

ComFlor Case Study

ComFlor 80: C1 Towers



ComFlor makes for quick construction on C1 Towers

Project Summary

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| Project name: C1 Towers |
| Location: Christchurch CBD, NZ |
| Structural engineers: Structex |
| Designed by: Foley Design Ltd |
| Main Contractor: AMC Construction |
| Project type: Apartments |
| Mid-floor: ComFlor 80 |
| ComFlor used: 12,000sqm |

A new tall steel building for Christchurch

When property developer Ernest Duval of the Equity Trust Pacific Group briefed Foley Design Ltd on his requirements for a high-rise, it was originally going to be 18 storeys in concrete. "It included the parameters for a hotel above the ground floor restaurant and retail outlets, with apartments above the hotel and a penthouse office suite," says architect Rob Campbell. "Then the project team reassessed the proposed five levels for underground parking. The sheer cost of excavation would have been prohibitive. The team began to look seriously at the alternative: above-ground parking."

A.M.C. Construction's Anton Summerfield engaged Structex Ltd to explore a steel option. Structex called on SCNZ's preliminary design team who were able to recommend the steel option as being 40% lighter than a concrete frame. The savings on the foundations alone made this attractive. But so too did the indicated speed of construction. As Anton said: "It wasn't going to be the cheapest solution by much, but it was going to be the quickest. This meant that A.M.C. Construction could commit to a completion date by the end of 2008."

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One of the chief constraints of the site, apart from its being tight, was the poor ground condition. This necessitated 30 concrete piles ranging in depth from 9 – 12 metres, each pile being 1500mm in diameter. Structex's Sean Gardiner: "Once we overcame the problem of soil heaving, caused by the ground water rising inside the steel caissons, we began to win the piling battle. The self weight of the concrete piles supports the weight of the building, but it was necessary to supplement these with steel screw piles, which have a helix on the bottom, to provide tension uplift capacity, as well as

Why ComFlor?

Performance:

ComFlor provides a bracing diaphragm for the structural steel during construction, eliminating dedicated bracing elements required for pre-cast construction.

Simplicity:

ComFlor 80 "doesn't need temporary propping and can be manhandled into position for stud welding very quickly, saving time and money". (Source: SCNZ magazine)

Cost efficiency:

The speed of installing ComFlor 80 reduced the construction cost and helped give earlier access to rental revenue.

Sustainability:

ComFlor is fully recyclable at the end of the building's life and utilises up to 12% recycled steel during manufacture.



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Composite floor decking

ComFlor 80: C1 Towers



additional compression capacity. Some 70 tonnes of reinforcing steel went into the foundations. All told, around 650m³ of concrete were poured.”

The design team’s solution to the car parking problem was to devote the four levels above the ground floor lobby to seven robotic car stackers; each stacker can accommodate between 8 and 15 cars, giving parking for a total of 91 vehicles. They will sit in a void between level two and the underside of level six. This void presented a challenge with the design of the columns, since these would be unbraced in one direction for almost 13 metres. Sean Gardiner again: “We opted for the Steltech 600 HCC (High Capacity Column). This has a flange and web of 50mm and weighs 667kg/m – Steltech’s heaviest.

“To achieve sufficient torsional stiffness and improve the deflection performance, we designed Eccentrically Braced D-Frames that formed a structural tube extending up the centre of the building from level one the full height of the tower. There are additional EBFs to the perimeter of the podium which provide further stiffness. At ground level, because the architect wanted an open walkthrough structure and preferred the EBF not to be visible, we changed it to a very heavy portal frame, again using 600 HCC to construct a super-frame arching over the doors and windows. This was designed to elastically take the over strength loads of the EBFs above while maintaining the stiffness of an EBF system.”

The fabrication and erection of the more than 800 tonnes of structural steel required for C1 was by a joint venture between the Christchurch firm Pegasus Industrial Engineering Ltd and Tauranga based Jensen Steel Fabricators Ltd. Pegasus’s Managing Director Gavin Lawry explains how they tackled the shortage of set down space: “From the ground floor level we delivered six storey high frames to site, the biggest being over 19 metres long and almost 9 metres wide. It weighed 28 tonnes and was lifted using a 220 tonne mobile crane and a 130 tonne tailing crane. Thereafter we used the tower crane, which gave us the capability of erecting frames for three floors at a time.”

The flooring system is Comflor 80 from Corus New Zealand Ltd and was installed by another leading Christchurch company,

John Jones Steel Ltd. Managing Director Frank Van Schaijik says Comflor 80 makes for smarter, faster construction. “It doesn’t need temporary propping and can be manhandled into position for stud welding very quickly, saving time and money.” Above the car park space, the Rendezvous Hotels chain has 14 floors and 171 rooms. Above the hotel, after level 19, there are 15 luxury apartments and the penthouse office suite. Counting the ground floor, the building has grown from 18 to 23 floors. At the very top, the four legs of a structural steel pyramid come to a point topped off by a mast of 13 metres, giving a total height of 86 metres. When finished, C1 will be the tallest building in the South Island.

Comflor 80 makes for smarter, faster construction: “It doesn’t need temporary propping and can be manhandled into position for stud welding very quickly, saving time and money.”

The typical cladding is precast concrete panels that clip on to the structural steel frame; the panels are designed to prevent them from interfering in the structure’s lateral load resisting system. Around the podium, there is a similar, light-weight cladding system done in stone.

“The external appearance is kept appropriate to the distinctive architecture of this district of Christchurch,” says Rob Campbell. “We also sized the structure to incorporate architecturally the installation of mass dampers at a later date, should they be needed. Mass dampers counter the tendency of tall buildings to sway during wind gust. C1 has been assessed as having serviceability limit state accelerations close to the recommended limits. It’s not a safety issue but simply a matter of human comfort. If dampers are required, they will be tuned to the frequency of the building. By making provision for them, we preserve the aesthetics of the design.” (Main article text sourced from SCNZ magazine, Nov 2007).

To learn more about ComFlor, the C1 Tower project, or other projects that have used ComFlor to their advantage call +64 (0) 271 7180 to arrange an in-practice presentation from one of our representatives.

