

Connecting Perth's north with the south

The New MetroRail Southern Suburbs Railway connecting north and south bound rail links will use 30,000 tonnes of steel and will effectively double the TransPerth network.

The link from the north of the city to the south is a major feat of engineering connecting Clarkson station north of Perth with Mandurah in the south providing a fast rail service.

Steel proved to be an integral part of the biggest infrastructure project undertaken in the metropolitan area and was used in various aspects including reinforcing bar, steel sheet piles, structural steel support work (strutting and bracing), railway line and the steel framework installed around the vertical sections of the preserved historic buildings.

It will expand the existing railway of almost 100 kilometres by 81



kilometres of new track doubling the existing fleet of 96 rail cars. Annual patronage is expected to grow from approximately 31 million to 51 million passengers in 2008, and 14 new stations will be built.

The construction of the metro tunnels and two stations is well underway in the southern suburbs where the rail line will go underground at The Esplanade, pass under the city into underground platforms at William Street and resurface at Roe Street, to join the Northern Suburbs Railway.

The trains will travel about 800 metres underground through twin bored tunnels with a maximum of 20 metre depth. The tunnels in Perth will be constructed through a mixture of sand, clay and fine gravel, well below the water table.

A launch box structure was built at The Esplanade for the tunnel boring machine (TBM) to enter and begin its journey from The Esplanade Station digging Northwood beneath William Street leaving a 470 metre long circular concrete tunnel in its wake that will surface at the other end via a 'retrieval' shaft. On its way to the William Street platforms the TBM will pass directly beneath four buildings and be dismantled after the breakthrough at the Perth Rail Yard and transported back to the Esplanade Station and re-assembled to begin the second and final tunnel.

Highly sensitive instruments continuously monitored for any sign of movement in the ground and buildings that were protected by

specialised grouting techniques. The massive TBM is 6.9 metres in diameter and was purpose built for Perth's ground conditions by Mitsubishi Heavy Industries in Kobe, Japan.

The speed and accuracy of the TBM as it passed directly under four properties on William Street, is remarkable. With more than 5000 instruments measuring the impact of tunneling activity to sub-millimetre accuracy, Leighton Kumagai Joint Venture recorded less than one millimetre of movement in the buildings above the TBM as it passed beneath them.

The TBM broke through into the William Street Station box at 20 metres below ground, within five millimetres of the design tolerances. This was achieved with less than one millimetre of movement in the buildings above the tunnel.

This project has also set a new record with the deepest excavation to be completed in Perth below the Murray Street Mall at 18 metres which is the equivalent to the height of a six storey building.

Having dug up to four metres below the Swan River level, the excavation has passed through a complete geological cross section of the Perth CBD and most likely through a former river bed.

Dwarfed by giant steel braces and thick concrete slabs, workers have completed the base slab level of the station and are now in a new phase of work, constructing the internal structure of the platforms.

The control of the ground water has meant that the surrounding buildings in the city, including the historic GPO building, are not at any risk as a result of a fluctuation in the water table.

Some internal dimensions of the use of steel in the project:

- 10,000 tonnes of reinforcing bar
- 4,300 tonnes of steel sheet piles
- 2,200 tonnes of structural steel support work (strutting and bracing)
- 15,000 tonnes of railway
- 65 tonnes of steel framework installed around the vertical sections of the preserved historic buildings.