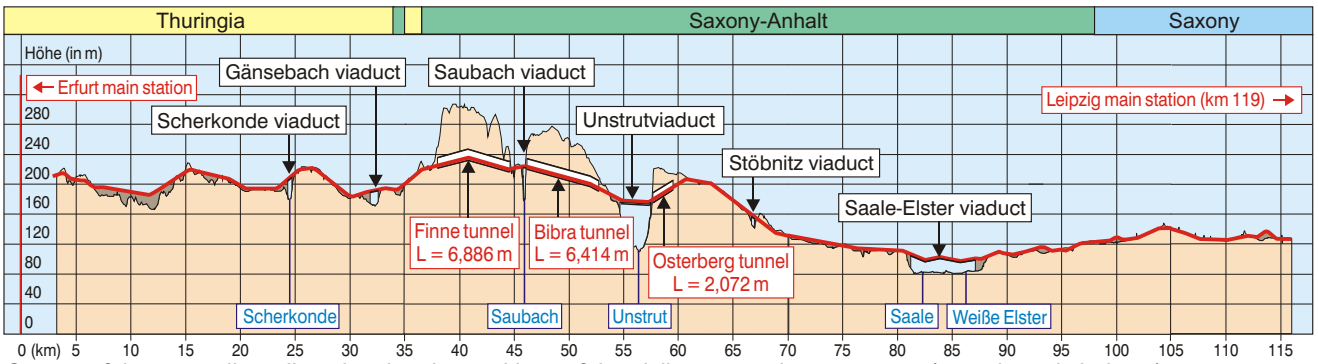
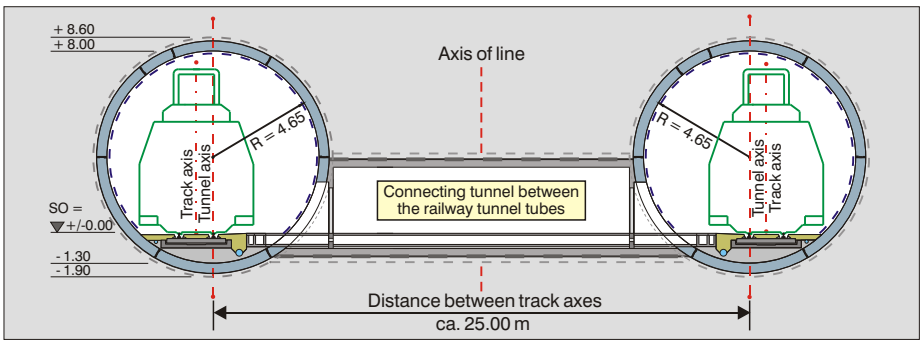
KREBS UND KIEFER

Tunnels
New Erfurt - Leipzig/Halle railway line



Course of the new railway line showing the positions of the civil engeneering structures (tunnels and viaducts)



Cross-section of the Finne tunnel (area of shield driving)

As part of the Nuremberg-Berlin connection, the central section of the new Erfurt Leipzig/Halle railway line - a project initiated following the reunification of Germany - crosses the high ground along the Finne faultline. Here, the course of the line includes three tunnels with a total length of 15.4 km:

In the western section, the 6,886 m long **Finne tunnel** passes through a major tectonic disturbance with locally loosened mottled sandstone. The tunnel is up to 50 m below ground water level in extensive areas.

The **Bibra tunnel** is 6,414 m long and passes through mostly stable mottled sandstone rock; it is above ground water level.

The 2,072 m long **Osterberg tunnel** passes through partly disturbed and loosened shell limestone.

Because the line is to be used for mixed traffic, and because of a requirement to ensure that goods trains and high-speed trains do not pass each other in tunnels, a standard concept comprising parallel single-track tunnel tubes was chosen for all three underground structures.

In view of the unfavorable geological conditions in the area of the Finne faultline, the only possible construction method for the Finne tunnel is machine driving (shield driving) with tubbing segment lining. As a result, the circular cross-section of each tunnel tube has a radius of 4.65 m. The clear cross-section area is around 60.7 m² in each tube. In the area of the faultline, driving must take place with a supported face. From the eastern side, conventional driving from the opposite direction is planned.

The planned construction method for the Bibra and Osterberg tunnels is conventional driving with shotcrete shoring and an inner lining of in-situ concrete. These tunnels have horseshoe-shaped cross-sections with a clear area of 60.5 m² in each direction. The distance between the axes of the tunnel tubes is ca. 25 m.

Owner
Deutsche Bahn AG

Client
DB Projektbau GmbH, originally Planungsgesellschaft Bahnbau Deutsche Einheit (PBDE)

Overall planner
Krebs und Kiefer

Processing time
Since 1991

Construction costs (tunnels only)
Ca. 507 million EUR

Project data
- 3 tunnels
- Total length: 15.4 km
- Maximum tunnel length: 6.9 km
- Two single-track tubes

Krebs und Kiefer services
- Basic planning
- Structural design
- Design surveying
- Cost and schedule planning in the phases:
- Preliminary design planning
- Land use procedure planning
- Outline design planning
- Design planning
- Authorization planning
- Tender procedure

