

GROSVENOR DECLINE TUNNEL

QUEENSLAND, AUSTRALIA

GEOLOGY
HARD ROCK &
MIXED GROUND



The Grosvenor Decline Tunnel Project is a metallurgical coal project owned by the Anglo American mining company. Located in Central Queensland, Australia, the Grosvenor Coal Mine is expected to produce five million tonnes of coal per year over the next 26 years. An expansion of the mine necessitated two decline tunnels at grades of 1:6 and 1:8, and TBM technology was utilized for both.

Unique project requirements led to the selection of an 8.0 m (26.2 ft) Robbins hybrid Single Shield/Earth Pressure Balance (EPB) TBM. The machine needed to be able to bore in hard rock and mixed ground geologies and in the presence of methane gas, maintain full ground support at all times, and be removed swiftly from the first tunnel for reassembly in the second.

DUAL MODE CAPABILITIES

Only the first approximately 300 m (984 ft) of each tunnel require EPB mode, so the TBM was optimized towards hard rock excavation. In EPB mode, the machine utilizes a two-stage, center mounted screw conveyor. In hard rock mode, a muck chute deploys around the screw. The cutterhead can be outfitted for both modes, with knife bits and scrapers in mixed ground, and cutters in hard rock.

QUICK REMOVAL SYSTEM

A Robbins-designed "Quick Removal System" allowed the inner core of the machine to be removed from the first tunnel, leaving behind its shields for constant ground support, a requirement in all Australian tunnels. A new set of shields were added to the machine once it arrived at the second tunnel heading 2 km (1.2 mi) away.

METHANE GAS RESISTANT

Project geology consists of potentially gassy conditions, and the machine was designed as Class 1, Division 2, and is coal mine compliant to ERZ-1. Custom features include extraction ventilation by way of a snuffing box at the discharge of the screw conveyor, and flame-proof machine components.



SPECIFICATIONS

GROSVENOR DECLINE TUNNEL | QUEENSLAND, AUSTRALIA

MACHINE SPECIFICATIONS

Maximum Thrust	46,102 kN at 300 bar (4,350 psi)
Cutterhead Drive	Electric, variable speed
Cutterhead Total Power	3,960 kW (5,310 hp)
Cutterhead Speed	0 to 3.2 rpm (constant torque range) 3.3 to 6.4 rpm (constant power range)
Cutterhead Torque	11,563 kNm (8.5 million lb-ft) at 3.2 rpm 5,506 kNm (4 million lb-ft) at 6.4 rpm
Cutterhead Breakout Torque	17,344 kNm (12.8 million lb-ft)
Screw Conveyor Type	Center shaft
Screw Conveyor Diameter	900 mm (3 ft)
Working Pressure	0 to 300 bar (0-4,350 psi)
TBM Length	11,375 mm (37.3 ft), including tail seals
Shield Length	10,530 mm (34.5 ft), including tail seals
TBM Weight (approx.)	835 metric tons (920 US tons) 1,297 metric tons (1,177 US tons) with back-up assembly

MACHINE FEATURES

Cutterhead	Flat-face design 5 x passages for foam; 5 x foam injection ports
Cutting Tools	17-inch Wedge Lock, back-loading cutters in hard rock Knife bits and scraper bits in mixed ground
Probe Drilling	18 x probe/grout ports through shield body
Segment Lining	Reinforced concrete, 350 mm (1.1 ft) thick 5+1 arrangement (with separate invert piece)
Custom Components	"Quick Removal System", methane gas resistant, dual mode capabilities

PROJECT FACTS

Project Name	Grosvenor Decline Tunnel
Project Location	Queensland, Australia
No. of Machines	1
TBM Diameter	8.0 m (26.2 ft)
Tunnel Type	Mine access for men/materials & conveyors
Tunnel Length	950 m (0.6 mi) and 1,100 m (0.7 mi)
Geology	Hard rock up to 120 MPa UCS, sand, clay, and coal seams
Project Owner	Anglo American



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