

Speedier multi-storey carpark build 'just the ticket'

Melbourne Convention and Exhibition Centre

The cantilevering entry corner to the carpark, maintained for use throughout the entire project.

Full service ASI steel fabricator, Stilcon Holdings has employed a more progressive approach to constructing the steel frame of a new four-level carpark than traditionally adopted to speed erection times and create better safety exclusion zones onsite in Melbourne's busy CBD.

Stilcon was able to provide a complete steelwork package for the building frame, handling steelwork processing, cambering, delivery to site and onsite erection for the project to provide 1180 car spaces over four levels, which is part of the current Melbourne Convention and Exhibition Centre expansion.

Stilcon General Manager, **Laszlo Puzsar** said that the approach adopted allowed follow-on trades to access the full height structure earlier whilst the steel erection crew was working a couple of bays ahead, rather than the more common horizontal floor-by-floor build sequence.

"Our prefabrication with steel helped keep out-of-hours work to only 20 percent of onsite works," he said. "We could leave the site at the end of each night shift and allow the pedestrian and road traffic to flow as normal the next day."

The main time saving aspects of this is in allowing the façade contractor and concrete to proceed onsite unfettered, working in parallel with the steelwork contractor.

Stilcon Site Engineer, **Adam Tierney** explained that this 'vertical method' focuses on a full-height straight-up build of a section of the structure, which is replicated in turn across the building width adopting the same principal approach.

"The flatter 'horizontal' approach is how most other multilevel carparks have been traditionally built in steel or concrete which spreads the floor area out wider, limiting the ability for multiple work fronts," he said.

He added that the speed of steelwork erection can be further optimised with two separate erection crews working in different directions off the first bay. And increasing the number of bays built provided a safety buffer zone between steel erection and follow-on trades which is an OHS requirement of the site.

The decision to embrace the full height vertical erection approach was made at tender stage after various erection methods were programmed out, showing decreased overall erection times using the chosen method as opposed to the horizontal technique. No revisions were required to the consulting engineer's design.

The vertical build method involved firstly constructing a single square grid bay using full height (13-metre tall) columns with some temporary propping to achieve plumb erection. All primary and secondary floor members are erected starting from the lowest level, resulting in a complete four-level high bay of steelwork.

Once the initial bay was completed, secondary bay structures were then built in two directions, allowing a block of bays to be completed sooner by Stilcon and handed over to Probuild for the follow-on tradespeople.

In this case, the metal decking was laid first on level two followed by level one. Whilst metal deck laying was occurring on level one, the reinforcement placement began on level two. The slab was then poured on level two, creating a safety deck between the upper and lower structure.

Then steel reinforcement was installed and concrete poured on level one as well as the steel decking laid for level three by the installer working off the poured level two. Reo bar was then placed and concrete poured on level three, and so on.

Temporary propping and bracing was required in the structure to provide temporary stability during steel erection, metal deck placement, concrete placement and façade installation.

The addition of some temporary bracing worked in conjunction with the permanent building bracing for temporary stability during construction. On top of this, the concrete placement occurring periodically behind steelwork erection provided the required dead load to bed the structure down and provide a diaphragm affect.

Mr Tierney contrasted this approach with the traditional horizontal floor-by-floor method that only allows a single work front as the building cycles up

“This build approach, using traditional construction methods, is much slower as columns have to be formed and poured, formwork tables setup for first floor pour, pour and wait until cured sufficiently to allow formwork loads for the floor above to be built and poured, and so on up and up,” he said.

“The erected floor area cannot be as large this way as crane lifts to inner areas need to be considered, only applicable to mobile crane erection rather than tower crane and there were no tower cranes used on this project for carpark erection.”

He also pointed out that it only accommodates shorter columns as using longer columns would result in too much lateral movement to the top of the column as the lower level concrete floors cure.

“For full height columns using this traditional method, the tops would need to be ‘locked’ into position by primary members at high level if lower level slabs were being poured prior to higher level steel being completed.”

The floor area of each bay is 70.5sqm for a total floor plate area of 9525sqm.

All up, 1600 tonnes of structural steelwork were used on this project, mostly G300 steel used for the steel frame comprising universal beams (UB) and columns (UC), all bolted together, along with additional steel used as formwork for the composite decking. Two steel footbridges provide access to adjacent retail areas over roadway and there are four access stairs – all steel.



Starting up with the 13-metre high columns.

The structural grade steel was supplied directly from OneSteel's Whyalla steel mill in South Australia. All steel frame components were galvanized.

Steel fabrication commenced in June 2016 with erection soon after to be substantially completed by that November.

Mr Puzsar said price competitiveness, an established relationship with the builder and a successful track record of multistorey carpark projects helped Stilcon win the work.

PROJECT TEAM

Client: Vicinity Centres

Structural Engineering: Irwinconsult

Builder: Probuild

ASI Steel Fabricator: Stilcon Holdings

Steelwork Erection: Stilcon Holdings

Steelwork Detailing: Ingen 3D

Steel Decking: Formdeck Australia

Decking Contractor: I&D Group

Galvanizing: Industrial Galvanizers, GB Galvanizing

ASI Steel Manufacturers: BlueScope, OneSteel

Topping out at Level Four – a great cross-sectional example of the composite structure.