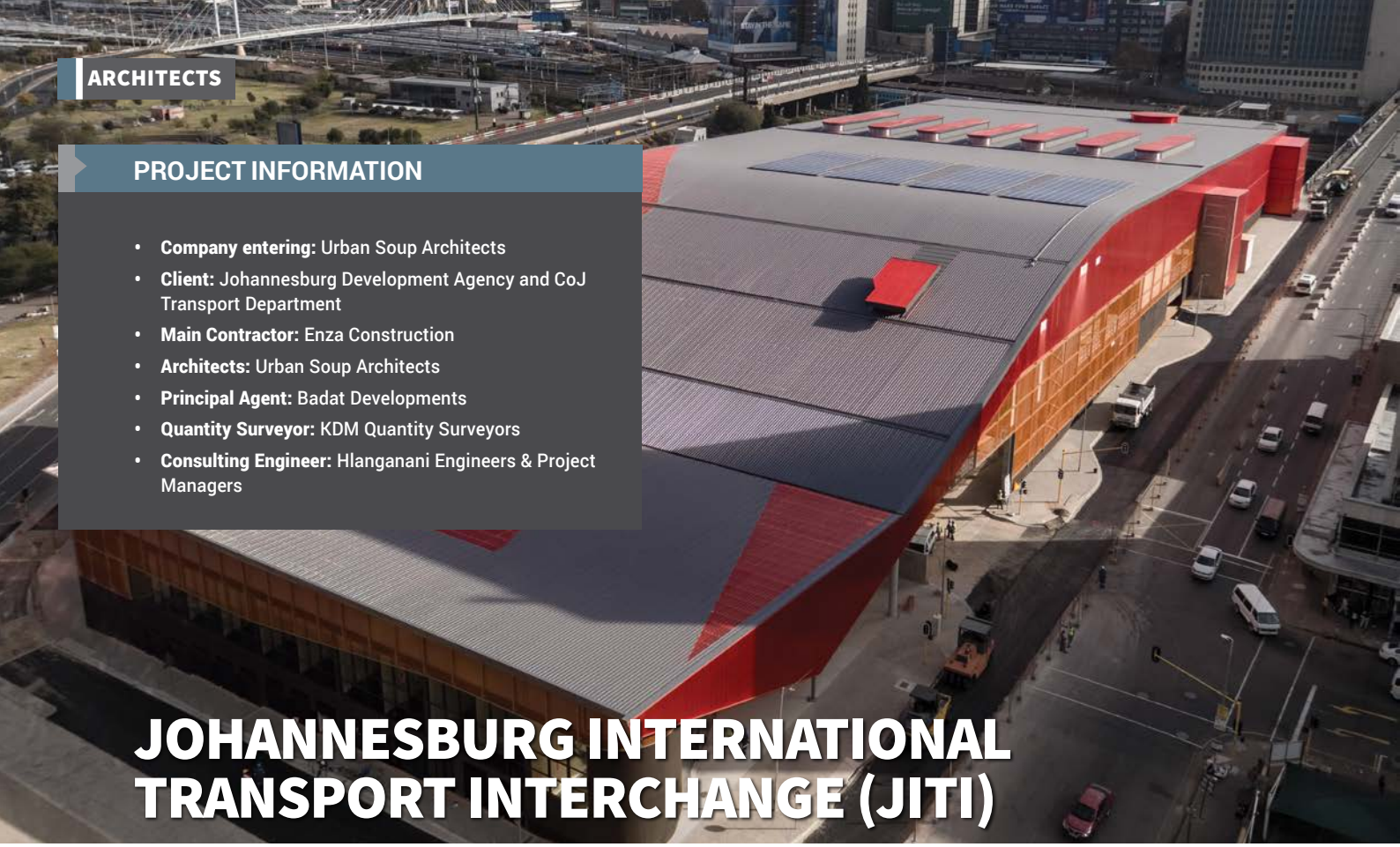
Inside, a TV lounge adjacent to the kitchen and a cozy rest lounge on the mezzanine level offer further relaxation options.

