Precast concrete framing answers the speed challenge

An urgent need for new multi-function educational facilities at Deakin University's Melbourne campus at Burwood called for an innovative construction solution that could maximise speed. The University also stipulated an energy efficient design in keeping to its principle of supporting ecological sustainable design (ESD).

The project team led by Wycombe Constructions opted for precast concrete framed structures. Utilising precast manufactured off site within a fast-tracked design/ construct methodology, the rapid construction time-table was met. The result is Central Precinct, four new inter-connected buildings that form a new heart for the Burwood campus.

North Building, general purpose teaching, 3 storeys, 6000 m^2 floor space, completed in 6 months (structure 3 months)

East Building, multi-purpose single-storey hall, 11 m high ceiling

South Building, 680 seat lecture theatre facilitated via split level insitu concrete floors

West Building, hospitality, retail and function spaces, 3 storeys

Project budget $45 million

The solution

An early decision to maximise the use of precast concrete in the structure was made to shift production off-site, reduce on-site labour, better manage building risks and ensure the scheduled speed of erection.

The two multi-level North and West Buildings yield large clear teaching spaces from suspended floors of precast hollowcore planks, pre-cambered, spanning up to 11 m between precast inverted t-beams. Precast panel lift cores provide lateral stability to the structures for wind and earthquake loads, with precast columns and load-bearing walls completing the structure.

Deakin University Central Precinct Project

Melbourne Campus at Burwood, Vic

builder:
Deakin University Project Design and Construction Management, Wycombe Constructions

structural engineer:
Meinhardt

architect:
H2o Architects Pty Ltd

'Brick-snap' method (thin tiles of brick) creates expression in precast facade

Concrete framing provides value

The greatest challenge and construction risk on the project was identified as meeting the ambitious time schedule. Structural framing options were reviewed as to their likely speed performance and their impact on mitigating the risk of delays and cost penalties. Risk assessment/ management adjustments were applied to costing estimates for the structural framing alternatives considered, which included instu concrete, steel framing and precast concrete.

Precast delivers speed

By selecting precast as the dominant structural framing component, off-site manufacture could be employed to meet the construction schedule by removing it from the on-site critical time path. The North Building precast elements were produced first and while they were being erected by rigging crews on-site, the precast elements for the West Building commenced production. This continuous production process continued until completion of the entire project. In some instances a second rigging crew was utilised to open up multiple work-fronts for precast erection.

Precast delivers cost savings by lowering risk

Precast minimises on-site labour and labour associated risks. A major objective for the Builder was to avoid industrial dispute delays, and of course minimising the reliance upon on-site labour greatly assists achieving this aim. The reduced construction time facilitated by precast proportionately reduces the exposure period for overall building risks.

Precast construction effectively reduced the builder's overheads and preliminary up-front costs on the project. For example, precast structural elements require only minimal safety scaffolding, as the structure is immediately self supporting with temporary welded connections, prior to permanent grouted fixings.

Concrete facilitates ESD principles in design

Ceilings were off-form painted concrete soffits, to efficiently allow the thermal mass of concrete to regulate internal space temperatures using minimal artificial means. Walls were similarly treated with just a paint finish. Mechanical heating/cooling plant was minimised due to the skilful use of concrete thermal mass by the service consultants, who also utilised the hollow-core ducts to distribute air throughout the buildings.

Innovation

A unique architectural expression on the precast walls to the East Building sports hall was created using the brick-snaps system. Thin tiles of brick are pressed into the face of the panels to create a geological layering effect in the final building form.

On some facades of the two multi-level buildings, the precast up-stand walling acts as a deep beam, with a built in corbel edge supporting the hollow-core flooring planks. Negating the need for an edge beam, this innovation saved both time and money.

Key features of the design-and-construct solution:

- Unique procurement model – Deakin University are the provider, user and construction manager for the project.
- Precast concrete frame maximised erection speed while minimising scaffolding, on-site labour and overall building risk.
- Fire performance assessment reduced sprinklers due to inherent fire resistance of concrete elements.
- Energy efficient design incorporating concrete thermal mass predicted to save 20% energy consumption.

Long spanning precast hollow-core floor planks prior to concrete topping

CEMENT CONCRETE & AGGREGATES AUSTRALIA

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