

Channel Tunnel Rail Link, Section 240

2 back-up systems



Back-up system



Mounting box



Back-up system rear

About the project

On May 6, 1994 the Channel rail tunnel between Calais and Dover was opened, the British Parliament then decided to improve the existing rail link from London to Dover. The new high speed line between St. Pancras Station in London and the Eurotunnel can cope with 8 Eurostar trains per hour in both directions, while today only 4 Eurostar trains per hour are possible; the capacity will thus be doubled. At the same time, the length of the trip from London to Paris is reduced from today's 2 hours 55 minutes to 2 hours and 15 minutes.

CTRL

- An additional rail line of 113 km length will be built, of which 26 km are underground.
- Since the tunnels are double-tubed, the total length of below-ground construction is 52 km.,
- The trains will reach a speed of up to 300 km/h.

Project data CTRL Los 240

Country	England
Execution	2001-2004
Client	Union Railways (Nord) Ltd
Building contractor	Costain Skanska Bachy Joint Venture
Developer	WIRTH GmbH

Tunnel length	each 4.7 km
Interior diameter	7.15 m
Excavated diameter	8.15 m
Gradient	+/- 2.5%
Forwarding	TBM
Curve radius	2'400 m horizontal 2'000 m vertical
Outbreak diameter	8'175 m
Outbreak area	52.5 m ³
timbering diameter interior	7.15 m
Segment lining	screwed and sealed
- Segment thickness	350 mm
- Segment width	1'500 mm
Soundage drilling	in ridge area with injections

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Supply train



Continuous conveyor



California switch

The conception

Supply and removal logistics

The 2 back-up installations of this project consist each of 10 waggons and of a California switch. Their length is 210 m. They contain the complete infrastructure necessary for the operation of the tunnel boring machine and for the finishing of the tunnel, such as:

- Complete removal operation for the heading by means of a continuous conveyor (continuously extensible within the back-up installation)
- Complete supply of the heading (fresh air, energy, lining segments, mortar, rail material, consumption material ...)
- Installations for the workers and safety equipment

Technical data

Covering diameter of the back-up system	6.75 m
Back-up system length	210m
Back-up system weight	80 t
Installed performance	850 kW

Specific characteristics

Back-filling system

Since the „Central Line“ remains operational during the whole construction period, no interference with the train service is allowed, and therefore settlements are tolerated only in the order of millimeters. In order to keep the settlements within the tolerances, not only the lining segments are back-filled, but also the shield. The lining segments are axially and radially linked together by means of 48 screw connections, and then sealed. A special mortar back-filling system guarantees that there remain no empty spaces between the excavated diameter and the outer diameter of the closed lining segments. In order to make this possible, there are 8 back-filling openings provided in the shield tail of the tunnel boring machine. Through these, the pressure and volumetric flow is monitored and the mortar pumped in by means of 4 mortar pumps. The hardening time of the back-filling, as prescribed by the contractor, had a substantial influence on the design of the back-up installation. For instance, the first 10 lining segments behind the tunnel boring machine may not be exposed to any mechanical stresses, and therefore a gap of about 20 m between the tunnel boring machine and the first part of the back-up system had to be bridged over by an appropriate construction.

In this area a transfer conveyor between the conveying worm of the tunnel boring machine and the continuous conveyor had to be installed.

In addition, the roadway of the lining segment transport crane with a load of up to 4.5 t is situated in this area as well. The loads of the mentioned components and the fact that this area has to be freely accessible are the reason why the back-up installation 2 has to be supported through a massive open frame construction on auxiliary rails. These auxiliary rails had to be dimensioned specifically for these extraordinary loads.