

# Spectacular steel supports concrete



NSW and Queensland, said that changes to business methods and new technologies meant that, with minor changes to the design, the original tower was now feasible.

Lorenzo Marengo, Structural Engineer with Connell Mott MacDonald, said that the existing core would become the prime element bearing the full load of the building. “The original cantilevered transfer structure was designed to distribute loads from the original

perimeter columns back into the core.”

“While it was originally designed in reinforced concrete, we have incorporated inclined steel tubular struts of 914mm diameter with steel and post-tensioned cable ties within the lowest office floor slab. These act in a truss-like manner to make erection and construction more efficient.”

The steel components are mainly in this transfer structure however, there are also four “collector” steel beams per typical floor. The inclined steel tubular transfer struts are 914 diameter x 12.7 mm plate hollow tubes.

The transfer deck ranges from 200UB to 700WB while a typical floor is 610UB125 with 300x24 bottom flange plate.

Joe Loreface, Grocon’s Project Manager for the Tower, said that working above the Masonic Centre, which remained fully operational during construction, posed extra challenges. Construction was commenced early in November 2002 with erection of a crane and early demolition works to remove the temporary roof over the Tower Core on the roof of the Masonic Centre.

The transfer structure, which took three months to build, rises from the existing core at level six and will consist

of two non-tenanted floors housing plant and equipment.

“If we had been building from the ground up we could have used temporary supports during that phase,” Mr Loreface said. “However, because the Masonic Centre is located underneath the Tower those standard engineering solutions were not available.”

“The transfer structure needed to be built in such a way that it is self supporting during erection and pouring. The wet concrete load could not have been supported by the existing Masonic Centre roof. Therefore, the structural steel grillage on level seven was formwork support, as well as acting as a horizontal tie. In fact the steelwork becomes redundant once the concrete has cured.”

“The benefit of using steel was that it facilitated construction of the concrete filled sloping struts. It was an effective way of handling the 11 metre spans as trimmer beam for the Ultrafloor precast concrete beams at the corners of the typical floor.”

The structural steelwork has typical standard connection details. The post tensioned anchorage system has 110 thick, 750x550 anchor plates, which are cast in the concrete edge beam and are detailed as live ends at both faces of the building (the tendons are generally uninterrupted between opposite faces of the building) though they are actually stressed only from one end.

The steel was generally grade 300 with grade 250 for the post tensioning anchor plates. The average typical floor self weight is about 4 kPa. The total steel tonnage is 460 tonnes.

PTW’s architect Andrew Andersons says he is privileged to be working on such an extremely rare and exciting building. He parallels it to other iconic brutalist buildings such as Le Corbusier’s La Tourette in Lyon, Unite d’Habitation in Marseilles and the Chandigarh in the Punjab.

**Architect:** PTW

**Engineers:** Connell Mott MacDonald

**Builders:** Grocon

**Fabricator:** Allfab Constructions

**Steel Detailers:** Allfab Constructions

The Civic Tower under construction in the Sydney CBD takes its name from the spectacular 24-storey cantilevered tower which rises like a missile from the solid structure of the old Masonic Centre below.

PTW’s Architect, Andrew Andersons says the tower is original to the 1974 Joseland Gilling design for the old Masonic Centre, which had been approved by the City of Sydney Council.

Changes to the design would have meant delays and cost increases so Grocon, the development arm of the Melbourne based Grollo Corporation, who are the developers and builder on the project, took the decision to stay with the approved designs, which were for a concrete structure.

The spectacular expressive cantilevers have earned the accolade of “engineering masterpiece” but their construction has not been without challenge, due to the design and the congested city location.

As part of the original design, the footings and central core were constructed in conjunction with the Masonic Centre and completed in 1979. However, the economic downturn in the 80s precluded the tower structure from being built.

Grocon bought the site in 1999. Nick Lucas, Grocon’s Head of Development for