RAILWAYS

AMBERG ENGINEERING

QUICKLY AND SAFELY THROUGH MOUNTAINS AND CITIES

Social, political and economic developments require traffic to be shifted onto the rail transport network. Growing demands for mobility demand a continuous increase in network capacity. Stretched alignments and a decreasing availability of space mean that ever-more railway lines must be guided through tunnels. A higher awareness of safety issues, the demand for higher levels of comfort as well as higher design speeds require adaptations to the facilities.

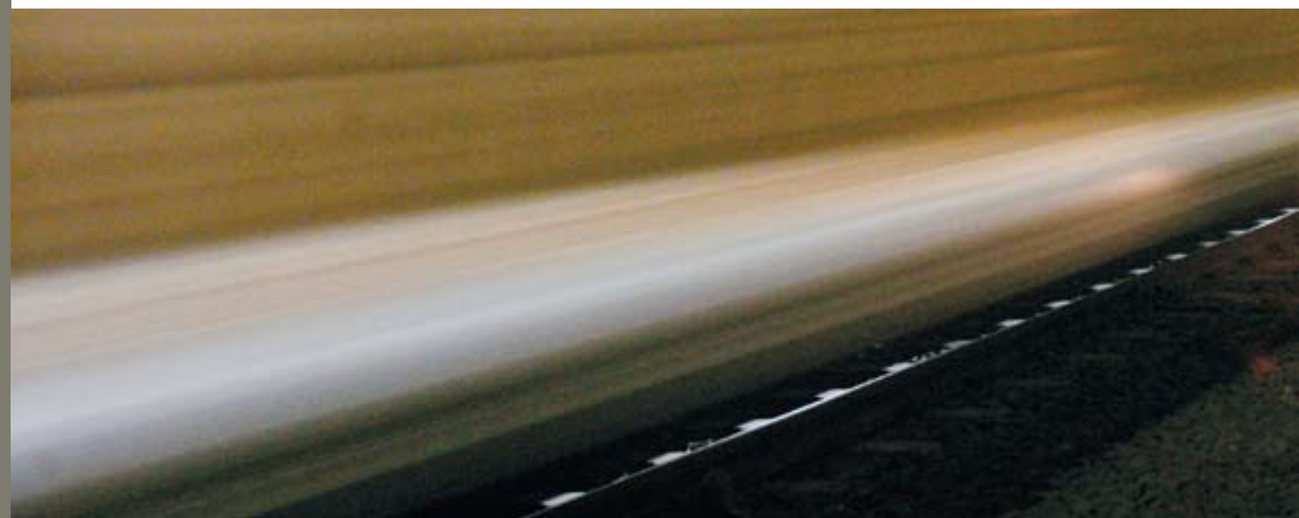
Railway tunnels are exacting systems

Modern railway tunnels have separate tubes for each direction of travel, safety and ventilation systems conforming to the latest standards, slab tracks for higher operating speeds, sometimes smoke extractions systems, etc. Higher design speeds demand larger cross-sections and therefore more complex construction processes. At the same time, budgets become tighter and construction times shorter. Thanks to progress and the latest technological developments in underground construction, railway lines can also be built in geologically challenging subsoil.

Railway tunnels built more than a hundred years ago as pioneering achievements have significantly influenced our knowledge. Today these structures often do not comply with requirements anymore. Therefore these structures need refurbishment to meet current regulations. The use of new or different rolling stock might demand higher clearance profiles or implementation higher standards for passenger rescue and evacuation. During the planning phase, considering that construction works have to be carried out under continuous operation, is a must.

Know-how for complex constructions

From planning and realisation to maintenance, Amberg Engineering and its specialists provide you with support throughout the entire lifecycle of a railway tunnel. We have over 40 years of experience in underground construction. This know-how allows us to offer our customers holistic and comprehensive services from under one roof.



SERVICES IN DETAIL

Amberg Engineering realises innovative, customised solutions for railways. From planning and realisation to operation, our specialists will support you throughout the entire lifecycle of a structure.

