

## Difficult construction challenge solved by concrete framing

Perth's new 12 storey District Court building which will also house Supreme Court criminal jury trials is the centrepiece of a new courts precinct for the people of Western Australia.

Built by design and construct contractor Multiplex, the structure is characterised by 12 primary lifts required for separating different judicial zones within the building. Constructing the resulting structure consisting of 6 cores and a 14 m maximum floor span presented a challenging undertaking. Opting for the dependable performance of concrete framed construction, Multiplex has recently delivered the project on schedule and within budget.

### A concrete framed solution

Precast prestressed hollowcore concrete floor planks (400 mm deep) were used in the main 14 m spans of the central floor zone area for suspended floors up to level 3. The floor planks had a 115 mm deep concrete topping slab cast over which comprised the 75 mm minimum structural depth and a sacrificial 40 mm to accommodate services.

12 storeys above ground

Total floor area 31,250 m<sup>2</sup>

Project value \$195 million

Construction period October 2005 to March 2008

60 MPa high strength concrete columns used in lower storeys



In situ reinforced concrete beams (800 mm deep x 900 mm wide) and slabs (200 mm deep) completed the surrounding floor structure which had shorter spans up to 10 m.

From level 4 onwards the precast concrete floor system was replaced by an in situ post-tensioned (PT) concrete band beam (640 mm deep x 1000 to 2000 mm wide) solution for the 14 m spans. The change from precast to in situ was instigated to alleviate the demand on crane time, allowing a better logistical distribution of materials to the tower.

The vertical structure comprised columns of size 400 x 600 mm up to 800 mm square in addition to the 6 concrete cores. High strength concrete up to 60 MPa was utilised in the lower level columns to minimise sizes.

### District Court of Western Australia building

Cnr Hay and Irwin Streets, Perth, WA

developer:

ABN AMRO

builder:

Multiplex Constructions WA Pty Ltd

structural engineer:

BG&E Consulting Engineers

architect:

Cox Howlett & Bailey Woodland



Construction underway with heritage facade incorporated (at left)

## Concrete framing provides value

Finding the most economic construction solution for the 14 m central floor span drove the choice of structural floor system. Structural Engineers BG&E considered several alternatives including in situ concrete band beams and slab; precast hollowcore planks supported on in situ concrete beams; and structural steel beams with concrete slabs cast on permanent metal deck formwork.

The steel framing solution was rejected at an early stage due to a significant cost premium when compared to both the precast and in situ concrete options considered. Other important considerations in the final decision were the effect on programme, resources availability and safety. On this basis the hollowcore precast option was selected for the floor structure, however was subsequently changed to a PT band beam solution from level 4 onwards.

A load-bearing precast concrete alternative to the traditional in situ concrete cores was also considered but rejected due to the necessary additional structural connections required.

The superior performance of a concrete framed structure in the key areas of cost, speed of construction, materials supply capacity and construction system reliability all added up to a superior value proposition on this project.

### Concrete framing achieves speed on a complex structure

A major challenge for the builder was achieving programme on a structure with 6 cores and an unusual configuration demanded by the unique requirements of law courts. The concrete framed structure chosen proved a reliable decision, achieving 3 week floor to floor cycle times and finishing on time.



Feature precast concrete facade

## Concrete framing the low risk option

The predictability of a concrete structure was viewed as a major risk management advantage on this challenging project. Apart from the previously cited budget and programme considerations, the inherent fire resistance and acoustic performance of concrete meant that the stringent courts' design specification in these areas was automatically achieved with a concrete solution.

### Innovative provision for services

An additional 40 mm concrete was included on top of floors to accommodate additional services that may be required in the future. This 40 mm zone was considered as sacrificial and did not count as part of the structural floor depth. This simple measure will prove an effective way of dealing with current and future service requirements of a busy courts facility.

### Key features of the design-and-construct solution:

- Versatile and cost effective PT concrete band beam floor structure.
- Jump formed core construction, crane lifted.
- Feature precast concrete facade panels.
- The District Court building project was a public/private partnership between the State Government and the Western Liberty Group, the first under the Government's Partnerships for Growth policy.

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