For intimate conversations, a secluded area adjoins the expansive glazed room housing the impressive wine collection, leading to a beautifully appointed open office.

The main bedroom is adorned with spacious dressing rooms and two exquisite en suite bathrooms with dressing rooms, one for him, and one for her, while two additional bedrooms boast their own en suite bathrooms.

The grandeur of the home is completed by a large gym that extends onto a terrace, adorned with a floor-to-ceiling window, allowing for invigorating workouts with a breathtaking view. The project finds its exquisite location at the Blair Atholl Golf & Equestrian Estate, nestled near the renowned Lanseria Airport and the world-famous Cradle of Humankind. ■





PROJECT INFORMATION

- **Company entering:** Urban Soup Architects
- **Client:** Johannesburg Development Agency and CoJ Transport Department
- **Main Contractor:** Enza Construction
- **Architects:** Urban Soup Architects
- **Principal Agent:** Badat Developments
- **Quantity Surveyor:** KDM Quantity Surveyors
- **Consulting Engineer:** Hlanganani Engineers & Project Managers

JOHANNESBURG INTERNATIONAL TRANSPORT INTERCHANGE (JITI)

A proposal to construct an international long distance and cross border transport and shopping hub has been on the agenda of the City of Johannesburg for over 15 years – as the city became a more important trading destination after the birth of democracy.

However, migrants and their families have had a need to travel safely and accessibly for as long as Johannesburg has existed as a formal town.

The establishment of this building aims to restore dignity to those passengers who traditionally have been forgotten and neglected by providing them with a world class facility.

The need to improve the quality of life of commuters, streamline the flow of traffic and strengthen the commuting connections with the rail service all indicated that there was an urgent requirement to develop a new integrated transport facility with good access to Park Station. The underdeveloped Kazerne Taxi facility provided an opportunity for such a facility.

In the context of the strategic importance of this site, in proximity to Park Station and the proposed project to deck the railway line and connect Braamfontein with the inner city, there was an opportunity to increase the scale of this development.

Research and analysis in the draft Johannesburg inner city traffic and transport study had estimated that there were about 190 000 taxi trips (provided by about 5 800 taxis) and 30 000 bus trips in the morning peak in 2010 in the inner city.

Prior to developing the concept scheme the design team invested a significant amount of time to research the local dynamics and inner workings of the site's immediate setting. It was of paramount importance to ensure that the scheme would seamlessly integrate into the urban context and work in unison with the complex surrounds. Once the context was fully understood the various components could be aptly positioned.

At its core, the main purpose of the project was to provide a world-class facility for long distance travellers. This was a segment of society that traditionally was neglected and never catered for. A series of informal, unsafe, and severely inadequate bus ranks are dotted throughout the city. These informal ranks act as the 'front doors' into the city for those seeking greener pastures.

One of the most significant design challenges was to safely harmonize the movement of taxis, buses, and pedestrians all under one roof.

In order to assist with this process a series of high tech vehicular and pedestrian traffic models were developed. This allowed us to simulate flows and address bottlenecks upfront. Entrances and exits needed to be carefully considered and, by adding a dedicated public transport route around the full perimeter of the site, uninterrupted traffic flows were ensured.

