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# 2020 SAISC STEEL AWARDS

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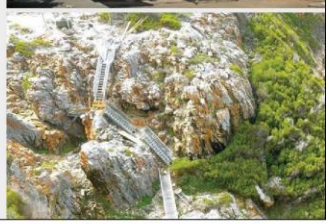

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# 2020 SAISC Steel Awards

Southern African Institute of Steel Construction Annual Awards

## The New Replacement Swing Bridge, V&A Waterfront

OVERALL WINNER, BRIDGE CATEGORY WINNER

The V&A Waterfront (V&A) is situated in South Africa's oldest working harbour. V&A had an existing swing bridge that was an efficient structure that opened and closed up to 60 times a day, carrying up to 2.4mn people per year. It was, however, 22 years old and the 2m wide walkway could no longer cope with the numbers of pedestrians. The team was commissioned to design a new wider bridge.

### The Engineering Brief

- The new bridge had to be equally as quick and efficient, effective and reliable as the existing;
- The construction cost had to stay within a tight budget;
- The works had to limit the disruption to the public, the V&A and the environment.

Both steel and FRP were considered at the early stages as the only materials that were light enough to limit the loads on the moving mechanical parts and to limit the foundation size. However, as the design progressed the use of steel was the obvious choice. Its advantages were:

- Its strength enabled the creation of a stiff yet slender pylon as well as a relatively shallow central spine beam.
- The material is robust and can withstand some impact.
- It created a relatively light weight structure that limited the power needed to move the bridge.
- The fabrication expertise was available in Cape Town.
- It enabled the bridge to be fabricated offsite and easily assembled on site and lifted into place.
- It gave great opportunity to sculpt a beautiful structure.

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### Structural Framing

The new swing bridge has a span of 40m. The deck is cable-stayed with a single plane of four locked coil cables connecting to a central, upstand spine beam. The spine beam is a 500mm wide fabricated box with a total depth of 800mm, but only 470mm protrudes above the top of the deck. The reclining pylon is in the continuity of the main central beam and its stiffness transfers the cable loads into the piled substructure. The steel with timber deck is rotated on a slewing bearing, which is stressed down onto a doughnut-shaped pile cap by 34 vertical Freyssibars.

The steel deck comprises cantilevering cross beams that are fabricated I-sections; a longitudinal edge beam that is a triangular closed section; and bracing members that are standard angle and T-sections.

The pylon is a fabricated box that has been sculpted to provide strength and stiffness where required. The stay cable anchorages are discretely housed within the top of the pylon with an access panel at the back to allow for stressing and inspection.

### Challenges

This was a challenging build. The bridge is over 40m long and 3m wide with the mast section extending over 10m into the air. Once completed it weighed more than 40T. In the workshop the eccentric shapes of the individual sections (some as big as 16T) created challenges with regards to the moving and rotating for the welding and fabrication.

One of the objectives was to limit disruption to the V&A. Hence, the bridge was assembled on a nearby jetty. Once completed the bridge was carefully craned onto a barge and towed to its position. The bridge was then lifted off the barge and mounted onto the slewing bearing. It was an amazing process that took two days.

The interface between the bridge and the circular slew bearing was a critical joint that required very tight flatness and dimensional tolerances. If not achieved the bearing's working life might be reduced, or worse, the fit-up with the bearing might have been compromised. The bridge 3.5m diameter ring beam that connects it to the bearing was fabricated from heavy plate sections to resist the forces needed to prestress it down onto the bearing. The dimensional control required in fabricating this element was a significant challenge and required all the skills of the welding team.

The architectural intent was for the pylon to be a continuation of the central upstand beam. As such, it is a very slender element. The fit up of the stiffeners and diaphragms as well as the various fabricated pieces of the pylon, ring beam, spine beam and deck elements had to be carefully considered to ensure that the required welding operations were practical.

**Client/Developer:** Waterfront Properties
**Architect:** Craft of Architecture
**Engineer:** SMEC Engineers
**Quantity Surveyor:** SMEC Engineers
**Project Manager:** Steffanutti Stocks Coastal
**Main Contractor:** Steffanutti Stocks Coastal
**Steelwork Contractor:** Anchor Steel Projects
**Steel Erector / Project Coordinator:** Anchor Steel Projects
**Galvanising:** Advanced Galvanising
**Corrosion Protection & Paintwork Contractor:** MRH Shot Blasting and Corrosion Control

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## The Precinct Lifestyle Hub

ARCHITECTURAL CATEGORY WINNER

With the housing market in decline Century Property Developments diverted their business model into the rental game. To attract tenants to their new development, The Precinct, a lifestyle hub was commissioned. The building features a movie theatre, spa, games room, restaurant, and gym. All with the intent to ensure Century Property Developments rental portfolio is the most attractive to clients in the Midrand Area.

