Form and function intersect

Steel Australia **spoke with Aurecon engineer, Tony Lavorato about the unique challenges of working on the 2016 National Steel Excellence Awards Large Projects winner, Sydney's 5 Martin Place and why adaptability is key to building designs of the future.**

Mr Lavorato has made a specialty of hatching design solutions to overcome challenging project constraints.

He describes the building as one of the most complicated of the many developments he has worked on across a three-decade-long engineering career. As lead structural engineer on the Grocon project which ran from 2011 to 2015, Lavorato faced dealing with the tight confines of the building's CBD location, a restricted construction zone and building height limitations, not to mention the very substantial challenges associated with constructing a new building over an existing heritage edifice.

"The project is by far the most complex in terms of engineering gymnastics of any building I've ever been involved in," Lavorato said.

"It's a fact now that there are no easy building sites left in the city of Sydney. If there's not a substantial building on the site now, there's a good reason for it – there's a tunnel under it or there's a restriction of some kind associated with it."

Of all the challenges associated with restoring 5 Martin Place, the key one was how best to rejuvenate a century-old building and extend its net lettable area, while also retaining its distinctive historic character.

Constructed in 1916 to house the headquarters of the Commonwealth Bank of Australia, the 'Money Box' building as it came to be known was one of the first in the world to use a structural steel frame. Extensions were added to the building in 1930 and then again in 1968.

With Lavorato as Principal Structural Engineer and working closely with builder Grocon, the design team arrived at an innovative steel-framed solution that involved demolishing the 1968 structure and replacing it with a new 20-storey building, part of which (levels 11–20) was to be cantilevered over the existing heritage building.

Tony Lavorato

"The floorplate in the new building has very few internal columns so we utilised long-span large panels and had to take dynamic load very heavily into consideration," he said.

Liberty OneSteel supplied a range of beams from 360UB to 610UB sections to enable the new building's significant spans.

Lavorato's approach involved reducing the number of steel members and altering their type. The major compression elements were changed to concrete-filled steel tubes, which allowed the concrete to resist about 80 percent of the load, while still retaining the erection advantages of steel. The major tension elements were constructed using post-tensioned concrete.

The new 5 Martin Place building is now a light-filled premium grade building offering 33,860sqm of nett lettable area and a full complement of tenancies across 20 levels.

An eye on the future

The idea that buildings can make a significant contribution to the social fabric of a city is something Lavorato says has increasingly motivated him as his career has progressed. He sees steel as making an important contribution to the urban renewal process right around the world. Steel's main advantage is – and will continue to be – its flexibility, he says.

"Structural steel can provide fantastic flexibility in the way it can be transformed, allowing designers the ability to adapt flooring to put in additional stairs or introduce voids, for example. Another very real advantage of steel is that it allows us to disassemble buildings in which steel is used so that it can be repurposed."

He nominates London's Leadenhall Building as a recently built structure that has impressed him for its adaptability.

"The driver for it was to reduce the amount of poured concrete used, so it has ended up using structural steel in a really innovative way," he said.

The need for flexibility in how we conceive of our built environment is something Lavorato expects will continue to influence our approach to building design.

"We don't know how we'll work in 10 to 15 years, but if we can produce a design that's adaptable – and steel certainly lends itself to that – we can ensure our buildings satisfy our demands well into the future."

The 2018 Steel Excellence Awards are now open for entries which can be lodged via the online portal at: ***steel.org.au/events/awards/***