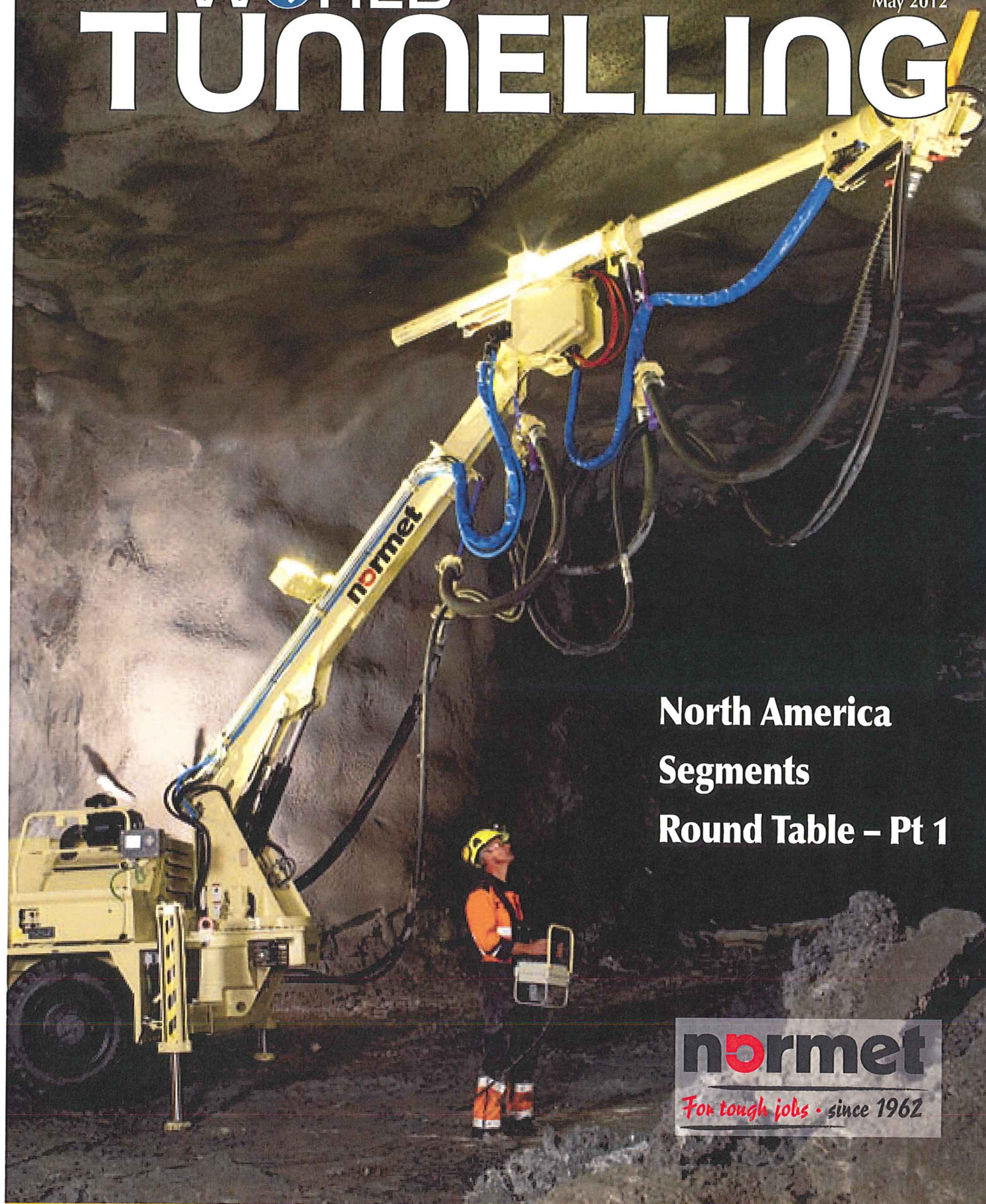


# WORLD TUNNELLING

May 2012



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## Shortlist drawn up for London's Crossrail fit-outs

CROSSRAIL has announced its shortlist of five teams of organisations for the US\$634 million design/installation tunnel fit-out contract (C610) for the east-west rail scheme across London.

The work to install track, overhead power, ventilation and drainage systems will begin in 2014 after tunnel excavation.