### Structural Frame and Challenges

The structure consists of a portal frame structure fabricated using universal beams with two floor levels which use universal beams to support various types of concrete floors. To reduce cost and maintain feasibility of the entire project, various slab interactions were utilised. Hollow core technology combined with a composite slab was used. The front portal extended down to the lower ground floor; thus, the steel work was required to be constructed in various phases. Allowing for access to pack the hollow core slabs meant structural steel columns had to be erected without the portals, following the packing of the slabs the portals could be completed.

The bridge connecting Building 2 to Building 3 was designed using 3D scan technology. This was to maintain the natural koppie and ensure the design best aligned with the rock features. This bridge was constructed from the top down - the walkway propped and installed, the columns installed and then the foundations cast. This was to ensure the bridge aligned perfectly with the footings and touched the earth lightly limiting the environmental impact of the construction. The extensive spans obtained by the hollow core slabs for the ground floor above the cinema are one of the most impressive features of the structure.

### Benefit of using steel

- Ability to save time with manufacture off-site;
- The industrial look obtained from exposed portal frames. The exposed steel lends itself to challenging aesthetic decisions. The building is honest in its structure and architectural intent;
- All connections, joints and interactions required careful consideration to ensure the final product was in line with the architectural requirements.

### Teamwork

The original steel contractor went under and Tass Engineering got involved in the project very late and had to expedite the detailing, supply, manufacture, delivery and erection in order to ensure that a quality product was handed over on time to ensure the success of the housing estate completion. The coordination amongst the slab installers, Tass Engineering and century property development excelled to ensure a successful project.

**Client/Developer:** Century Property Developments
**Architect:** Century Property Developments
**Structural Engineer:** ADA Consulting Engineers
**Engineer:** Century Property Developments
**Quantity Surveyor:** Century Property Developments
**Project Manager:** Century Property Developments
**Main Contractor:** Century Property Construction
**Steelwork Contractor:** Tass Engineering
**Cladding Contractor:** NG Roofing
**Corrosion Protection – Primer:** Tass Engineering
**Paintwork Contractor – Site / Final Coat:** Cutting Edge


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## New Barloworld & Caterpillar Head Office & Showroom

COMMERCIAL CATEGORY WINNER, ARCHITECTURAL CATEGORY COMMENDATION

The new Barloworld and Caterpillar head office and showroom in Isando is dedicated to heavy earthmoving equipment. Designed by Paragon Architects, the development consists of a head office, showroom and new training campus. The showroom alone is a first of a kind in the country and is split into two zones, namely 'tyre' and 'track' product categories, with both open and enclosed areas.

The most immediately noticeable feature of the 3,200m² new showroom structure is its elongated front-facing bubble profile, inspired by the curved shape of the Caterpillar excavator tread. Not only is this an iconic tribute to the earthmoving equipment showcased within, but it also allows this huge machinery to be exhibited in the voluminous interior space. Coupled with a vast glass façade, which makes the interior exhibit perfectly visible from the R24 highway, this becomes far more than a cutting-edge combination of corporate head office and flagship showroom. How can such huge apparatus easily enter or be extracted from this space? The building claims a never-been-done-before international breakthrough with a staggering 8.8m x 5.5m piece of the prominent glass frontage being fully retractable via intricate motor-driven automation.

A challenge was the dimensions of the showroom and how to move the equipment in and out. 'It requires massive clearance in height as well as width to turn one of these mammoths.' Paragon took for its starting point the roller shutters used to access the Caterpillar servicing warehouses. But the architects wanted to use glass, not metal, so in what they believe is a world first, they elected to vertically slide a 8.4m by 5.5m section of the high-performance glass frontage upwards, using a complex motor system installed upstairs and hung from a structural beam.

A steel girder framework was created to provide for the track-shaped design of each of the two bubbles, with large spanning trusses that carry the roofs, all sitting on a specially devised grid (increased to 12m or 15m) to accommodate the different-sized equipment required. Finally corrugated iron was applied like an external skin.

