

Guadarrama, Spain

2 Back-up installations for double-shield TBM: Year of construction 2002



Assembly in Le Creusot, France



Assembly on the construction site north, autumn 2002



Workplace for the back-fillin of the lining segments

About the project

The project is a key part of the rapid rail link Valladolid – Madrid and consists of 2 single-track tunnels suitable for high-speed rail service (designed for 350 km/h) with a total length of 28,5 km each. There are cross passages every 250 m linking the two tunnels. 4 tunnel boring machines are working simultaneously, each having to cover about 14 km. Upon request of WIRTH, Rowa has supplied to the two joint ventures which are involved in the construction one installation for the attack from the north

Project data

Country	Spain
Owner	GIF (Gestor de Infraestructuras Ferroviarias), Spain
Client	WIRTH Maschinen- und Bohrgeräte-Fabrik GmbH, Erkelenz
Final customers	Joint Venture North: FFC, ACS, Ferrovial Joint Venture South: Nesco, Dragados, OHL
Rowa's order	Supplying 2 high-performance back-up installations
Duties of the system	Supply and removal from the high-performance tunnel boring machine including the placing of the lining segments
Advance length	14'500 m each
Excavation diameter	9.34 m
Advance method	Double-shield hard rock tunnel boring machine
Lining segments	screwed and sealed
Interior diameter	8.5 m
Double-tracked supply	2x900 mm gauge
Removal	tunnel conveyor

The customer's opinion

Detlef Jordan, General Manager MSO WIRTH Group



„Rowa has developed and supplied to the WIRTH company two complete back-up installations for the project Guadarrama, which is a very demanding project, technically as well as with regard to its processing. Both installations have been designed to meet the specific requests of the final customers and both comply with the very high performance requirements.

Upon request of WIRTH, Rowa has assumed responsibility for the supervision of the assembly. Afterwards, Rowa instructed the staff on the construction site for the commissioning and the start-up period, and thanks to this assistance both final customers achieved excellent advance performances after the short start-up period. We are convinced that we supplied to the two final customers, with Rowa's assistance, two high-quality advance installations with a high performance potential.“

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Lining segment magazine with material transloading area



Dry mortar storage and pump station



Rear of the back-up system with front of the mobile platform truck

Technical data tunnel

Work locations in tunnels	Advance North and South
Total tunnel length	North west and south east about 28 km
Tunnel length up to section limit	about 14 km
Inclination	max. +1%
Excavated diameter	
Normal operation	9'460 mm
With overcut for special operation	9'530 mm
Excavated cross section	70.29 m ²
Finished interior diameter	8.5 m
TBM	Double-shield hard rock TBM
Lining segment construction	screw, sealed
- Segment thickness	320 mm
- Segment length	1'600 mm
- Quantity	7 units.
Pilot drills	in the ridge area

The concept

The Rowa back-up installations north and south comply with the performance requirements, thanks to the high-performance logistics with the adequate equipment. The logistic system is designed to function during the advance with the double-shield tunnel boring machine simultaneously with the ring construction. The lining segment ring construction takes place continuously and has to be interrupted only for 2 minutes for the re-positioning of the gripper shield. This allows to achieve advance rates of 1.6m (length of lining segment) in 20 minutes, which corresponds to a maximum advance rate, ring construction included, of 4.8m/h.

Supply logistics

Each supply train carries the necessary material for an advance of 3.2m. Thanks to the quick segment unloading system the material can be unloaded in less than 8 minutes. The following components can be transported and transloaded every 40 minutes:

- 2 complete lining segment rings (14 lining segment stones)
- Back-filling components
 - Dry mortar 4.5 m³
 - Pearl gravel (south) or wet mortar (north) 2x8.5 m³

The intermediate storage of the daily requirements is possible in the back-up installation:

- Pipes for cooling-, industrial and sewage water
- Rails for the double-track installation in the tunnel
- Conveyor elements for the tunnel conveyor
- Auxiliary material

At the rear of the back-up installation there is a double rail rolling platform for the reversing of the loco, which is always at the head of the train.

Performance

The exceptional capacity of the back-up logistics was proven by the achieved maximum daily performances of more than 50m and by a maximum monthly performance of almost 1000m.