AUTOMOBILES ...
OR THE ROADS THEY TRAVEL ON

PROGRESSING FROM OUR THEME IN LAST MONTH'S 2014 EARTH AWARD COVERAGE OF "PLANES, TRAINS ..." WE LOOK AT AUTOMOBILES OR, MORE CORRECTLY, THE ROADS THAT AUTOMOBILES TRAVEL ON.

We have some unusual parallels between last month's rail coverage and this month's road coverage: four of South Australia's five categories were won by rail projects, with one also being a national winner; and the same can be said this month of road projects in Queensland.

Another point of note is that Hazell Bros won categories for road projects in two states – its home state of Tasmania and in Queensland.

All roads lead to Queensland

QLD, National Category 2 (QN2)

McIlwain Civil Engineering (MCE) won both Queensland and National Category 2 Earth Awards for its Spring Creek Road embankment stabilisation project for the state's Department of Transport & Main Roads (TMR).

Spring Creek Road is a two-lane road near Killarney (close to the NSW border), and a section of embankment failed after heavy rain following ex-cyclone Oswald in January 2013. The work was undertaken as part of the Transport Network Reconstruction Program (TNRP).

Although it won the tender based on a conventional design, MCE saw potential problems in delivering this design and submitted an alternative micropile A-frame design *(see sidebar)*.

The design involved 111 high pressure grouted micropiles fixed at the apex by a concrete capping beam. The front micropiles were installed in a vertical row, with the rear row installed on a rake of 30° or 40°.

A rotary percussion drill with 90mm drill bit was attached to a 24-tonne excavator to install Ischebek fully threaded hollow reinforcing bar, with the hollow tube allowing grout flushing during installation.

The micropile A-frame binds a wedge of soil that prevents slope movement and supports the road, while allowing ground water to pass through normally.

QN2 *Completed restoration works on Spring Creek Road*

Although there were delays in gaining approval for the alternative design, and having that design engineered by a TMR-approved geotechnical consultant prequalified to GE3 level, the end result was that there were significant cost savings and actual construction took five weeks (including an extension due to weather) where a 12-week construction time was projected for the original design.

Other advantages of the micropile solution were that it involved no spoil removal and minimal temporary works.

The alternate design involved 3-metre grout columns in place of shotcrete between the front row of micropiles to prevent soil loss. It had a narrower capping beam with Ezy-Guard rail mounted on the capping beam. These changes shifted work away from the batter while maintaining road width.

With the site located above the Condamine River, MCE installed a series of chain wire/star picket catch fences with integrated silt fence along the length of the job to control small rocks and soil rolling into the forest. In areas of higher risk a second and sometimes a third fence was installed.

MCE improved on the original run-off design through a combination of a concrete swale, asphalt shoulder dyke and kerb integrated in the capping beam and discharging through a reno mattress structure at the bottom end to disperse the water at half the velocity of the planned half pipe chute.

A 100-metre lined table drain captures surface water runoff from the road and diverts it to scour-protected discharge points beyond the failure zone (a 375mm cross road culvert was removed from the failure zone).

To manage work above an unstable slope, MCE engaged a Senior Geotechnical Consultant to be present on site and undertake risk assessments of exposed embankments during construction.

TECHNOLOGY THAT TRANSFORMED A PROJECT

THE WIN BY MCILWAIN CIVIL ENGINEERING (MCE) AT QUEENSLAND AND NATIONAL LEVEL FOR THE 2014 CATEGORY 2 WIN EARTH AWARDS OWES MUCH TO THE PIONEERING USE OF MICROPILES IN AUSTRALIA.

A-frame micropile structure under construction, showing the tops of the rows of vertical and raked micropiles and the reinforcing cage for the concrete capping beam

Piling and Concreting Australia (now trading as PCA) researched the technology and imported rigs to undertake the work in Australia. Micropiling is a mature and accepted technology in the US and Europe, but largely unknown in Australia.

MCE recognised issues with the conventional bored pile cantilever wall solution that went to tender for the Spring Creek project, and attendance at a presentation on micropiles by PCA at Engineers Australia raised the possibility that this was a viable alternative.

Keith McIlwain (MCE) attended an industry briefing by the Director General of Queensland's Department of Transport and Main Roads (TMR), who outlined tight funding and the need for contractor innovation to allow work to proceed within the TMR budget.

The design for which tenders were called was prepared by a consulting engineer; and had cased piles socketed in rock, with a reinforced concrete capping beam, shotcrete installed between the piles and drainage installed behind the shotcrete.

This would have required use of a 60-tonne piling rig and 50-tonne crane, construction of a substantial platform above an unstable slope to support the weight of these machines, and clearing of the tree canopy to provide working headroom for the machines. MCE also believed that the chute drain required as part of the design posed a number of potential safety risks during construction.

While MCE was awarded the contract based on the initial design, it pursued its alternative design incorporating A-frame micropiles despite the extensive approval process required. It saw that the alternative would provide significant cost and time savings, reduce traffic disruption to the local community and minimise the need to clear vegetation. PCA was commissioned to provide the alternative design and construct the A-frame micropile structure.

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