Perth's largest office building in a decade framed in concrete

Completed in 2004, the 28-storey Woodside Building is the largest office building in Perth since the construction of Central Park a decade ago.

The design and construct project team led by Baulderstone Hornibrook selected a concrete framed building solution from an extensive review of other alternatives. Concrete best met the key selection criteria of cost, speed of construction, reliability of material and labour supplies, ability to accommodate sub-floor services, floor-to-floor height and future flexibility of office usage.

Nett lettable area:
2400 m^2 on levels 1–7,
2200 m^2 on levels 9–15, and
1600 m^2 on the high rise levels (16–24).

Construction contract: $195 million

Project delivered within budget (after contingencies)

A concrete framed solution

Typical office floors consist of post-tensioned one way spanning band beams with conventionally reinforced slabs. A post-tensioned perimeter edge beam completes the floor, supported on an 8.2 m grid of columns. Podium floors at the ground and upper basement levels are post-tensioned band beams with post-tensioned slabs.

The lateral load resisting system is a conventionally reinforced concrete core located centrally within the building and containing all lifts, stairs and service risers. The building is founded on cast insitu concrete continuous flight auger piles.

Woodside Building

240 St Georges Terrace, Perth, WA

builder/developer:
Baulderstone Hornibrook
structural engineer:
Kellogg Brown and Root
architect:
Kann Finch Group

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Post-tensioned floor plates provide tenancy space flexibility

Concrete framing provides superior value

Alternative flooring systems considered were post-tensioned, conventionally reinforced concrete, steel frame with composite floor, steel frame with precast floor and several other hybrid combinations. Concept designs were developed, costed and compared for each alternative. The major factors favouring the adopted concrete solution were buildability, time schedule and the relevant experience of the team. With costing similar across most floor structure alternatives, the time tested reliability of concrete was considered of most value in meeting the project schedule and budget.

Another key factor was the major tenant's need to have an uncluttered ceiling space to provide easy and flexible re-configuration of office fit-outs. The adopted shallow post-tensioned concrete solution suited this requirement better than the steel framed options, and also achieved the minimum floor-to-floor height with direct cost savings flowing to the building facade.

Options for the core were briefly considered, however, it was quickly concluded that conventionally reinforced concrete was the best solution for the core structure.

Speed required to meet practical completion date

Tenant pre-commitment agreements within the contract made speed of construction an essential requirement. Potential speed benefits of using prefabricated materials such as steel and precast concrete were considered, however, they were offset by other factors such as additional cranage demand and difficulties delivering materials to a confined inner city site. Efforts were therefore focused on designing the selected post-tensioned flooring system to facilitate fast construction. This involved the use of mesh reinforcement in the slabs, positioning beams to avoid complex beam-to-column junctions, prefabricating column reinforcement cages and using prestress to minimise and simplify the use of conventional reinforcement.

Co-ordination of services with shallow post-tensioned floor design minimised floor-to-floor height

Final decision favours low-risk concrete

The final decision on the structure by Baulderstone Hornibrook was based around the experience of the project team. Staff designated to manage and supervise the construction had built concrete framed structures previously, and had less experience with other systems. There was less risk in going with concrete, a proven system with the ability to accommodate change if required.

Integrated floor and core design

Structural solutions for the typical office floors and the core were designed by the structural engineer in close collaboration with the mechanical engineer. The positioning of beams and major ducts in the ceiling space were co-ordinated so they wouldn't cross each other thus enabling floor-to-floor heights to be minimised. This design also had to address air riser locations within the core and thus the structural solution for core walls. The outcome of this collaboration was a carefully integrated core/floor and structural/mechanical solution.

Innovation in construction

Skilful use of boom pumps facilitated efficient concrete pours for the jump-formed core construction. Self-climbing perimeter safety screens were also employed, providing a completely safe working environment for the floor construction.

Key features of the design-and-construct solution:

- Post-tensioned floors to minimise depth, floor-to-floor height and provide tenancy plan flexibility.
- Collaboration between structural engineer and mechanical engineer optimised service integration with structure.
- Jump-formed core construction.
- 80 MPa concrete used to minimise size of lower storey columns.

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SYDNEY [61 2] 9437 9711
BRISBANE [61 7] 3831 3288
MELBOURNE [61 3] 9825 0200
ADELAIDE [61 8] 8274 3758
PERTH [61 8] 9389 4452
TASMANIA [61 3] 9825 0200

e: concreteconcepts@ccaa.com.au