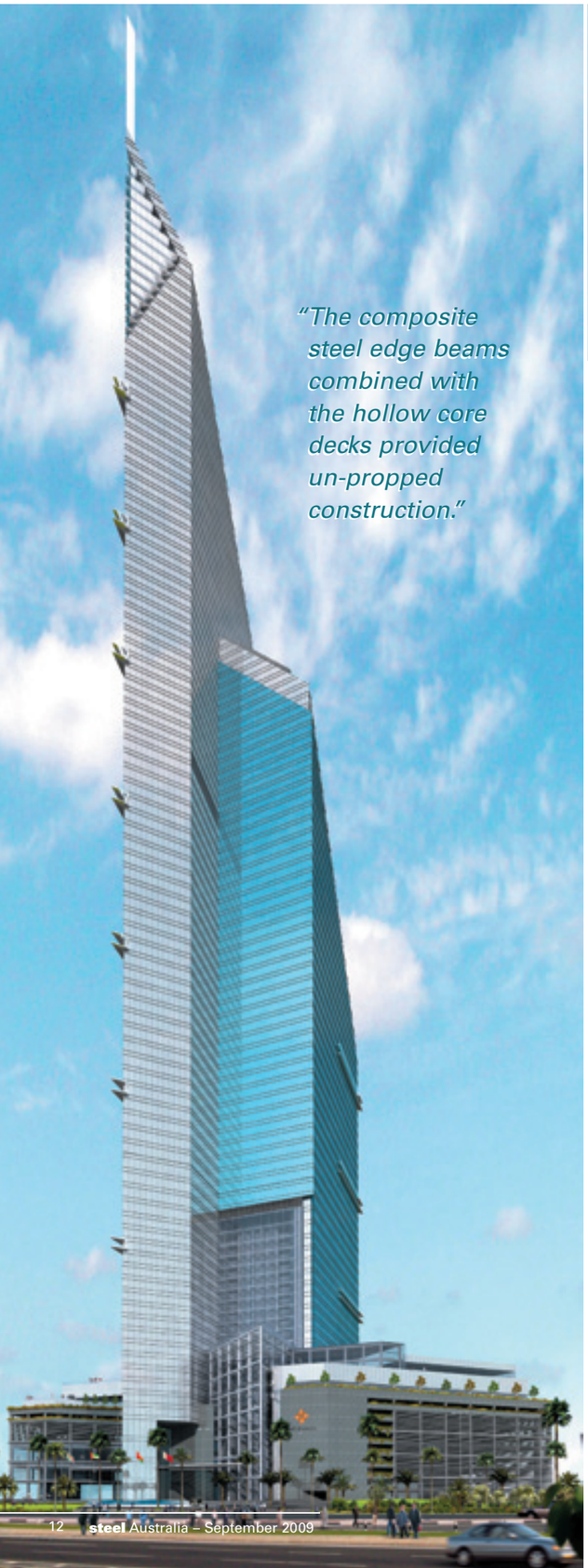

"The composite steel edge beams combined with the hollow core decks provided un-propped construction."

Marriage made *for* the heavens

DUBAI TOWER, DOHA

BY ALAN MARSHALL

A clever marriage of concrete and steel is destined to be the tallest tower in Qatar at a height of 437 metres and join the ranks of the world's top twenty tallest buildings.

With over 90 levels above ground and five levels of basement car parking planned, the mixed use Dubai Tower for the West Bay district of Doha will include a 7000sqm retail area, 13 floors comprising a 225-room five-star hotel, 29 floors of office space and 31 floors containing 226 luxury apartments and three super luxury penthouses.

The lateral stability of the tower is provided by the high-strength reinforced concrete core in conjunction with composite steel and concrete outriggers and perimeter belt trusses at plant-rooms.

Perimeter columns are a combination of high-strength reinforced concrete and concrete-filled steel tubes engaged in the wind frame by the outriggers and perimeter belt trusses.

Principal Structural Engineer, Sydney-based **John Merrick** from Hyder Consulting worked as sub-consultant for the structural design of the tower.

He said the key aspects of the final design were a compatible floor, beam and column construction system composed of steel perimeter beams and concrete-filled steel columns with a short construction cycle.

"Reinforced and post-tensioned modes were considered, but a composite steel solution was determined to be the most appropriate due to the ready availability of local pre-cast hollow core planks and the ability to maintain the direct line of the perimeter columns through a mixed usage structure," Mr Merrick said.

"And only two column transfers from a total of 22 tower columns is a great achievement both architecturally and structurally."

In these two instances, composite steel and concrete trusses supporting up to 85 levels spanning 16 metres were designed and detailed.

He said that the main advantage of this approach is speed. The hollow-core floor plate panels span between the core and perimeter steel beams un-propped.

The concrete filled tubes can be constructed in at least two storey lengths and the composite box sections are constructed in segments. Once the temporary connections for the box sections are in place, the box section steel plates are fully welded and filled with 80MPa concrete.

"We took advantage of the inherent stability and better load capacity of the concrete filled tubes to erect them several storey heights ahead of the actual floors," he said.

"The composite steel edge beams combined with the hollow core decks provided un-propped construction, although it did necessitate pre-cambering and fire protection of the steel beams."

One of the major challenges in this tower was the design and detailing of the composite outrigger connections to the concrete core to transfer significant axial and shear forces.

He said that although the steelwork in the completed state will be enclosed by the façade, a key design aspect was the consideration of creep and shrinkage effects over time.

"Based on recognised international research, the differential shortening between the perimeter concrete filled steel tube columns and high strength concrete core was deemed minimal compared to a reinforced concrete column."

Once completed in 2010, the development will contain world class retail, offices, hotel, serviced apartments and residential units designed to both recognised international design codes and international research.

Situated on Doha's prominent cornice edge, this crystalline glass tower is intended to provide an iconic and symbolic reference to the aspirations of the Emirate of Dubai in the neighbouring city of Doha, Qatar. Situated on the Corniche that skirts Doha Bay, 95 percent of the tower will see the seascape.

Project Team

Project Manager: Robert Matthew Johnson Marshall (RMJM)

Architect: RMJM

Structural Engineer/MEP Engineer: RMJM

Tower Design Sub-consultant: Hyder Consulting

General Contractor: Al Habtoor-Al Jaber Joint Venture

Cost: A$2.7billion (approx.)

* Images courtesy of Robert Matthew Johnson Marshall