

## Surveyors charged with tall order



**Gold Coast surveyors, Treasure and Associates have been charged with a tall order - the surveying and monitoring of the world's soon-to-be tallest residential building - "The Q1 Tower". Currently being constructed in the heart of Surfers Paradise on the Gold Coast of Australia and planned for completion in 2005, the architecturally stunning tower will soar to a massive 80 storeys (323m / 1,058 ft). By March 2004, construction of the complex had reached level 30 and just 46 apartments remain for sale.**

**(below from left): Brian Rogers and Rod Stead from Treasure and Associates together with Lawrie Watson from Leica Geosystems' Australian distributors, C.R.Kennedy and Company Pty Ltd.**

Developers, Sunland Group Ltd have designed the Q1 Tower to offer five-star resort living, with 527 apartments comprising of pent-houses, as well as one-, two- and three-bedroom apartments. The fastest lifts in Australia travelling at 9.0 m/s (1772 ft/min) will take visitors and residents to the

observation deck at the top of the tower where they will enjoy the breathtaking views that encompass the crystal clear waters of the Pacific Ocean; the 42 kilometres of pristine sandy beaches of the Gold Coast; the green hills of the hinterland; as well as the extensive waterways and the Broadwater. A ten-storey Sky Garden from level 60 upwards will showcase tropical Queensland's unique flora and fauna.

### Engineering innovation

Despite its lavish features and impressive grandeur, it is the engineering behind its construction where Q1 achieves real innovation. Construction challenges were encountered due to the sandy soil and proximity to the ocean, which meant that it was necessary for foundations to stretch almost 17 storeys underground. After boring through the ancient seabed, drillers eventually struck rock that was seven times harder than concrete and literally drilled the 26 building plings 5 metres into it. The six largest of these span 2.4m in diameter.

During construction, a polymer liquid was used prior to pouring of the concrete to prevent the sand falling in. The aboveground construction wasn't easy either, with the outside building columns needing to be linked to the central core to minimise wind movement and to strengthen the structure. Although concrete performs exceptionally well under compression, it does not perform so well under tension, so it was necessary to reinforce the concrete with steel bars (rebars).

### Monitoring of the construction

Brian Rogers and Rod Stead, Project Managers of surveying consultants Treasure and Associates, have been working closely on the logistics involved in monitoring the construction of the massive building. A significant problem in monitoring is the wind movement. "We prefer to do the surveying work during times of low wind," Rod Stead said. "The sea breeze can cause the buildings to move up to 20mm." Plumbing of the lift shafts is undertaken by the builders



### World record holder

**The Q1 tower will hold a number of world records. When completed it will become the tallest residential tower in the world and will eclipse world famous structures such as New York's 319m Chrysler building and the 321m Eiffel Tower in Paris. Its oval-shaped spire, which starts at level 50 (146m high) and extends 47m above the glass fin, will be the world's longest at 176m in length. It also boasts the highest swimming pool in Australia (15m x 6m), which will be located in the penthouse on level 74, 217m above ground level. Q1 will be the 16th building on the Gold Coast to hold the "tallest title" since the first highrise was built in 1957.**



for verticality. Surveyors then check the walls and columns using external control. This determines how straight the structure is and whether there is a twist. Brian Rogers said: "When plumbing, you get accumulative errors, and these errors are exacerbated when the cranes and hoist are working. Crane hours are paramount on these sites, and everything is scheduled around the crane so it's not ideal for this type of monitoring most of the time during the construction."

### 'Radiation' surveying

In an attempt to overcome this problem, the so-called 'radiation' surveying method was used. This involves re-section with a free-standing total station from the control network (some are ground marks and others are on surround-

ing buildings). "Prisms are permanently attached to surrounding buildings," Brian Rogers said. "These are checked using a Leica TCR1101 with Automatic Target Recognition (ATR) both day and night if required." "This method means we work from the whole to part and it allows us to establish our stations at the most convenient position," said Rod Stead. "Using a one-second machine with ATR means we can get results down to a 10mm accuracy."



*(above): Surveyor, Brian Rogers of Treasure & Associates uses a Leica TCR1101 for monitoring on the Q1 construction site.*

**Bt**



*(above): aerial view of the construction of Q1 in July 2003. (below): aerial view of the construction in December 2003. Photos courtesy of Sunland Group*



*(below): an artist's view of the Gold Coast landscape when Q1 construction is completed. Image courtesy of Sunland Group*

**The Gold Coast is not only Australia's sixth largest city, it is also the tourist mecca for the country with over four million domestic and international tourists visiting the city every year.**