Phase 1 – Planning

– Geological survey
– Feasibility study
– Preliminary and schematic design
– Invitation to tender, tender documents
– Geotechnical and structural analysis
– Stability analysis and evaluation
– Dynamic analysis
– Fire protection concepts and evaluation
– Safety concept
– Evacuation planning

Phase 2 – Realisation

– Detailed design
– Construction supervision
– Project direction
– Control surveying
– Vibration and shock monitoring
– Resource planning
– Quality management

Phase 3 – Operation

– Facility inspection
– State assessment
– Conservation of value planning
– Maintenance planning
– Renewal and refurbishment
– Modification

Services in all phases

– Project review
– Project management as the client representative
– Controlling
– Risk management
– Consulting
– Training
– Safety evaluation

Axenberg Tunnels – Switzerland

REFURBISHMENT UNDER TRAIN OPERATION

The mountainside Swiss Federal Railways line at Axenberg started operation in 1948. Now, after over 60 years in operation, comprehensive refurbishment work is necessary. In particular the Morschach, Fronalp and Stutzeck-Axenberg tunnels – important parts of the Gotthard line with a total length of more than 8 km – show a variety of defects and damages. Amberg Engineering is responsible for design as well as supervising construction.

The challenge
Train operation may not be affected during the work, which will last for two years. Construction work will be carried out on one track while the other track is open for train operation. This means also some necessary working during the night, when no trains are running.

The solution
The superstructure will become conforming to standards by optimising the track alignment and installation of a new invert. The concrete substructure, in combination with a new drainage, will permit systematic de-watering along the carriageway. The lining is not only to be refurbished, widening is also necessary to meet clearance requirements. During the two years of construction, structural measures in the order of almost 30 million Swiss francs will be implemented. Thanks to the separate refurbishment and the staggered timing of the work, the job will be carried out without affecting train operation. After work has been finished, the rail line can be integrated in the New Transalpine Railway.

Lyon–Turin rail connection – France and Italy

THROUGH EUROPE AT HIGH SPEED

The new high-speed rail link between Lyon and Turin is intended to create a connection from north to south (London–Milan) and from west to east (Lisbon–Kiev). Journey times between Lyon and Turin will be reduced by more than half with this line. In co-operation with partners, Amberg Engineering created the "Avant-Projet de Référence/Projeto Definitivo" for the 72 km long section between St Jeanne de Maurienne and Bruzolo. The work includes the stations in St Jeanne de Maurienne and Bruzolo, the approximately 53 km long base tunnel, the Viaduc de Cenischia, the St Jeanne de Maurienne Bridge and the approximately 12 km long Bussoleno Tunnel.

The challenge

With an overburden of up to 2,400 m depth the main tunnel is in a complex and sometimes extremely demanding geology. Here, conditions with high levels of squeezing, thermal inflow of water and gas accumulations must be taken into account.

The solution

The base tunnel has two single-track tunnel tubes and four emergency stop locations with a track crossover and an overtaking track. The single-track tunnel tubes are excavated partially with conventional methods and partially using tunnel boring machines starting from three intermediate access points and the portals. In sections with poor geology a flexible lining with steel arches is foreseen. Geotechnical and structural analysis, elaboration of installation, logistics concepts and detailed evaluation of the construction schedule show the feasibility of the difficult section of the line.

Further references for railways:

– Gotthard Base Tunnel (Switzerland)
– Vereina and Zugwald Tunnels (Switzerland)
– Rossio Tunnel (Portugal)
– Pajares Tunnel (Spain)
– Tampin Tunnel (Malaysia)
– Zimmeregg Tunnel (Switzerland)
– Ceneri Base Tunnel (Switzerland)
– Semmering Base Tunnel (Austria)
– Railway Tunnels Perschlingtal (Austria)
– Qinling Tunnel (China)
– Stuttgart 21 (Germany)

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