

A South African ENGINEERING MARVEL

South Africa's flagship shopping centre, Sandton City, scored a world-first when it underwent a major revamp of its entire upper deck without impacting commercial trade on any levels nor causing major disruptions to traffic.

The challenge

Mark Axelrod of consulting engineers, Aurecon, says Sandton City like so many other successful shopping centres worldwide, poses a particular challenge to owners and developers wishing to build on the success of the property. Its stature as the premium shopping and tourism node for the region makes it near impossible to close for renovations. In addition, uncertainty of design parameters used to cast slabs 40 years ago (as well as general fatigue) would almost certainly make it risky to make substantial additions to the structure.

"The only way to overcome the challenge was to avoid placing any additional load on existing slabs by constructing new slabs over

the top of them suspended by the building's own structural columns. This allows us to determine exact weight bearing capacities and remove any uncertainty that may exist about future structural integrity. It also negates the need to strip out shop fittings, ceiling and services and as a result overcomes the challenge not to disrupt the commercial undertakings of tenants within the building."

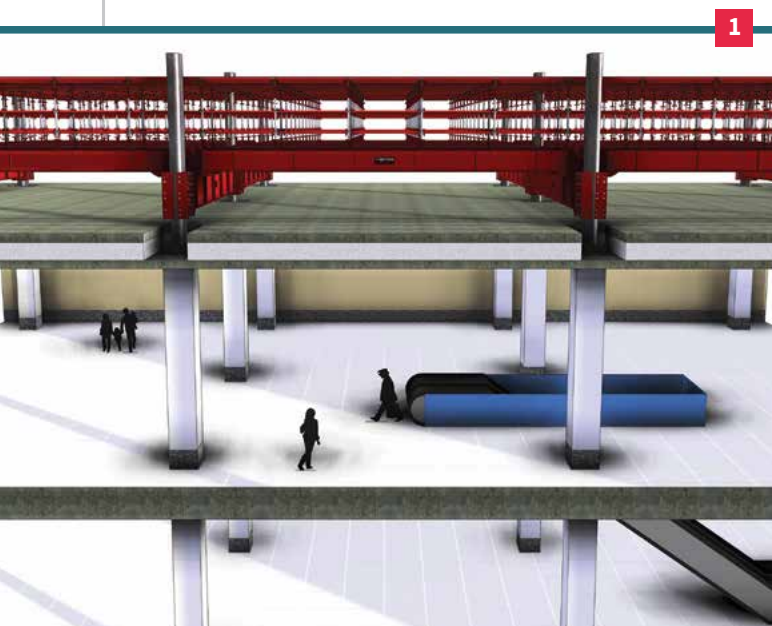
Contracts director, Richard Amm of Grinaker-LTA explains, "Another major challenge was the crowded sidewalks and roads below the construction site, which meant that crane access would be impossible. All structural elements would therefore need to be lifted with the use of mobile cranes from road level and material handlers and forklifts while concrete would need to be pumped from up to 500 metres away. The modular nature of the formwork structures and versatility of Form-Scaff's design provided the ideal solution and ensured that even despite these massive challenges work would be able to progress quickly without disruption."