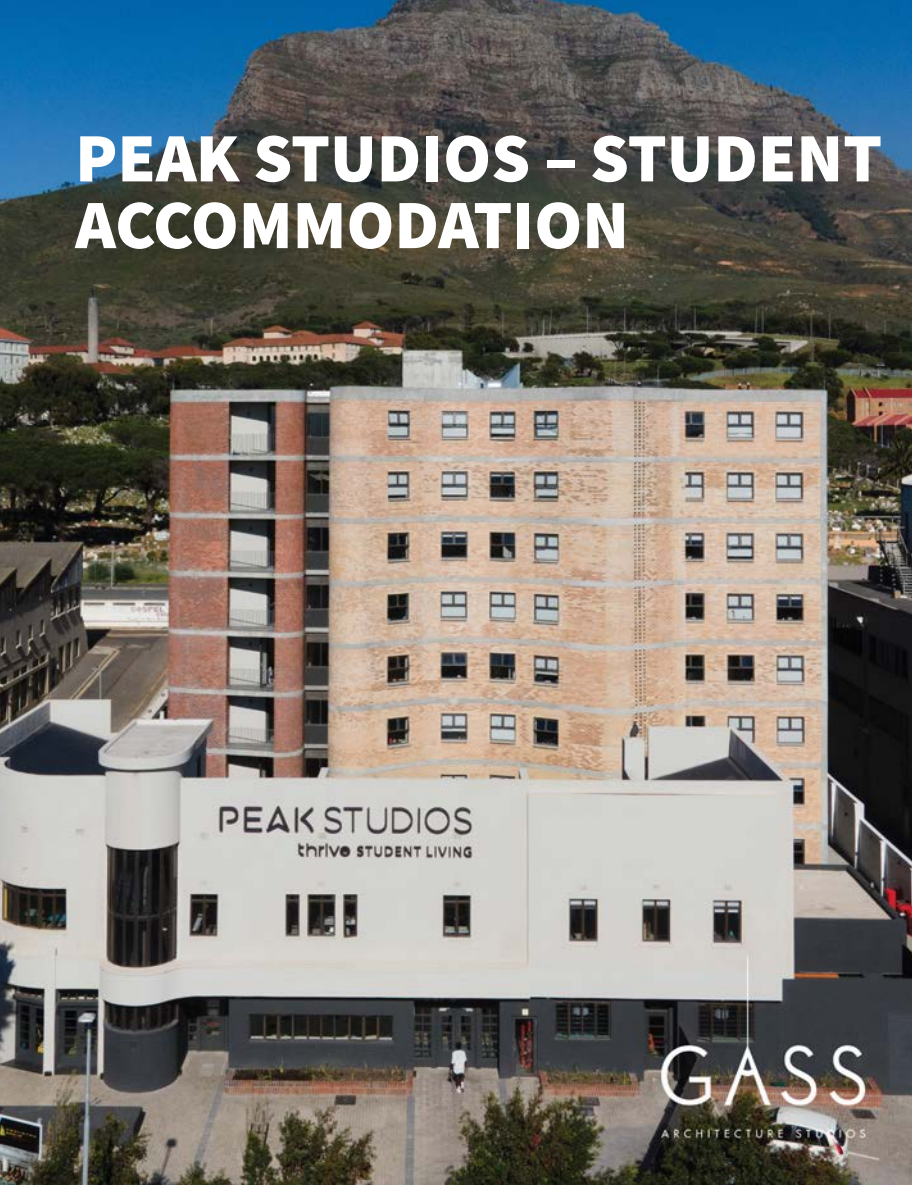
One of the key successes of the project was the way the design team embraced the informality of the context and celebrated it within the building. They did not simply impose first world models of transportation buildings but instead provided a truly contextual building that responds to its complex backdrop.

The size and variety of the retail units effectively provide for economic progression. Shops range in size from small 5 m^2 units right up to anchor store sizes. This will allow our smaller retail tenants to grow and progress to larger shop sizes as their needs expands.

Security is of paramount importance and by installing over 280 CCTV smart cameras, the entire 48 000 m^2 space can be carefully monitored from the control centre.

In addition to this the team worked with Samsung to provide dual authentication for drivers entering the facility. Dual authentication involves both facial and license plate recognition. ■

PEAK STUDIOS – STUDENT ACCOMMODATION



Located in Observatory, Cape Town, Peak Studios Student Accommodation houses 563 students in a new nine storey building. The development repurposes an existing heritage building to serve the surrounding UCT & CPUT campuses. Taking inspiration from the existing building facing Main Street, the new addition, even though much higher, interprets the geometry through a contemporary lens to create a unique addition to the area. The existing building houses building offices, communal areas, gym, laundry and study areas and ties into the new residential building seamlessly on ground floor. From the main circulation and gym area the space spills out onto an interior courtyard, extending the area for exercise and relaxation to the outside. Hugging this larger green area, the new building creates various safe, inspiring interior and exterior spaces for studying, gathering and living.