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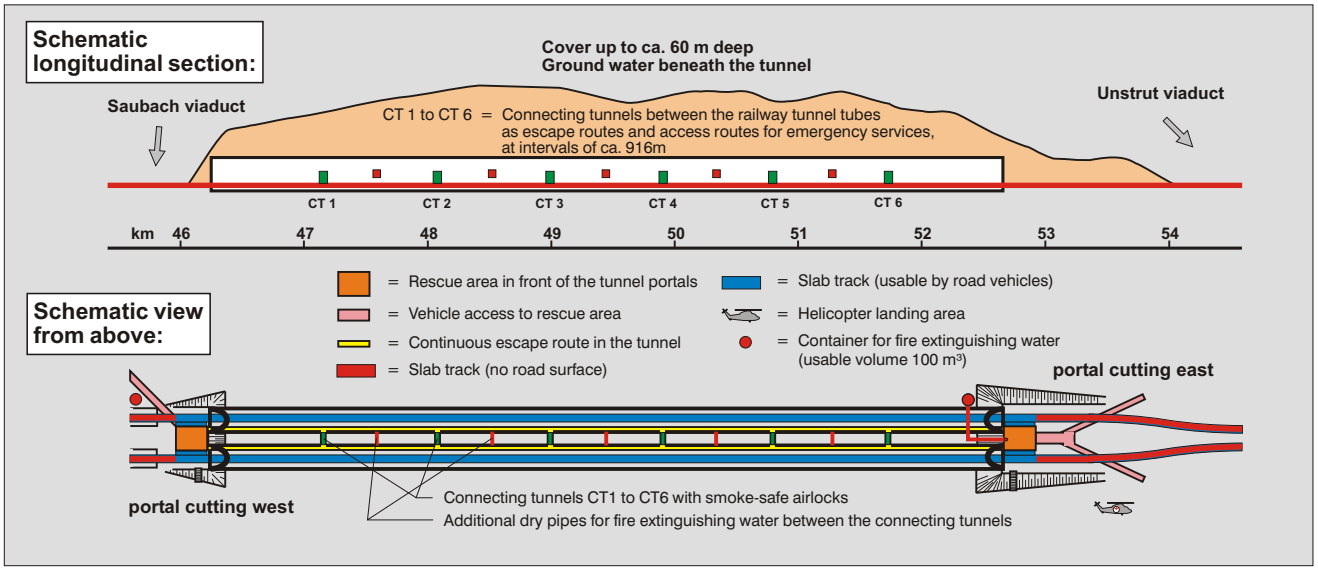
Tunnels
New Erfurt - Leipzig/Halle railway line



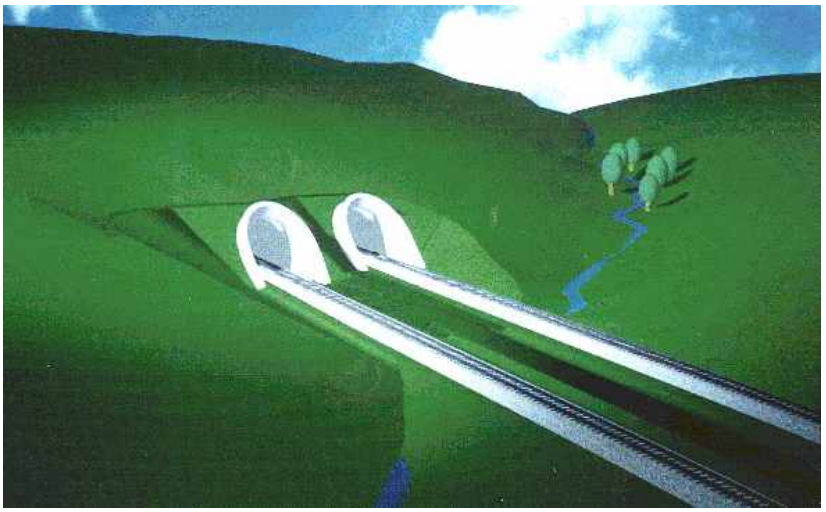
Concept for the Bibra tunnel: 6,414 m long - 2 parallel single track tunnel tubes - rescue facilities

An important feature of the escape and rescue concept are the connecting tunnels between the tunnel tubes at intervals of ca. 1,000 m. These allow fast escape into a “safe area” (the other tunnel tube) in cases of emergency and provide fast and safe access for the emergency services.

The tunnel tubes are constructed with slab track superstructures throughout; these are also equipped for use by road vehicles (e.g. fire engines). At each tunnel portal there are rescue areas and water storage containers for fire extinguishing purposes.

The Finne tunnel crosses several drinking water protection zones and the catchment area of the Wischroda waterworks, so that in the western part of the tunnel, driving over a length of 1,585 m must take place with no lowering of the ground water.

In the 3,100 m long middle section that follows, localized ground water lowering accompanying the shield driving process is planned. The groundwater that is extracted in this way is fed into the Wischroda waterworks in raw water quality. In the eastern section of the tunnel conventional driving methods are used and the groundwater is completely lowered, the water also being fed into the waterworks.



3D-simulation of the eastern portal of the Finne tunnel

The effects of temporarily and locally lowering the ground water level are checked by means of a comprehensive monitoring (securing of evidence) program in cooperation with the water authorities.

During tunnel driving in the middle section, ca. 4 million m³ of excess material is produced that cannot be re-used during the construction process. To accommodate this excess material, 4 terrain modeling projects are planned in the immediate vicinity of the line.