ComFlor Case Study

ComFlor 80: Twenty-one Queen Street

ComFlor employed in construction at Twenty-one Queen Street

Why ComFlor?

Performance:
ComFlor's unique design, with its rounded corners, has the longest span of any composite steel deck in New Zealand meaning fewer beams and columns, ultimately creating spacious offices more easily.

Simplicity:
Multiple levels can be constructed at the same time.

Cost efficiency:
Elimination of the need for temporary propping saved unnecessary expense.

Sustainability:
The composite nature of the steel decking used with concrete provides the ongoing benefits of thermal mass through the building's life.

Project Summary

Project name: **Twenty-one Queen Street**
Location: **CBD, Auckland, NZ**
Installer: **CFD South Island**
Structural engineers: **Murray Jacobs Ltd**
Designed by: **Peddle Thorp Architects**
Main Contractor: **Fletcher Construction**
Project type: **Commercial Office Building**
Mid-floor: **ComFlor 80**
ComFlor used: **2950sqm**

ComFlor helps create flexible office space at Twenty-one Queen Street

The original office building at Twenty-one Queen Street, Auckland, was certainly not a prime piece of real estate and at 14 levels the concrete structure had not achieved its allowable floor ratio. Even before AMP NZ Office Trust (ANZO) struck the deal to buy the property, they were strongly motivated to maximise the net lettable space. By the time the purchase was made, a design/build team consisting of Peddle Thorp Architects and Fletcher Construction, both of whom had worked on the 1973 building, had gone through several iterations as to how its value was going to increase. The addition of HVAC design firm Norman, Disney & Young, underlined the serious commitment to ESD (Environmentally Sustainable Design). The consulting structural engineer joining the team was Murray Jacobs Ltd; the steel constructor was Enterprize Steel Ltd..

"To their credit," says Wade Jennings of Peddle Thorp, "ANZO gave us the freedom from day one to design for real ESD benefits. These are not mere "greenwash" such as is often bandied about in the marketplace but actually make a positive commercial impact when the life cycle of the facility and its maintenance loads are accurately calculated. The design/build team achieved real ESD by taking the client through serious design exploration to arrive at an integrated solution."

> "In the process, we had to meet cost/square metre specifications and lead times while achieving ESD performance targets and give the building an identity and presence. I think we got it about right."

Four storeys and a plant room were to be added to the existing 14 storeys, immediately raising questions about the vertical gravity load, not to mention the horizontal load when wind and earthquake action were taken into consideration. The present strength

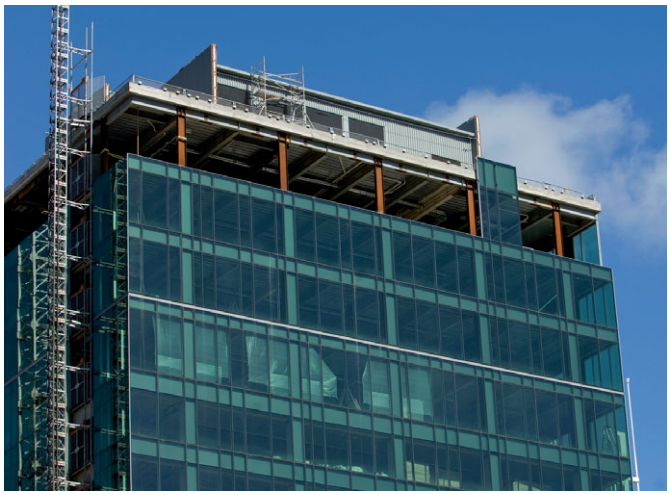
corus

Corus International
7 Bruce Roderick Drive,
East Tamaki,
PO Box 58880, Greenmount
Auckland, New Zealand

T: +64 (0)9 271 1780
F: +64 (0)9 271 1970
E: comflor@corusnz.com
www.comflor.co.nz