As part of the Thrive Student Living group of buildings - a national portfolio of student accommodation in Johannesburg, Pretoria and Cape Town (PEAK Studios being the first in WC) - the spaces are designed to adhere to the overarching requirements and product. Each of the buildings is branded individually with finishes, colours and graphics reflecting the physical context and the brand identity, both in direct and more subtle ways.

Peak Studios provide a student living experience designed fit for purpose to give users the benefit of physical infrastructure (power and water backup, computer labs, security systems), as well as the social environment.

The development of a student accommodation building in the area feeds directly into the great need for these spaces serving UCT, CPUT and other private educational institutions in the area. Repurpose, densification and redevelopment of a previously single function and closed off site, contributes to the activation of the urban environment and contributes in a valuable way to the developing Salt River and Observatory neighbourhoods.

Structurally, the building consists of: driven cast in-situ reinforced concrete piles with pile caps, high strength reinforced concrete columns, post-tensioned concrete flat slabs, reinforced concrete shear walls and cores. The Western Cape Peninsula is regarded as a Moderate Seismic Zone and the building was therefore designed to adhere to the Seismic Requirements as set out in SANS 10160 Part 4.

All internal demising walls and interior skin of cavity walls were constructed from cored 90 mm thick Maxi bricks produced by Claytile. This not only ensured optimised overall use of raw materials in the building, but also increased internal usable/lettable area.

Post-tensioned flat slab construction simplifies formwork and finishing, but also to speed up construction and reduce the use of materials. Use of post-tensioning could reduce slabs to 200 mm thickness – enabling optimal developed use of the allowable height on the property.

Due to the layout and levels of the existing building an existing retaining wall along a sloping road, were supported with the use of soil nails during the construction process, until lateral support between the existing and the new structure was installed. A seamless flow of space between an existing heritage building and a new multistorey building posed structural challenges, which were executed with diligence to sequencing and integration.

Dedicated permeable paving areas are integrated into the hardscaping design to reduce stormwater surface run-off. ■

PROJECT INFORMATION

- **Company entering:** GASS Architecture Studios
- **Client:** Growthpoint Student Accommodation Holdings
- **Project Manager:** Atvantage Project Managers
- **Architect:** GASS Architecture Studios
- **Quantity Surveyor:** MMQSMace
- **Structural & Civil Engineer:** AECOM
- **Engineers:** Solution Station
- **Principal Contractor:** ISIPANI Construction

HARNESSING ENERGY FROM ORGANIC WASTE THROUGH ENGINEERING

The intent of the project was to harness flammable and noxious gas that is generated from the decomposition of organic waste that is disposed at the landfill site, and to use it for electrical generation into the City of Cape Town electrical grid.

The obvious benefit of this project was that this gas would have naturally been released from the landfill, causing major damage to the environment and the ozone layer due to its methane content. But rather than this, this facility intercepts this gas and creates a use for it, for Cape Town and for South Africa. South Africa and Cape Town need electrical generation and one of the perfect projects for this is to take a product which people have discarded and turn that into beneficial use that serves our everyday needs while also reducing the impact our waste has on the environment.

The next major benefit of the project was that this electricity was to be used for a new material recovery facility located within the landfill footprint.

This project represents a remarkable feat of engineering innovation and technology integration. The first of its kind to be constructed by the City of Cape Town and one of very few in operation in South Africa currently.It focuses

on capturing and converting landfill gas, utilizing advanced gas collection and processing systems to transform methane-rich emissions into electricity for the Cape Town electrical grid. The initiative not only mitigates the harmful effects of methane on the environment but also addresses South Africa's pressing need for electrical generation. Additionally, the project pioneer's circular economy practices by incorporating a sophisticated Material Recovery Facility (MRF) that employs cutting-edge sorting and processing technology to recover and reintroduce recyclable materials into the economy. It's a prime example of how engineering can repurpose waste, generate clean energy, and promote sustainability, setting a precedent for similar projects worldwide.

