

# BUILDING Sol Plaatje's LIBRARY

The new library and student resource centre in the expanding Sol Plaatje University district is nearing completion well ahead of the commencement of the new academic year in 2018. Its opening will not only mark yet another major milestone for the institution of higher learning as a driver of this large development, but it will also be a momentous occasion for all members of the professional team involved in this project.

► This building that celebrates Kimberley's well-known diamond-mining past will certainly live up to its expectation of being the central showpiece of the rapidly-expanding node that has also become a catalyst for the rejuvenation of the larger surrounding Kimberley central-business district.

## Concrete façade

It is immediately noticeable by its angular-shape and striking origami-like roof structure with each corner at a level that corresponds with the neighbouring buildings on the campus.

However, it is the building's concrete façade that appears as if floating 2,4 metres off the ground that showcases the skills and capabilities of the professional team.

Seamlessly blending in with the roof of the structure, the façade is a three-dimensional concrete envelope that is functionally, structurally and technically separated from the inner core of the building. The void created between the external envelope and floor plates along the perimeter of the building acts as a thermal duvet between the non-insulated external shell and its habitable building, while facilitating all vertical movement, houses the services and allows natural light to all floors.

## Upfront planning

The successful outcome can be attributed to the extensive upfront planning undertaken by the professional team ahead of the construction of the façade. This extensive six-month-long process, which also relied heavily upon the expertise of Murray &

Dickson Construction Group, started in June 2014, while the main contractor commenced on the core of the structure.

"Certainly, there were more cost-effective and practical ways to construct the façade. However, they all had their limitations that would compromise the high-quality finish that was required by both architect and client. We, therefore, all agreed that a cast in-situ 'liquid-stone' façade was the only available option to achieve the demanding end-result. All members of the professional team were aware of the very high risks involved, and the client's willingness to work closely with us played an essential role in helping us achieve this engineering feat," says Heinrich Stander, a technical director and structural engineer at Aurecon.

The 220 mm thick walls were climb-formed by Murray & Dickson Construction Group while supported eccentrically off slender steel columns. As the wall progressed, it was tied to the floor slabs by steel struts which resist the overturning nature of the design and ultimately create the illusion of a floating façade.

## Continuous in-situ concrete

Importantly, significant consideration was required to limit the influence of concrete shrinkage on such a large, continuous in-situ concrete element.

Specialist supplier, Lafarge, helped design a concrete mix with the necessary low-shrinkage properties. The design also incorporated 600 mm-wide shrinkage pour strips that would run the full vertical height of three sides of the building and remain open for 90 days afterwards. This enabled unrestrained movement of up to 50% of the expected shrinkage movement in the walls. In addition, Murray & Dickson Construction Group followed a stringent concrete-curing regime which further limited the effects of drying shrinkage.

This high-slump concrete mix with a smaller-sized aggregate would have to be carefully vibrated in-and-around the closely-spaced reinforcement and other embedded cast-in elements.

Once the design and construction process had been validated, the contractor built a 1:1 scale 'sample' wall to test the process. Special attention was also paid to the complicated interface of the shuttering panels with the sloped roof of the structure, as well as ensuring consistent concrete flows.

Stander says that he remains impressed by the off-shutter finish that was already

achieved by the main contractor during the trial phases. Only minor refinements had to be made at this stage to achieve the desired off-shutter finish.

Renell Samuel, Murray & Dickson Construction Group's building construction director, is also very proud of his team's workmanship, noting that the outcome can be attributed to the wealth of experience garnered by the division on many other projects that also demanded excellence in the application of concrete.

"We are considered a leader in the field, especially in off-shutter concrete finishes. This is an extremely sophisticated skill that we started applying at the University of Witwatersrand in Johannesburg, Gauteng, a long-standing client of Murray & Dickson Construction Group," Samuel says.

## NEC 3 Target Cost Contract

He also points to Murray & Dickson Construction Group's familiarity with the NEC 3 Target Cost Contract, which transfers more risk and responsibility to the building contractor.

By involving Samuel and his team early during the design phases of the façade, Murray & Dickson Construction Group was able to share critical insights on shuttering, staging technology and construction sequencing. The building division also helped optimise the programme and align costs to the client's budget.

On track for completion in September 2017, he also attributes the success of this project to the contractor's already thorough knowledge of the environment and strong working relationship with the structural engineer. Murray & Dickson Construction Group and Aurecon were awarded this contract ahead of the completion of the university's main administration block on campus.

Certainly, the division's stellar workmanship earlier on campus, combined with its successful track-record at other institutions of higher learning, also played a major role in Murray & Dickson Construction Group being entrusted with the highest profile project in the precinct.

"Most university-related projects are characterised by extremely onerous timelines that require extensive upfront planning, as well as careful attention to construction scheduling and programming. They are also undertaken in an operational area, adding another level of complexity, especially in terms of maintaining our high



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healthy and safety levels are well above what is considered to be the norm in industry also talks to our success," Samuel says.

### Co-ordinating activities

Planning and co-ordination activities were especially complex on this site, which is located in the heart of the development node. This limited space for the crane laydown area and delivery of building supplies that had to be undertaken on a just-in-time basis, all while continually interfacing with the many other professional teams.

Joining Murray & Dickson Construction Group on this project was specialist supplier, Uni-Span, as well as Kimberley-based emerging contractor, OIK, which was tasked with the extensive and challenging steel fixing and shuttering activities.

OIK also worked alongside the main contractor to construct the two striking internal in-situ concrete A-frames that required an intricate construction sequence, starting with building of the large temporary support columns. Ultimately, the A-frames

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were jacked upwards by 400 ton jacks to remove temporary shim plates, and then deflated to allow the A-frame to span free, followed by demolition of the two temporary concrete columns.

Stander also commends Murray & Dickson Construction Group for the very high-levels of accuracy achieved on this aspect of the works programme, where tolerances were achieved within a few millimetres of the engineer's design.

This complements the contracting teams' workmanship on many other stand-out features of the new building. Among others, these include the reinforced concrete fire-escapes on the western wall

that are hung with tension rods; the internal steel stair cases that are hung from the sloping roof slabs; and courtyard façade that also demanded extensive upfront planning ahead of its construction and precision in execution.

OIK commenced its incubation period with the main contractor two years ago in line with Murray & Dickson Construction Group's Khula Nathi motto. Khula Nathi is Zulu for 'Grow with Us', and this programme was also applied in the extensive training of the many locals employed on this contract.

Samuel is especially proud of this aspect of the contract, considering the dearth of specialist building skills in Kimberley.

"Prior to the flurry of construction activity that is now under way at the precinct, there was very limited building activity in-and-around Kimberley. Training and development was, therefore, a very important requirement of the project, and we exceeded the client's expectations, while also outperforming in other key areas, such as Black Economic Empowerment; as well as spending on local subcontractors and labour, especially youth and women."

He concludes that he is very proud of Murray & Dickson Construction Group's association with the new library and student resource centre that has already received much acclaim from the South African built environment profession, and ensured the company's ongoing involvement with the institution of higher learning and elsewhere in Kimberley. ●