ComFlor Case Study

ComFlor 80: Twenty-one Queen Street



of the building, from foundations to top, had to be assessed; would the foundations and the existing concrete columns need to be strengthened? Not at the perimeter of the building, where architectural concrete panels were replaced by a much lighter double-glazed façade. But at the central core, Square Hollow Section (SHS) columns were bolted to the face of the existing concrete columns to strengthen them. Just below each floor level, the connections were made with angled steel plate welded to the SHS and bolted to the concrete column with vertically slotted holes; this was to prevent the vertical load of the new steel columns from transferring into the concrete columns. The connections were designed to provide restraint to the SHS columns preventing them from buckling because of their long length from the B2 level all the way up to the new roof at level 18.

Murray Jacobs: "We had geotechnical confirmation that the 1973 piles were adequate for the weight that was being added. So we were able to concentrate on estimating the shortening that the long steel columns would undergo. These, however, did not shorten by as much as we thought they would. The Steltech beams had so many penetrations to take the air-conditioning ducting that we designed full length reinforcing plates along the top and bottom of the service penetrations. Even though the beams span 11 metres, we were able to calculate the deflections accurately, so that when the slab was poured on the ComFlor 80 there was no unexpected sagging. Level 15 needed no propping. At level 18, which was to be the plant room floor, we used Traydec for acoustic reasons, propping down to level 17 and continuing with 50% propping on level 16."

The design team's sense of aesthetics was applied to the plant and lift room, hiding these behind glass louvres set in steel frames 6m tall and 1.8m wide.

These louvre frames follow the perimeter of the top of the building. Another visually appealing feature of the building is its balcony on the North elevation overlooking QEII Square. The 4m-wide balcony extends across three bays of the perimeter columns and consists of portal members that have been fixed through the concrete columns to a height of two floors (6.4m).

Finally, the building has been double glazed. Wade Jennings again: "It's high performance glass (shading co-efficient of 0.29 maintaining 51% VLT (Visible Light Transmittance) but we have maintained near enough to a 50:50 ratio between a vision panel and an insulated spandrel façade. This has been achieved by insulating the columns and beams and playing with the sill height to tune the façade. The building occupiers will perceive a floor to ceiling glass environment.

"Even though the beams span 11 metres, we were able to calculate the deflections accurately, so that when the slab was poured on the ComFlor 80 there was no unexpected sagging.

"Energy is the big concern," says Wade, "not just in terms of the efficiency of the mechanical plant and electrical usage but also in reducing the heat load. HVAC is via a chilled beam solution delivering 100% fresh, pre-conditioned air with more than 150% of the volume required by the Building Code. In design terms the façade is a skin that required the balancing of a large set of numbers that had a direct impact on mechanical and electrical lighting systems. In the process, we had to meet cost/square metre specifications and lead times while achieving ESD performance targets and give the building an identity and presence. I think we got it about right."

A final word from the steel constructor, Colin Ross of Enterprize Steel Ltd: "As with all design/build projects, numerous design changes throw up challenges, and it's here that today's steel constructor plays a vital role. He has to be very practical and ensure that each variation in the design can first of all be fabricated and erected. Often he also has to contend for changes that keep the project within its budget. The best approach is for everyone on the design team to ensure that the progressive design is sufficiently detailed for there to be no nasty surprises. It's our experience that the practical ramifications of an evolving design need to be carefully analysed even before the drawings are issued. Some problems can be genuinely overlooked through inexperience, but when that occurs it should be a learning opportunity. A good steel constructor brings experience that ensures potential problems are identified and rectified through shared inputs. There's just no room for laziness or the cascading of responsibility. When everyone on the team pulls his weight, we can all sleep easy." (*Main article text sourced from SCNZ magazine, Nov 2008).*

To learn more about ComFlor, the Twenty-one Queen Street 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.

corus

Corus International
7 Bruce Roderick Drive,
East Tamaki,
PO Box 58880, Greenmount
Auckland, New Zealand

T: +64 (0)9 271 1780
F: +64 (0)9 271 1970
E: comflor@corusnz.com
www.comflor.co.nz