This project addressed Cape Town's annual disposal of 2 million tonnes of waste material, which typically ends up in landfills, including organic waste that generates pollutants and gases. The facility captures and utilises these gases, primarily methane, for electricity generation, aligning with the city's need for sustainable energy solutions. Despite tight time constraints, the engineering team expertly navigated environmental challenges on a confined site, which was urgently repurposed for this project.

Innovative design solutions ensured effective stormwater management and accommodated existing infrastructure, like a sewer rising main pipeline. Overcoming technical soil constraints required soil replacement to ensure the safety of the electrical generation units. Throughout construction, the project maintained continuity of service for the existing sewer rising main, with the City of Cape Town actively overseeing progress, demonstrating a strong commitment to its success.

The design innovation of this project is truly groundbreaking. It revolves around the ingenious concept of harnessing landfill gas for electricity generation while seamlessly integrating a Material Recovery Facility (MRF) to promote circular economy practices. This innovative approach not only addresses energy needs but also maximizes resource efficiency by efficiently sorting and processing recyclable materials. The waste-to-energy facility is designed to generate carbon credits through the Clean Development Mechanism which can be used or sold to offset carbon emissions in Cape Town. ■

PROJECT INFORMATION

- **Company entering:** JG Afrika
- **Client:** City of Cape Town
- **Main contractor:** Fountain Civil Engineering
- **Architect:** Colab Concepts
- **Consulting Engineer:** JG Afrika

SOWETO EDUCATION & TECHNOLOGY CAMPUS

Growing Up Africa envisioned a building that would facilitate a variety of community education programmes that might change over time as the needs of the community evolve. In addition to satisfying the programmatic requirements for the project, the organization wanted the building's architecture to be a strong visual statement that communicated its commitment to providing resources necessary to improve educational opportunities for the Devland community. The organisation made it clear that the design must be tough, durable, and easy to maintain – and that the entire building would be constructed of donated materials. Growing Up Africa, aware of the risks and knowing full well that the challenges may be insurmountable, committed to building a world class campus for a deserving community.

The SOWETO Education & Technology Campus will provide a blended mix of education opportunities, from basic skills to uplift the community to advanced technical training to develop techno-preneurs in the community and its surroundings. The idea is to support the community with multiple education opportunities that will provide offerings related to the advancement of the community but also provide entrepreneurship opportunities in Industry 4.0 to the talent pool within. A major aim of this project is to ensure that historically disadvantaged communities, like SOWETO, are included in Fourth Industrial Revolution and technology development. This was an important aspect for Growing Up Africa's design choice to donate the campus on to The University of Johannesburg. A contrary approach may see individuals, who are already poor, being further marginalised by lack of technology.

The primary structure of the project was designed as a robust concrete superstructure with generous open space, expansive overhangs, infill of sandbag walls for thermal performance, and glass curtain wall at the street-facing façade. The design strategy for

PROJECT INFORMATION

- **Company entering:** Growing Up Africa, NPO-PBO
- **Client:** Growing Up Africa, NPO-PBO
- **Main Contractor:** Growing Up Africa, NPO-PBO
- **Architect:** Boogertman & Partners (Architect of Record)
  William Reue Architecture NYC (Design Architect)
  ML Architects
- **Principal Agent:** Deborah Terhune
- **Project Manager:** Deborah Terhune
- **Quantity Surveyor:** Norval Wentzel Steinberg
- **Consulting Engineer:** Surbana Jurong South Africa (Civil)
  Earth Civils (Civil) Surbana Jurong South Africa (Structural
  Spoormaker & Partners (Electrical) MRT Electricians (Electrical)
- Ferro Plumbing (Plumbing) The WSP Group Africa (Traffic)

