

BURNLEY TUNNEL

MELBOURNE, AUSTRALIA
PERMANENT ROCK ANCHORS



Client: Transurban Pty Ltd

Contractor: Transfield Pty Ltd and Obayashi Corporation Joint Venture

Principal Design Consultant: Hyder - CMPS

Specialist Contractor: Menard Bachy Pty Ltd

THE PROJECT

The Burnley Tunnel, on the Melbourne City Link Project, is a 3.4km long tunnel built to carry 3 lanes of traffic and provide a link between the Tullamarine, Westgate, and the South-Eastern Freeways. The City Link project is seen as one of the most important metropolitan road developments ever undertaken in Australia.

The D-shaped tunnel was driven to obtain a minimum cover of 12 metres of moderately weathered to fresh mudstone under the Yarra River. The primary support system used shotcrete, rock bolts and where necessary steel sets during excavation. After excavation, a waterproof membrane and a concrete lining 300 to 450 mm thick completed the structure.

MENARD BACHY'S ROLE

Menard Bachy were part of the remedial works team for the project and the Geotechnical Division was awarded the contract for the detailed design, supply, installation and stressing of 1800 permanent rock anchors to resist the uplift forces on the tunnel floor slabs. An extremely tight construction program was required with work being done over 24 hours and 7 days per week. Construction commenced mid April and was completed by the end of July 2000.

The rock anchors typically spaced at 1100mm centres were recessed into the top of the slab and drilled 10 metres into suitable rock. The anchors consisted predominantly of 7 no 15.2 mm diameter strands and a small proportion of 40mm diameter Macalloy Bar, with working loads of 1000 kN and 700 kN respectively. A sophisticated double corrosion protection system was adopted due to the aggressive environment and the required 120-year design life, with anchors fabricated in an offsite factory. Water inflow from the highly fissured bedrock led to the development of both permanent grouting and temporary mechanical methods of water sealing within the critical time frame.

A major trial of grouting techniques and materials was commissioned during the same period to determine the need, and most appropriate timing, phases and location for supplementary grouting behind the tunnel lining and into the surrounding rock. Over a period of 20 days working 24 hours each day, the very low target permeability was reached with only one phase of cementitious grout injections into the rock. Controlled injection pressures ensured the lining remained as designed.

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