

Legacy Way Tunnel

Innovations in shotcrete slump control



Applying shotcrete at the Legacy Way spoil tunnel portal

The Background:

Construction of Brisbane City Council's Legacy Way Tunnel in Brisbane's inner city was undertaken by the Transcity Joint Venture (TJV) from 2011 to 2015. The 4.6 kilometre twin-bore tunnel provides an essential link for traffic between the Western Freeway in Brisbane's west to the Inner City Bypass in Brisbane's north. The tunnel forms part of Brisbane City Council's TransApex transport plan designed to reduce traffic congestion and increase connectivity on Brisbane's road network.

The Challenge:

Whilst tunnel boring machines (TBMs) were used for the main road tunnel, a number of smaller cross passages were constructed in between the two road tunnels for evacuation and emergency services.

These tunnels were made using robotic shotcrete technology from contractor, Jemna.

The shotcrete required for the primary lining of these cross passages had to be delivered to suit TJVs continuous operation program. This involved maintaining minimal impact to the adjacent residents at night.

Hydration-control admixtures in shotcrete mixes are a common solution to provide contractors with confidence that the mix will not hydrate when the spray-application is required. However, this does not always guarantee that the controlled mix will maintain its optimal slump. TJV required an innovative solution where shotcrete could be delivered to site and held at optimal operating slump of 180mm for a period of up to 24 hours.

Project:

Legacy Way Tunnel

Location:

Brisbane, Australia

Project completed:

2015

Owner/s:

Jemna/Transcity Joint Venture

Concrete Producer:

Holcim

Products used:

MasterGlenium SKY 8270

MasterRoc HCA 20

MasterSure 1008

MasterRoc SA 167

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180mm slump shotcrete at 24 hours age



Our Solution:

Master Builders Solutions worked with the principal contractor TJV, shotcrete contractor Jemna, and concrete supplier Holcim to provide an innovative solution that allowed shotcrete to be delivered to site and kept at ultimate working slump of 180mm for up to 24 hours.

- MasterGlenium SKY 8270 was the main superplasticizer to achieve the critical working slump.
- MasterSure 1008 retained the slump over the extended period of time.
- MasterRoc HCA 20 provided hydration control, ensuring security that the shotcrete would not hydrate throughout the extended period.
- MasterRoc SA 167 shotcrete accelerator was added to the mix while spraying the tunnel lining. This ensured high shotcrete early strengths were achieved.

The Customer's Benefit:

- Shotcrete was able to be delivered to site during daylight hours but held for application throughout the evening.
- Less traffic to site during the night minimised the impact of tunneling operations to the neighbouring residential community.
- Concrete supplier, Holcim, was able to minimise costly night-shift operations.
- The ability to control a constant working shotcrete slump minimised the need for re-tempering of the shotcrete mix, ensuring design compressive strengths would be maintained.
- Minimal traffic from concrete agitators allowed improved access to tunneling operations.

Project Facts at a Glance

- Transcity Joint Venture consisted of Acciona, Ghella and BMD.
- Brisbane's Lord Mayor Graham Quirk opened Legacy Way in July 2015.
- Extended slump retention technology has been utilised in other tunnel projects, including the Tintenbar to Ewingsdale Pacific Highway upgrade in Northern New South Wales.
- A number of underground mine sites have also successfully utilised this technology.

Master Builders Solutions

Master Builders Solutions is a leading global manufacturer of concrete admixtures, as well as other sustainable solutions for the construction industry, focused on delivering its vision: Inspiring people to build better. Master Builders Solutions provides value-added technology and market-leading R&D capabilities to improve the performance of construction materials and to enable the reduction of CO2 emissions in the production of concrete. Founded in 1909, Master Builders Solutions has more than 1,600 employees and 35 production sites globally with over 150 employees and 6 production sites operating across Australia and New Zealand. Master Builders Solutions supports its customers in mastering their building challenges of today – for a decarbonised future.

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