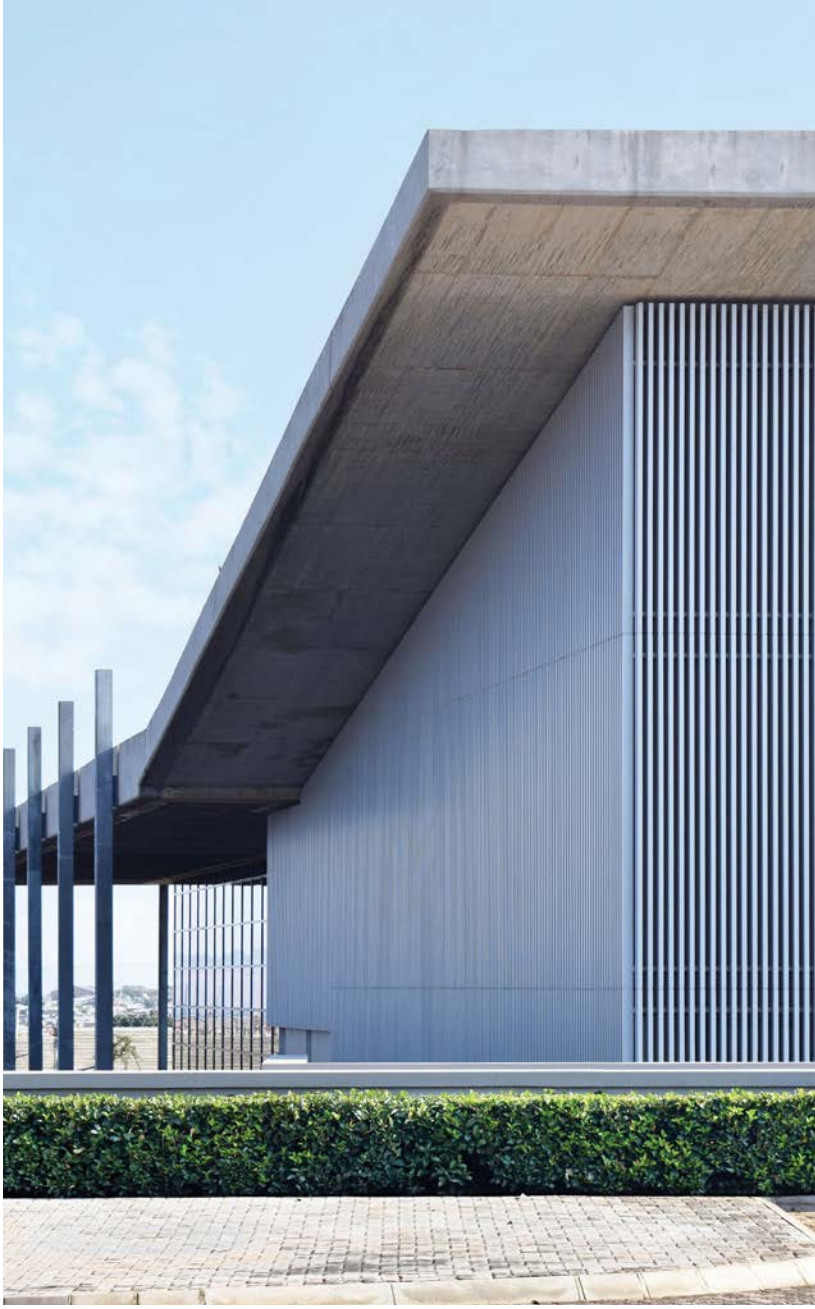
an easy-to-understand structure made of durable materials was intentional as many of the aspects of the original design, such as the concrete super structure, were based on early in-kind sponsorship that had committed to the project.

As construction progressed, some aspects of the design had to be modified based on materials that could be obtained from donors and construction expertise available to the project.

The design and construction process adopted was flexible enough to accommodate changes due to resources available.

The project has become a source of pride for the community, especially for the more than 200 local skilled and unskilled people who were directly involved in its construction. Critically important was the income earned that in turn fuelled the local economy.

