New digs for youth respect remains at Rocks

The light footprint of a predominantly steel framed construction is allowing a sizable new youth hostel to be developed on an archaeologically sensitive site in historic The Rocks area skirting Sydney's CBD.

In January 2006, the Sydney Harbour Foreshore Authority called for innovative proposals for the design and conservative redevelopment of the area known as the 'Big Dig Site' in the historic precinct.

The 2650sqm site has outstanding cultural significance and contains rare physical evidence of Australia's first European settlement. The first major archaeological excavation of the site from 1994 unearthed over 750,000 artefacts and the remnants of more than 30 buildings.

Chosen from four designs shortlisted by an expert evaluation panel, the development conserves the in-situ archaeological remains whilst establishing an interactive history and education centre on the lower level with minimal impact.

The building is of a four-storey, twin building design with an atrium situated in each tower incorporating a single lift tower servicing the entire structure. The hostel will contain 106 rooms with capacity for 365 beds when completed in late 2009.

The situation ruled out any chance of a symmetrical foundation layout and significantly restrained the building's weight distributions.

As project manager **Neil Denton** from Built explained, the sensitivity of the site requires the whole development to virtually be performed in the air.

"All movement on the site is done via two cranes as there is no driving allowed within the site boundaries," Mr Denton said.

"Most sections are prefabricated in steel offsite to minimise movement onsite."

A steel truss system is being deployed to raise the building off the ground on a series of columns that minimise points of contact with the ground and interference with the heritage remains.

The location of the footings was carefully negotiated between architectural, heritage, archaeological, structural and geotechnical consultants.

The building itself will be a steel-based structure to lighten the load significantly on the site footings with joists and plywood decking incorporated to eliminate the need for heavier options such as concrete slabs. LiteSteel® beam (LSB) joists were used in place of timber ones in order to increase the joist length.

Concrete was limited to localised areas due primarily to its heavy weight, but also because of very limited access to the site for pours and the risk of spillage and damage to remnants on the heritage site.

"Even though the development is located in the heart of Australia's biggest city, this was one of the tidiest construction sites I have visited recently," said ASI State Manager – NSW, **Phil Casey.**

The design approach specifies universal beam (UB) and Rectangular Hollow Section (RHS) columns. Most of the horizontal bracing could be removed from the structure which is saving significant costs, fabrication and onsite erection times.

This is achieved by utilising plywood panels as a stress membrane screwed to the LSB joists and steel beams. The floor is stiffened to limit horizontal deflections by screwing the plywood panels between joists along all panel edges.

"The project is a tremendous example of how a low-rise lightweight steel building can be developed with a full steel frame-based design," said **Ray Vallett**, State Sales Manager – NSW with steel sections supplier LiteSteel Technologies.

"Once again, the Australian steel value chain is providing a complete solution for a major builder in a Design and Construct situation."

"LSB is an important contributor to the success of this site with its long span, light weight attributes as well as its considerably superior performance to other building materials."

OneSteel Steel & Tube processed all of the LSB joists for S&L Fabrications as well as a large proportion of the structural beams as well. That included notching of the joist flange ends, cut to length and pre-drilled on their beamline to achieve a flat, even floor. Rigid connections for beam-to-post joints were utilised and bolted angle cleat connections for joist to beams. Floor loads of 2kPa for most areas and 4kPa for major traffic areas like around the atriums.

LiteSteel Technologies engineers worked closely with the building and structural consulting engineering firm Taylor Thomson Whitting (TTW) to support construction of the building.

Project engineer from TTW, **Tomm Lewis** said the project is innovative in using one storey deep trusses to span up to 17 metres, closely coordinated with the architect to avoid clashes with doors and windows. These trusses allow for minimal use of columns and reduce impact on the heritage remnants below.

The use of 25mm plywood flooring provided a speedy work platform also allowed for significant construction loadings. The internal stud walls are also steel providing an all-steel frame.

Mr Lewis noted that steel is also being used to frame the heritage screens, which represent original buildings on the site and are an important element in highlighting the project's archaeological significance.

For economy whilst complying with fire protection standards, inorganic zinc silicate intumescent coating was applied to any steel sections installed less than four metres away from the building's boundary, galvanised for any other exposed sections and twin-pack epoxy primer for the rest.

Project Team

Client: YHA Australia
Builder: Built
Engineer: Taylor ThomsonWhitting
Architect: Alexander Tzannes
Fire Engineer: Fire Engineer Designs
Fabricator: S&L Fabrications
Processing: OneSteel Steel & Tube
Joist Supply: LiteSteel Technologies