

Fire Towers – steel standing guard

EFFICIENT STEEL DESIGN FOR A NEW GENERATION.

The design, fabrication and erection of these new steel framed fire towers will help protect \$75 million of young plantation forests from fire in New South Wales.

Over the summer months two new fire towers were constructed at Tooloom and Pikapene at a cost of around \$255,000 using steel supplied by OneSteel.

GHD Engineer Hans Jensen, who was the structural engineer on the project, told OneSteel Solutions that State Forests' generic design had to cover towers of 10, 20 and 30 metres founded in four different soil conditions, rock, soft clay, peat or loose sand, and designed for two different wind loads (Region A and B as per AS1170.2).

The towers, Tooloom is 10 metres tall and Pikapene 20 metres, are free standing and modelled as a simple cantilever on an identical footprint.

State Forests' Engineer Peter Dwyer said that in designing the new towers maintenance was a key consideration. The new design did away with the guy wires and

bolted structures and made provision for drain holes to allow drainage and evaporation of any moisture from the inside of the galvanised members.

CONSTRUCTION

The towers are made up from fully welded, shop-fabricated modules of 10 metre lengths, which are then assembled on site by bolting only.

Each module consists of four columns with vertical bracing in the four elevation planes and horizontal bracing ("diaphragms") every five metres.

Whilst the framing layout for each ten metre module is identical, the structural size of the individual members varies to cope with the wind loads which fluctuate with tower height and location.

The platforms for the ladder access to the cabin are also spaced at five metres vertically and form part of the diaphragm bracing.

The concept was to have one set of drawings and specifications for a fire tower.

OneSteel square and rectangular hollow sections were chosen for the vertical bracing, horizontal bracing and most platform members because of their superior structural strength and easier maintenance relative to angle sections used in earlier designs.

The hollow sections have two advantages over angles. They have higher yield strength, 350 MPa or 450 MPa depending on their size, compared to 300 MPa for the angles. Secondly they have greater structural capacity to weight ratio and so are a more efficient member when used in this application.

Additionally the hollow sections have fully welded connections within any module.

Design Concept

State Forests of NSW conceived the idea of a new generation, generic fire tower. The concept was to have one set of drawings and specifications for a fire tower that could be erected to three different heights in varying flat, remote and exposed locations. Although remote, the locations are accessible by vehicle.

"A walkway, cabin, cabin floor, hand rails and ladders were also bolted to the tower, ensuring the integrity of the galvanising was not compromised by onsite welding" said Hans Jensen.

Using OneSteel's TUBELINE® 150x150x5.0 SHS, 125x125x5.0 SHS and 300PLUS® 100PFC and Angles, the ten metre modular tower elements were fabricated under controlled conditions by Future Engineering & Communications Pty Ltd in Western Australia.

After being hot-dip galvanised, the modular elements were then transported to the two sites by heavy vehicle (without the need for police escort) where they were erected and bolted to prepared footings by Comrig National of Adelaide.

FUTURE DIRECTION

Peter Dwyer said "More towers are planned for the future and as old structures reach their use by date they will be replaced by towers of this new generation, standardised generic design needing lower maintenance and with a longer life expectancy."

The strength of steel and efficient low maintenance design – combining to stand tall against the elements



CLIENT

State Forests of New South Wales

FABRICATION

Future Engineering & Communications Pty Ltd

ENGINEERING

GHD Pty Ltd
State Forests of New South Wales

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