

## Concrete framing first choice for Brisbane's largest office building

The 38 storey Brisbane Square office tower is the new home for anchor tenants Suncorp-Metway and Brisbane City Council. Creating a distinctive landmark on Brisbane's skyline, the unique architectural facade hides a complex and sophisticated engineering structure that posed several challenges for design and construct builder Baulderstone Hornibrook Pty Ltd (BHPL).

Possessing a narrow rectangular floor plate, the lift and services core was located at the end of the building to provide an open plan floor configuration. The eccentric core location required a 'mega' brace frame at the other end of the building to balance the building's structural response to lateral loads. Other notable challenges were expressed columns external to the building for 28 floors that support the overhanging uppermost 9 floors, and accommodating integrated fitouts designed by the two major tenants. BHPL relied on tried and tested concrete framing to deliver this demanding project on time and on budget.

Total project cost \$198 million

38 storeys above ground

Project schedule (including integrated fitout) 3 years, completed October 2006

Over 50,000 m<sup>2</sup> total net lettable area

9.0 m x 13.4 m column grid

85 MPa high strength concrete used in lower storey columns



### A concrete framed solution

The typical floors from levels 6 to 28 comprise an 1800 m<sup>2</sup> (gross) floor plate on a 13.4 m x 9 m building grid. Post-tensioned concrete band beams, generally 500 mm deep x 1800 mm wide, span the long direction and post-tensioned one way concrete slabs varying in depth from 160 mm to 230 mm span the shorter direction.

From level 29 the floor plate extends over 3 circular concrete columns that are expressed externally on the George Street side of the building, and increases the gross floor area by 10%.

Vertical load bearing is provided by 900 mm square perimeter columns and up to 1500 mm square columns internally. High strength 85 MPa concrete is used in the lower level columns to minimise sizes.

Lateral load resistance is provided by the concrete core located at the George Street end and the 'mega' steel brace frame built into the Brisbane River side end of the building.



### Brisbane Square

266 George Street, Brisbane, QLD

developer:

**ABN AMRO**

builder and project manager:

**Baulderstone Hornibrook Pty Ltd**

structural engineer:

**Qantec McWilliam**

[now t/a Opus Qantec McWilliam]

architect:

**Denton Corker Marshall**



Integration of the 'mega' steel braces required unique connection detailing

## Construction industry prefers superior value of concrete framing

The original site owners Suncorp Metway engaged the engineer and architect to produce building designs and documentation sufficient for a traditional procurement process. The Brisbane construction market has a dominant predisposition for concrete framed structures based on concrete's strong record for cost, speed and reliability. With this in mind only concrete framed options were considered by the structural engineers Qantec McWilliam. This decision was validated during the tendering process with no builders wishing to consider a structural steel option. Shortly after BHPL were awarded the tender the site and project was sold to ABN AMRO who renegotiated the contract to be design and construct, with the consultants novated to the principal contractor. Having reviewed the proposed concrete frame design with post-tensioned floors at tender stage, BHPL accepted the design with little changes and construction commenced in November 2003.

### Maximising the cost benefits of concrete framing...

Several minor changes to the original design were made by BHPL to make improvements in the cost and speed performance of the concrete structure. These included optimising some beam sizes to simplify formwork and changing some insitu concrete perimeter beams to precast to eliminate formwork in difficult access locations.

### Premixed concrete supply innovation delivers speed...

The innovative technique of maturity age modelling was used by premixed concrete supplier Hanson Concrete to give accurate real time strength development predictions of the maturing concrete. This enabled BHPL to undertake formwork stripping and post-tensioning operations at the earliest possible time thereby increasing speed of construction.

Floor cycle times varied with different levels due to their varying structural complexity introduced by the 'mega' brace. The shortest cycle time achieved on the tower was 6 days, while 7 days was a typical cycle.

### Concrete framing the low risk option...

A well integrated concrete supply chain supports the prevalence of concrete construction in the Brisbane market. BHPL deemed the abundance of supporting sub-contractors and trades to be a critical component of their low risk assessment of concrete framing, along with its reputation for reliability in budget and construction speed planning.



### Innovative concrete construction

Using versatile systemised formwork and working in close collaboration with the formwork contractor was a key element of BHPL's construction solution to a complex engineering structure. Crane reliance was reduced by using two externally positioned formwork hoists for moving table forms used for suspended floor construction to subsequent levels..



Self climbing 'ClimTrac' formwork was used to construct the three external columns

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

- Self climbing jump form core construction.
- Self climbing 'ClimTrac' platforms used to elevate the three external column's formwork as well as selected complex perimeter beams.
- Maturity age modelling predicts real time concrete strength.
- Remote core and 'mega' brace engineering solution for lateral load resistance.
- Brisbane Square is the largest office building to be awarded a 5 star Green Star (office design v1) rating.

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