**Client/Developer:** Eris Property Group
**Architect:** Paragon Architects
**Engineer:** DG Consulting Engineers
**Quantity Surveyor:** Matla Quantity Surveyors
**Project Manager:** SIP Project Managers
**Main Contractor:** Trencon Construction
**Steelwork Contractor & Erector:** Central Welding Works
**Cladding Manufacturer/Supplier:** Global Roofing Solutions
**Cladding Contractor:** Chartwell Roofing
**Paintwork Contractor:** Dram Industrial Painters
**Paintwork Contractor:** First Class Projects
**Structural Steel Detailer:** KRU Detailing

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## Bakers Transport Cato Ridge

SAFINTRA METAL CLADDING CATEGORY WINNER, FACTORY & WAREHOUSE CATEGORY WINNER

The architects were commissioned to provide a distribution warehouse of 25,000m² and an office building of 3,000m² on a sloping site alongside the N3 Freeway.

### Warehouse

Steel cladding is the main aesthetic of the large, steel sheeted warehouse. The site is relatively remote, so the use of lightweight elements of great strength was the obvious choice. Carefully edged and defined office and ablution elements are strategically cut into the large steel box to contrast and enhance it while defining clarity of purpose. White edging contrasts with the dark colour of the sheeted box which is further enhanced with lighting.

The main warehouse structural frame comprises interconnected trusses and lattice girders supported on a column grid of 24m by 24m. For economic and practical reasons the lattice girder trusses comprise I sections and angle sections and the trusses comprise angle sections. The canopies comprise triangular tubular trusses for aesthetics where required and I sections and angles sections elsewhere for economical and practical reasons.

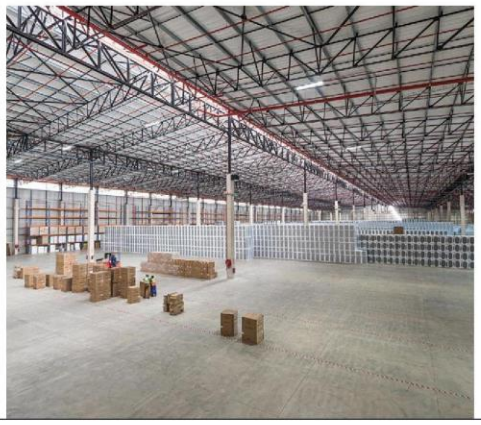
The use of steel structure allows for wide spans to achieve the required uncluttered interiors essential for large scale economical storage. The steel structure is split along the center with a sloped polycarbonate ridge line step to allow light to enter. The structural engineers were able to maintain continuity of the main perpendicular trusses through the ridge step in order to allow for improved design efficiency of the structural steel. Dark grey coloured steel compliments the red fire water supply pipes and the white underside of the insulation blanket, so the structure is celebrated as the main event.

The warehouse structure is clad with dark grey concealed fix steel sheeting and opaque white translucent sheeting. The translucent white sheets were positioned to coincide the sloped apex ridge step and sloped gable step with a horizontal eaves strip thereby forming a narrow starkly contrasting white frame against the dark grey background.

### Office

The simple trio of concrete boxes in the office block contain large vertical steel louvres that dominate the aesthetic of the freeway elevation. These over-scaled steel elements are framed in coloured steel and filled with punched aluminium panels. They perform their sun control function and consciously celebrate the steel material connection with the warehouse. Steel allows for the subtle connection to the concrete frames being only at the top and bottom.

**Client/Developer:** Growthpoint Properties
**Architect:** Ries Shaw Architects
**Civil & Structural Engineer:** Kantey & Templer
**Electrical Engineer:** EG Africa
**Mechanical Engineer:** I-Mep
**Fire Engineer:** National Fire & Safety
**Quantity Surveyor:** Kantey & Templer
**Project Manager:** Growthpoint Properties
**Main Contractor:** WBHO Construction
**Steelwork Contractor/Erector:** Paragon Steel Structures
**Cladding Manufacturer/Supplier:** Safintra South Africa
**Cladding Contractor:** MJC Industrial Roofing
**Corrosion Protection:** Sigma Coatings
**Paintwork Contractor:** Insimbi Coatings



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## Menlyn Maine Park Lane West Atrium Skylight

ASTPM TUBULAR CATEGORY WINNER

Park Lane West is a new premium grade commercial development in Menlyn. At the center of the 7-storey building there is 26m long by 17m wide atrium skylight which brings natural light into the building.

### Architectural Brief

The architectural brief was to create a modern skylight, with lightweight steel members and a very clean geometry, that would bring the right balance of heat and light into the atrium below. Due to the need for a lightweight structure which could support large glass lites, steel was the obviously material of choice.

### Structural Framing

Rectangular hollow sections were selected for the main beam so concealed connections. In addition, since the structure was designed as a braced three-pin pitched roof, the hollow sections efficiently carried the bending and compression forces. Small diameter round tubes were used for longitudinal apex bracing.