The shortlisted group are:

- Alstom Transport / TSO / Costain JV;
- Balfour Beatty Rail;
- BAM Nuttall / Ferrovial Agroman / Kier Construction JV
- Laing O'Rourke Construction / Volker Rail JV; and
- Rhomberg Bahntechnik / Alpine Bau/ FCC Construction Joint Venture

Andy Mitchell, Crossrail programme director, said: "Tunnel fit-out will be one of the largest contracts to be let by Crossrail. We had significant interest from the rail and construction industry, with a large number of responses received. The contract will be awarded in early 2013, providing the chosen contractor with sufficient time to undertake detailed design and planning before fit-out work commences in 2014."

Tunnel construction will begin in April, when the first tunnel boring machine is launched from Royal Oak. By late 2014, more than 21km of twin-bore tunnel will have been constructed beneath the capital. The line is expected to be operational by 2018.

The Crossrail route will pass through 37 stations and run 118km from Maidenhead and Heathrow in the west, through new twin-bore 21km tunnels to Shenfield and Abbey Wood in the east.

# Special shotcrete saves time on Malaysian tunnel

US-BASED TBM maker Robbins has reported that its three TBMs working on Malaysia's Pahang Selangor raw water tunnel are making good progress. This is partly attributed to a novel type of shotcrete used for primary support under high cover.

Applied manually, the shotcrete consists of a continuous mixing and charging pump system, customised dry mortar mix with polypropylene fibres, and a fast-acting accelerator. Developed by Japan-based MCM and Denka, the material has been used on numerous hard-rock TBM and NATM projects in Japan, though this is the first time the system has been used internationally.

"The dry mix system is advantageous as it can be started and stopped whenever necessary, and can be mounted in the TBM back-up," said Nobuo Suematsu, MCM's marketing director. "Wet systems, by comparison, generate unused mortar if frequently started and stopped, requiring down time for cleaning."



*The nozzleman applies a novel type of near-zero rebound shotcrete directly behind the cutterhead support of the excavating Robbins TBM*

The near-zero rebound L1 shotcrete system has been specially developed by Robbins in association with MCM and Denka for use on the tunnel's granitic hard rock (200MPa). Immediately after each TBM stroke, the shotcrete is applied to the top 180° of the tunnel in a 20mm layer directly behind the cutterhead support. Ring beams may accompany this layer, depending on ground conditions.

Compressive strength of more than 15MPa is achieved within 24 hours of application. "The shotcrete is very quick-setting with

no rebound, and the mortar does not require high-pressure application," said Mr Yoshikuni Nakano, deputy project manager for contractor SNUI JV (a consortium of Shimizu Corp, Nishimatsu Construction, UEM Builders and IJM Corp).

A spokesperson for Robbins said that because the special shotcrete can be applied during excavation, there has been less down time compared to conventional ground support systems. In the somewhat fractured ground conditions currently being encountered, the use of conventional methods would have meant that the machines would need an estimated two hours of ground support work for each 1m of tunnel excavated.

This would have added up to 210 days to the excavation and support programme but, using the fibre mortar system, this has been reduced to 158 days.

When complete, the 44.6km tunnel will become Southeast Asia's longest. TBM excavation is expected to be completed in 2013.

## TBM excavator arrives in Bangkok

A 6.44M-diameter EPB TBM (pictured) has been delivered to Thailand-based contractor Italian-Thai Development PCL for use on Contract 1 of Bangkok's Blue Line extension.

The machine had been handed over before to the contractor at a ceremony on March 27 in Guangzhou, China, attended by officials of Thailand's Mass Rapid Transit Authority.

Produced in Guangzhou by Terratec, in association with Japan Tunnel Systems Corp (JTSC) – a subsidiary of Japan's IHI Group – the machine uses IHI design and key parts for the shield, while Terratec's design and parts are for the back-up system.

Terratec said it tailored the machine specifically for the

project, and features IHI's 'unique' Cone-type cutterhead, designed to cut any concrete piles that might be encountered along the tunnel alignment.

The handover of the unit is seen as significant for the development of Bangkok's metro, seeing as it is the first TBM to bore there for ten years. The machine has been shipped to Bangkok, where it will be assembled to start excavation by the end of June.



## Strabag bags deals for Vienna's metro

AUSTRIA-based contractor Strabag has won two civils and tunnelling contracts worth US\$117 million for extending Vienna's metro system.

The work is part of Wiener Linien's (Vienna Lines) extension of Line U1 from Reumannplatz station to Oberlaa, designed to provide direct transportation between a densely populated housing estate (Per-Albin-Hansson-Siedlung) and Vienna's city centre.

Strabag will provide civil engineering, tunnelling and specialist ground engineering works for the two contracts, which will last 47 and 54 months, respectively. Construction, to begin in May, is due to finish in early 2016.