The completed front entrance of Studios on Park in Stellenbosch

FINALIST
Technical Excellence Category

KEY PLAYERS

Client
Hodevco (Pty) Ltd and
Daniet Beleggings (Pty) Ltd

Professional team
UWP Consulting,
Jürgen Kieslich Architects,
Atvantage, Ekcon and E2C

Main contractor
Remey

Sub-contractors
Inside Living and
Warwick McCance-Price

Studios on Park

SUMMARY

Student housing in Stellenbosch – as in the rest of South Africa – is increasingly in demand. The Studios on Park development was initiated in response to this need. The development consists of a number of buildings of which Studio Vijf is the building discussed here. The building is configured to function as a student residence, comprising 62 units of 27 m² each with communal kitchen and recreational facilities.

The modular nature of the building made it ideal for off-site modular construction techniques. The individual prefabricated, steel-framed box units were completely finished off-site in a controlled factory environment, including structure, services and all finishes. They were then placed on top of one another on the post-tensioned transfer slab over the basement parking, and services were simply connected on site.

Walkways and staircases were the only elements built on site. The concrete walkways between modular units were cast onto Bondek and structural steel. Staircases were constructed from structural steel, as were the roof and gable ends which 'clipped' onto the pod frames.

All structural aspects, including the pod frames, were designed by UWP Consulting.

The building has a total footprint of 1 310 m², with the transfer slab over the basement parking being 920 m² and the steel roof structure covering 960 m². An internal reinforced concrete frame, columns and slab were built for open communal areas and for the main staircase void.

The quality of the living environment created through this construction method far exceeds that of similar conventionally built residential units. It also meets or exceeds current regulatory requirements with regard to water and energy usage, as well as temperature and acoustic insulation.

On a purely cost basis, this project is more expensive than a comparable

structure using conventional construction techniques. However, factoring in the interest saving due to the significantly shorter construction period, as well as the fact that one additional unit could be incorporated per floor using this method, it is more economical.

This approach also gave the developer an opportunity to try out the new technique on a smaller scale with a view to larger scale for future developments.

BENEFITS OF MODULAR CONSTRUCTION

There are various generic benefits to using this construction technique, but benefits specifically pertaining to this development were:

- Increased speed of construction, which was estimated to have reduced the construction time by at least 40%. This was due to the ability to begin manufacturing upper floor modules simultaneously with the start of excavation onsite for the parking basement.
- Higher standard of finishes were achieved in a factory environment.
- Savings in the cost of foundations and the transfer slab structure were realized due to the reduced loading. Modules translate to 3.4 kPa DL per floor compared to approximately 12 kPa for conventional construction, i.e. a 70% reduction in DL.
- There was no need for expensive shear elements for seismic design, due partly to the interconnectivity of the units, but mainly to reduced seismic loading which is largely a function of DL.
- No storage of bulky materials was needed on the very confined site.
- Overall project costs were reduced due to interest saving on the development finance.
- Increased project revenue was realized due to the ability to add three additional units, compared to the comparable conventional scheme.

EXCELLENCE, INGENUITY AND INNOVATION IN ENGINEERING

UWP's research indicates that this is the first project of its kind in South Africa. Internationally the method is being used fairly commonly, particularly for hotel developments and inner city sites where space constraints make it attractive.

The challenges that needed to be overcome to complete the project successfully are not rooted in pure structural engineering complexity (the structural concept is relatively simple), but were related more to the coordination between different parties involved in the design process, as well as educating and mentoring the contractor and manufacturer in the novelties of the technique. The main challenges were as follows:

- A very high level of detailing was required prior to the start of construction on site and in the factory. There was no leeway for alterations/adjustments on site.
- The condensed construction programme, together with the required level of detailing mentioned above, resulted in the team having to produce a significant amount of construction information in a very short time, compared to conventional means of construction where a lot of detailing is developed as the construction proceeds on site.

RESPONSES TO ENVIRONMENTAL CHALLENGES AND CONCERNS

The following steps were taken to meet or exceed environmental requirements and mitigate environmental challenges:

- Very high levels of insulation were included in the factory build of the units.
- Double glazing for windows was used.
- Less bulk material was used. The mass of the building is 30% of the conventional equivalent.
- A grey water system was used for irrigation.
- Existing trees were retained which would have been lost with conventional construction. □

The building starts to take shape

A typical modular room