Due to the accuracy of the steelwork and efficiency of the glazing installation team, up to 16 glass panels could be installed in one day. Ie, this equates to the weight of the full steel structure in glass panels per day. The low pitch ridged roof consisting of neatly fabricated hollow steel sections and large glass panels created a simple but bespoke looking skylight.

### Cladding

To reduce the number of steel beams, large point supported glass panels were used. Each panel was 2.2m wide x 3.3m long and weighed approximately 350kg.

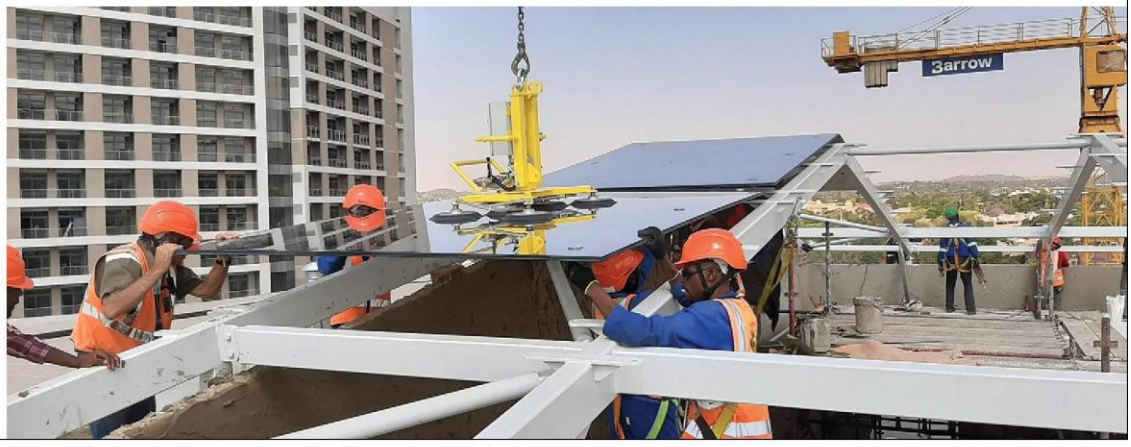
### Challenges

Since all the glass lites were fully tempered and pre-fabricated the steelwork needed to be installed to a very high degree of tolerance to ensure each glass lite would fit. Extensive QAQC checks were carried out both in Tass's factory and onsite before the cladding was installed.

High yield strength of the S355 tubes enabled small beams to be used while the hollow sections enabled neat hidden connection details. In addition, due to the stringent deflection requirements of the glass, both during installation and long term, the high stiffness of structure enable the joints between each glass panel to be sealed with a neat strip of silicone only. No mullions were required.

LEAF Structures worked very closely with the professional team, as well as the general contractor, to come up with a solution that met the architectural intent, budget, and site constraints. During the design phase, several structural and cladding solutions were developed and priced so the client could pick their preferred option.

**Client/Developer:** Menlyn Maine
**Architect:** Boogertman and Partners
**Structural Engineer:** LEAF Structures
**Main Contractor:** Barrow Construction
**Steelwork Contractor:** Tass Engineering
**Cladding Manufacturer/Supplier:** LEAF Structures
**Cladding Contractor:** LEAF Structures



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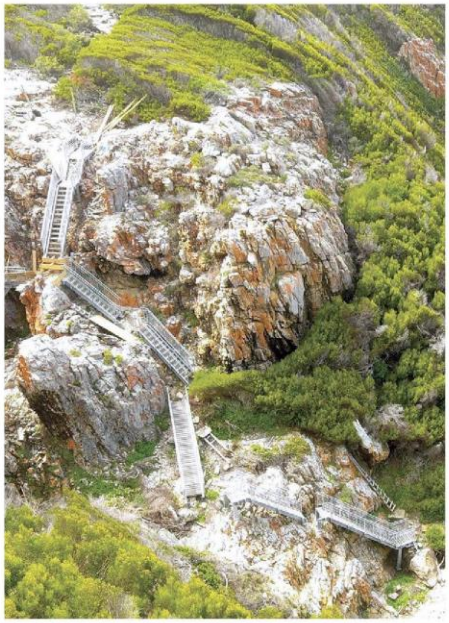
## Whale Trail Staircase

SAFAL STEEL INNOVATION & SUSTAINABILITY CATEGORY WINNER

ParaMatic was commissioned to measure the site then conceptualise and detail the new steel stairway to Stilgat at the De Hoop Nature Reserve. ParaMatic used a 3D scanner to capture the site and modelled and detailed the new stairway in Tekla Structures.