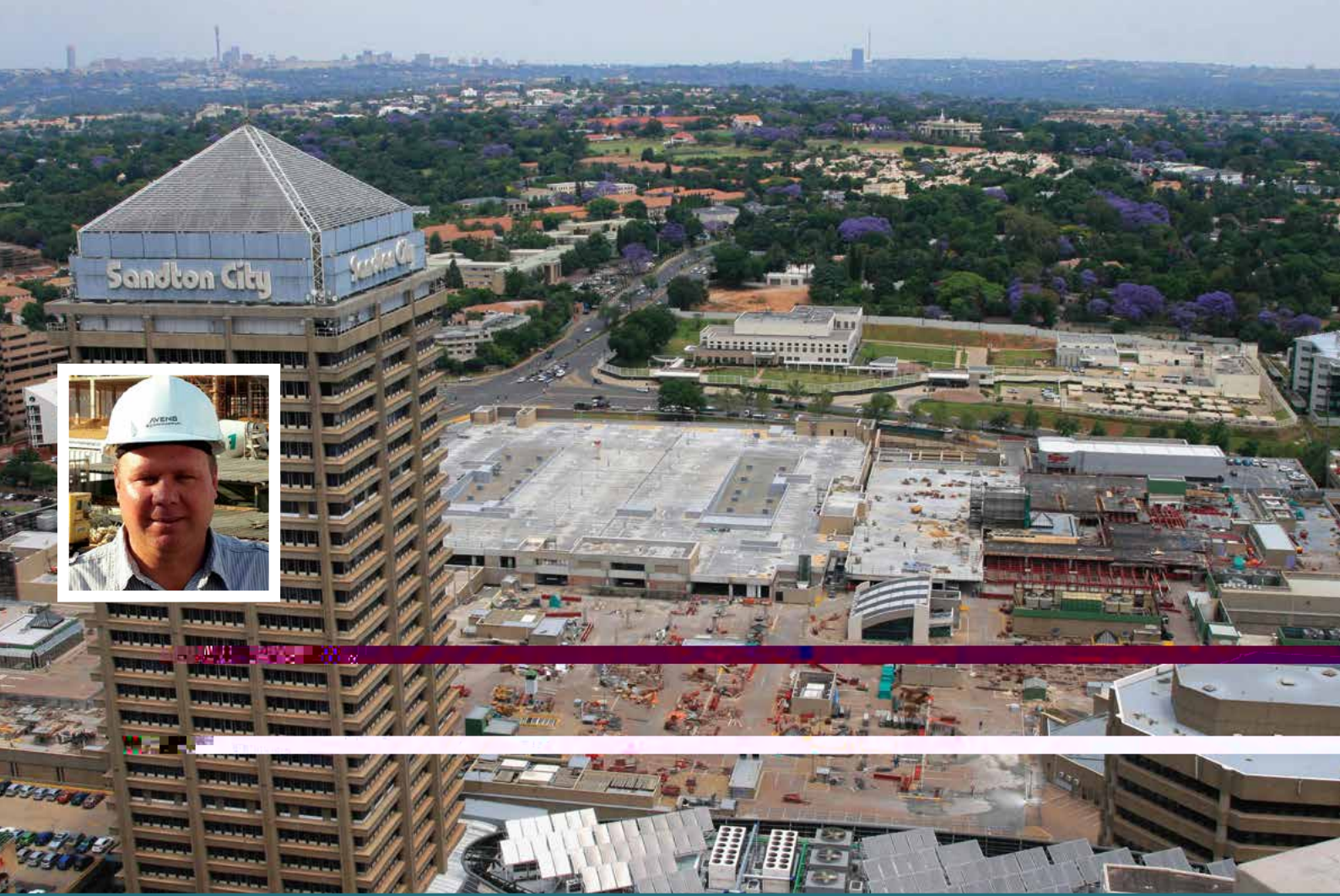
Project requirements

Form-Scaff technical director, Chris Erasmus, reveals that the Sandton City Level 8 Parkade project was bigger than anyone ever thought possible. It required precision levelling of the entire top level of the shopping centre which encompasses an area of approximately 40 000 m². All areas of differing heights needed to be remodelled, while existing air-conditioning refrigeration units, electrical units and other utilities were to be kept operational and incorporated into the works.

"With lack of crane access and other challenges facing us, we realised that the tasks that lay ahead were daunting and that they would require all our technical resources to get the job done profes-

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sionally and on time. Meanwhile, with deadlines mounting and pressure growing, these were the first of many engineering chal-

and core samples taken to establish the composition and strength of materials. Thereafter the top screed had to be removed from the existing floors, column toppings taken off and the original columns needed to be exposed so that new reinforced stubs could be cast onto the original column. The stubs were then used to mount Form-Scaff's Super-Beam system to carry the main weight of the new slab using specially manufactured clamping systems.

Designed and manufactured by Form-Scaff's Specials Factory in Elandsfontein, the clamping system allowed the beams to be fastened directly to the stubs and enabled the company's Kwik-Stage support to be placed on top of the Super-Beams. Form-Scaff's Kwik-Deck system provided the flat slab formwork to receive the reinforcing steel and readymix concrete. Due to the Form-Scaff's large stock holding of temporary works, more than 2 500 tons of support work and formwork could be supplied and erected on site as required. Form-Scaff's Martin Boschoff – a highly experienced formwork coordinator was also placed on site and acted as a link between all role-players in the construction team.

Variations between old records and the actual position of columns proved tricky as differences were often substantial. This brought about a special requirement for Form-Scaff to ensure that the Super-Beam solution catered for any such variations – this was handled through adjustable beams and multi-pronged connection plates to attach beams where variations occurred. These were attached to the specially designed column stubs that would anchor and spread the weight of the new slab evenly through the column.

Post tensioning struts were attached and concrete was poured to a depth of between 300-350 mm. After curing and post tensioning,

thousands of carefully torqued high tensile bolts were removed and discarded (as each bolt would have been deflected through the compression of the concrete).

Once completed, services such as electricity and air-conditioning units could be secured to the new structure. Thereafter the mammoth task of stripping away the temporary works could be easily accomplished with forklifts and removed from the site.

The solution

Form-Scaff's engineering expertise supported by its huge stock holding of appropriate modern product solutions ensured that the project was completed safely and within specification. Due to the off-the-shelf Super-Beam solution, there was only limited requirement for custom made propping and support materials. Through the ingenious use of available formwork and support structures tied to the building's existing columns, the solution meant that the entire project could be carried-out effectively and with accrued savings of millions of rands.

"The ground-breaking engineering solutions used on this site mean that the doors have effectively been opened for shopping centres (and other high traffic buildings) to be extensively rebuilt and upgraded while remaining fully functional throughout the entire construction process," concludes Erasmus. <

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- 5. Form-Scaff's modular Super-Beams bolted to the columns creating a support structure for the future decks without touching the existing slabs.
- 6. Although most of the Super-Beams were placed in position by forklifts, some of the perimeter Super-Beams were lifted into position by crane.

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