The architecture of the building itself, with the impressive concrete structure and heroic



roof, has been received as a positive symbol of hope and optimism. The SOWETO Education & Technology Campus includes a 2 000 square metre building on a beautifully landscaped 7 000 square metre site in SOWETO, about 25 kilometres from Johannesburg. The fully accessible structure consists of multipurpose teaching spaces, flexible classrooms, open-plan work areas, a lecture hall, restrooms, storerooms, and administrative offices anchored by a large auditorium.

The building's most reconisable feature is its soaring roofline that caps the auditorium on the northeast side of the site. The auditorium's concrete framework is filled with thousands of sandbags, contributing to the extraordinary thermal and acoustic qualities of its interior space. Hundreds of galvanized aluminium extrusions make up the auditorium's exterior cladding.

Thousands of tons of reinforced concrete make up the framework for the building's flexible spatial organization, and the coffered concrete ceiling is a bold, unifying element for the building's interior.

The SOWETO Education & Technology Centre was designed with sustainability features and a range of processes that reduced the building's environmental impact. ■

STELLA P1 BASEMENTS

The Stella P1 basement structure came about as the existing lateral support wall along West Street in Sandton needed to be laterally supported due to the existing anchors having reached their expiration date.

The client made the decision to support the lateral walls by constructing the future structures basement levels.

The WBHO & Tiber JV was appointed to carry out the works required to make the lateral support walls safe.

Due to the high-risk nature of the excavations that would need to take place and the sensitivity of the lateral support walls along West Street, specialised equipment was brought in to commence with the base excavations:

- This included the use of four 8-ton excavators that could be dismantled into component form and lowered into the basement area with the use of a tower crane that was erected in the centre of the works area.
- All excavated material was removed by utilising a fleet of skid steers and small motorized dumpers.
- All rock removed had to be broken down to a size that could be handled by the smaller earth moving equipment.
- The existing stone drainage layer was removed and

stockpiled safely whereby it would be cleaned and re-utilised at a later stage.

Rock was encountered in most areas within the boundary of the site and specialised drilling and chemical blasting took place to remove approximately 500 m^3 of granite. The bases were then bunded with earth and covered with plastic to prevent water permeating on to rock face.

Once the rock had successfully fractured, the 8-ton excavators were brought back in to remove the layers of rock and break down the rock in o a size that could be safely carted away. Due to the size of the bases, all bases were pumped utilising a specialised 40 Mpa mix of concrete developed by AfriSam for the foundations.

As the works taking place at ground level were considered to be the highest risk in terms of affect on the lateral support wall, a detailed daily inspection was executed at specific points at the base of the lateral support walls as well as at the top of the lateral support walls to monitor any and all movement.

A number of detailed construction methods were designed and planned upfront to ensure the requirements of the superstructure were met.

This included the fabrication of specialised sleeves and plates that were to be installed in the double volume columns on all floors. These sleeves had to be installed as a method of future proofing the columns to accommodate intermediate concrete slabs at a later stage should the client wish to increase the number of basement levels.

The columns on the project required the development of an ultra-high strength concrete to meet the needs of the design team as well as the contractors on site in terms of placing. This concrete needed to achieve a crushing strength of 80 Mpa.

Special care had to be taken to cure the slab with differing strengths as the 80 Mpa mix cured differently to the 30 Mpa concrete. This resulted in several methods being utilised at one time to cure the slab, including curing compounds, water and covering the slab in plastic in isolated regions.

Stella P1 was a Greenstar project and required Environmental Authorisation to be obtained. As such, there was a detailed Environmental Management Plan (EMP) drafted for the development and the requirements therein were strictly adhered to mitigate any adverse environmental impacts. ■

PROJECT INFORMATION

- **Company entering:** WBHO Tiber Joint Venture
- **Client:** Fortress
- **Main Contractor:** WBHO Tiber Joint Venture
- **Architect:** LYT Architects
- **Principal Agent:** Profica
- **Project Manager:** Profica
- **Quantity Surveyor:** MLC
- **Consulting Engineer:** WSP

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