The De Hoop Whale Trail is a long-distance hiking trail in the Reserve. Part of the trail runs along a coastal ridge with a detour down a steep valley to a swimming cove and picnic spot at Stilgat. The hiking path runs approximately 100m from the sea. The original timber and wire rope ladders on the mountainside have long since decayed from rot and corrosion. With an increasing trend in the average age of hikers, the client realised that the route either had to be closed or made safe. A stairway was approved but the stipulation was that it had to be aesthetically unobtrusive, sympathetic with the area, modular and lightweight and make a minimal use of cement works. Maximum off site manufacture was required. Wherever possible, the staircase had to follow the mountainside to allow it to blend in with the undergrowth and avoid breaking the silhouette of the cliff.



The cost of a stainless steel structure was beyond the budget of the project. A structural, duplex hot dip galvanised solution was considered the most likely solution. Standard hot rolled sections were used for the stair stringers and platforms. All elements were limited in mass to ensure they could be hand carried onto site for bolted assembly. Site welding had to be eliminated or minimised. Drilling using battery packs would be acceptable, so anchor foundations into existing rock was considered the preferred route for fixing wherever possible.

The structure had to be essentially fire proof and if a component was fire damaged, the design should allow for replacement without welding. Steel is a perfect building element for elaborate builds – the ready availability of structural sections and the ability to bend and weld stock plate from the same material for a cost effective yet unique and hardy product. Joining and coating processes are simple and well understood and relatively simple.

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## Vamosem Semi-Mobile Crushing Plant

INDUSTRIAL CATEGORY WINNER

The project entailed the fabrication of a complete mobile crushing plant for a mine in Mozambique. Steel/ Platework was chosen as the material of construction due to the industrial nature of the project. This SMC plant was detailed and fabricated by local South African companies which really showcases the level of experience and expertise that South Africa has.

The design of the SMC Plant was undertaken by ThyssenKrupp Germany, however the detailing of the steelwork/plate work was undertaken by Betterect. The project included the fabrication of over 1,000 parts totaling close to 950 tons of steelwork, plate work, grating, and hand railing and the pre-assembly thereof. The fabrication of this steelwork/plate work was extremely labour intensive and required the strictest quality requirements as all welds required 100% non-destructive testing and needed to pass either radiographic or ultrasonic testing. The reason for such high-quality standards was due to the enormous loads/tonnages placed on the steelwork/plate work during operation at the mine in Mozambique.

There were many technical fabrication requirements which included preheating, welding of exotic materials, laser alignment, heavy lifts and more. The steelwork was painted with an industrial three-coat paint specification to withstand the grueling exposure to elements and operational requirements. The hopper base frame weighed close to 45 tons and required abnormal transport loads to the site, which included police escorts in some area on route to the site due to the size of the equipment.

This was a technically challenging project due to the stringent NDT requirements and the quality level of the fabrication by Betterect was extremely high.

Overall, it was a successful project with the equipment currently in operation. This project was truly a South African Engineering accomplishment and showed the world the capabilities of our fabricators and design houses.

**Client/Developer:** ThyssenKrupp Industrial Solutions
**Structural Engineer:** ThyssenKrupp Industrial Solutions
**Steelwork Contractor:** Betterect
**Cladding Manufacturer:** Global Roofing
**Cladding Supplier:** Global Roofing
**Cladding Contractor:** Global Roofing
**Paintwork Contractor:** Betterect

## Douala Grand Mall

EXPORT CATEGORY WINNER

Douala Grand Mall in Cameroon is a new mixed used development situated in close vicinity of Douala International Airport. The mall is the first phase of a multi-phased development. When completed Douala Grand Mall will be the first of its kind in Cameroon. The development comprises a 2-level shopping mall with basement parking and is approximately 112m x 120m on plan. Towards the east of the mall is a single level hypermarket approximately 56m x 40m on plan. The development was conceptualised by the project architect to be a 2 level steel structure, constructed on a reinforced concrete basement substructure.

The steelwork superstructure comprises duo and mono-pitch portalised frames with a first floor at approximately 5.85m above ground level. Localised raised steelwork platforms, with suitable grating to support various plant, are situated above the roof line. The roof consists of a composite roof panel system, spanning between cold rolled steel purlins. The elevations are predominantly clad with a composite wall panel system, with a glass façade facing the food court to the south.

**Client/ Developer:** Actis
**Architect:** Benoy
**Architect of Record:** PKA Architects
**Civil & Structural Engineer:** WSP Africa
**Main Contractor:** Raubex
**Steelwork Contractor/Erector:** Cadcon
**Cladding Manufacturer:** Brucha
**Cladding Supplier:** Brucha
**Cladding Contractor:** Raubex