Concrete framing first choice to manage weather related construction risk

A new nine storey commercial building in the Docklands dynamic Victoria Harbour precinct will be Ericsson's new Melbourne corporate headquarters. Currently under construction, the project is due for completion in early 2008.

Undertaking the design and construction, Bovis Lend Lease (BLL) identified speed of construction and buildability as two key criteria for the structural framing system selection to overcome Melbourne's frequent high wind days. With safe crane operations being shut down on a relatively high number of days due to wind, the structure programme would be at risk unless crane dependence could be minimised. Choosing contemporary insitu concrete construction that has little reliance on cranes for assembly, BLL have effectively managed the risk of lost time due to wind, and are well on track to meeting the project's tight programme.

Total project cost $80 million

9 storeys above ground

Project schedule 20 months, structure program 8 months

Over 22,000 m^2 total net lettable area (3,500 m^2 per typical floor)

9.0 m x 13.5 m column grid

25 to 60 MPa concrete used in structure

North east elevation showing the concrete framed structure under construction

A concrete framed solution

Above ground level, all floors are post-tensioned one way slabs spanning between band beams. The office floors typically have 170 mm thick slabs spanning 9 m grid to grid and 550 mm thick post tensioned band beams spanning 13.5 m between columns. Beams have been notched at each end to allow services reticulation at the cores and perimeter zone.

The perimeter beams were sized to match the facade modulation, allowing tight control over deflections to minimise the facade stack joint depth.

Vertical structure elements consist of reinforced insitu concrete core and columns. The main lift and services core and stair shafts provide resistance for lateral and torsional loads, which were governed by the earthquake loads case. In the carparks, additional columns were added to reduce the band beam spans to10 m, allowing a reduction in beam depth to 400 mm and a floor to floor height of 2.8 m.

Ericsson House

818 Bourke Street, Docklands
Melbourne

builder and project manager:
Bovis Lend Lease
structural engineer:
Lend Lease design
architect:
Lend Lease design
developer:
The GPT Group

Movement sensitive facade system is supported by post-tensioned concrete perimeter beams

Concrete framing provides superior value

The selection of a concrete framed structure was made at the outset by BLL to minimise dependence on cranes and thereby manage the risk of lost time caused by Melbourne's frequent high wind days. Ease of construction was deemed to favour a concrete structure in several areas, such as fire proofing. Following trades would not need to install fire proofing to critical structural elements, as would be the case in a steel framed structure.

The selected facade system was highly sensitive to deflections, requiring tight control over deflections within the perimeter beams. A concrete framed structure using post-tensioning was deemed to offer better tolerance results and limit deflection that you would typically have difficulties with on a steel framed building.

With a steel framed option being dismissed due to its heavy reliance on cranes, the framing value selection process was reduced to determining an optimal mix between reinforced and post-tensioned insitu concrete construction and the most effective combination of formwork solutions.

Achieving lowest cost concrete framing …

The selection of a shallow post-tensioned concrete floor design minimised the floor to floor height and overall building height giving proportionate cost savings, particularly to the expensive facade. The fully post-tensioned floor solution also realised cost savings through minimising conventional reinforcement.

Speed achieved by breaking up large floor plates …

To meet an ambitious completion date of October 2007, which allows 8 months for the structure, BLL have opted to break up the large floor plate construction into 6 separate concrete pours ranging from 550 m^2 to 720 m^2. The combined floor cycle target is 6–8 days for the typical floors.

Buildability of concrete framing lowers risk …

By using a combination of table forms for the floors and self climbing jump formed core construction, crane dependence was minimised, and the crane freed up for utilisation elsewhere on the project. In this way the risk of lost time due to wind was effectively managed.

Technical challenges overcome with concrete …

The project entailed some unique engineering challenges.

Ground conditions are typical for most of Victoria Harbour, comprising fill overlying the infamous Coode Island silt and gravels until siltstone bedrock is encountered at a depth of 30–35 m. Due to the predicted ground settlements, the ground floor concrete slab is designed as a suspended reinforced concrete floor spanning between piles. Pile caps were incorporated in ground beams together with setdowns at the rear of the retail space, allowing for future services reticulation.

Key features of the design-and-construct solution:

- Compressed construction programme achieved by using concrete.
- Integral water-proof system for basements located below the water table.
- Lubeca jump-formed core construction.
- Post–tensioned floor plates.
- Self climbing perimeter protection screens.
- Table forms used for typical suspended floor.

left: *Detailing of post-tensioned perimeter beams*

below: *Aerial view showing the large floor plates under construction*

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