

**SHAPING THE FUTURE –
WE LOVE UNDERGROUND**

**+ 50 Years
+ 800 Projects
+ 25 Countries
5 Continents**



**AMBERG
ENGINEERING**

OVER 50 YEARS OF INNOVATION

Over 50 years of developing solutions in the fields of underground railway, road and metro tunnels, caverns and infrastructure galleries.

Headquartered in Switzerland with offices throughout Europe and India, the company is family owned and ISO-9001 certified.

Amberg Engineering offers numerous services for the entire project cycle of your infrastructure. As part of the Amberg Group we offer holistic and comprehensive consulting for the creation, operation and maintenance of underground facilities.

Our engineers and specialists guarantee professional, state-of-the-art design and implementation. We promote quality and safety by continuous training of our employees in the latest developments in underground construction.

Together with the other companies of the Amberg Group – Amberg Technologies, Amberg Loglay, Amberg Infra 7D, Amberg Infocon and the Hagerbach Test Gallery – Amberg Engineering can offer everything from providing solutions to highly specialized questions to comprehensive services for extremely large and complex construction projects.



Project-oriented engineering services with a view to a sustainable future

We understand professional project management as an interplay of quality and environmental awareness, safe workplaces and social and respectful behavior. On schedule, flawless quality and cost-consciousness are just as natural to us as open communication, careful use of resources, the use of new digital tools, correct and fair behavior towards our fellow human beings and the introduction of innovative, future-oriented ideas.

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COMPREHENSIVE SERVICES

Underground projects are complex with widely varying requirements. From design and execution through to operation and renewal, our staff will support you throughout the entire lifecycle of a structure.



Planning & Design

- Project design from A to Z
- Across all project phases
- Rail, Road, Metro, Hydro, Utility, Underground Space
- All underground structures
- From rock to soft ground
- NATM, TBM, Drill & blast
- Risk Assessments

Geotechnical Engineering

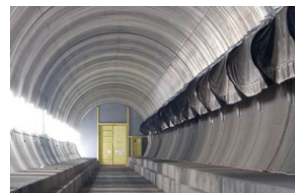
- Project-specific & custom tailored
- BIM-Model based numerical analysis
- Monitoring design & data analysis
- Geotechnical surveys
- Ground characterisation

Structural Engineering

- Project-specific & custom tailored design
- BIM supported structural analysis
- Fire design & thermal analysis
- Logistical concepts and capacity dimensioning
- Expertise in international design standards

Renewal & Refurbishment

- Structural inspection & assessment
- Operational safety
- State-of-the-art technology to map and monitor
- Value conservation and maintenance planning
- Future proofing



Project Management

- Overall project management
- Project support
- Procurement
- Cost management
- Risk management
- Public relations
- Development and maintenance of project platforms

Risk & Safety Management

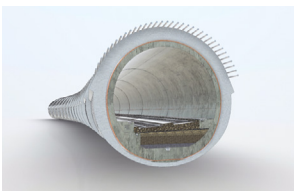
- Safety and fire-protection concepts
- Fire simulation and evacuation design
- Safety assessment and risk analysis
- Quantitative risk analysis
- Testing and safety certifications

Aerodynamics & Ventilation

- Ventilation design and assessment
- Optimum ventilation control
- Aerodynamic and fire modeling
- Comfort and health analysis of high-speed rail tunnels
- Realization and commissioning

Underground Space

- Sustainable and space-saving solutions for urban areas
- Planning and design of large span caverns
- Geotechnically optimal layout and configurations
- Logistics aspects planning
- Stakeholder management



BIM

- BIM strategy consulting
- BeyondBIM
- Parametric Design
- Rapid Engineering
- BIMtoGIS, BIMtoGEO
- RetroBIM
- Data Analytics and Business Intelligence

Nuclear Waste Management

- Safe and structurally sound long-term solutions
- Geotechnical investigations
- Design and planning
- Supervision and monitoring
- Implementation and operation

Service for contractors

- Smart engineering solutions
- Value engineering
- Independent design verification
- Trouble shooting

Site supervision

- Technical expertise and consulting
- Time, cost and quality monitoring
- Definition and monitoring of procedures and requirements
- Commissioning & handover



ROADS: GUBRIST TUNNEL, 3RD TUBE

Zurich, Switzerland

Not a day goes by without a traffic jam: With a traffic volume of more than 120,000 vehicles each day, the Zurich northern bypass (A1) has reached the limits of its capacity. The expansion of the northern bypass around Zurich is a key project for the FEDRO, Federal Roads Office, to eliminate this bottleneck. The 3rd tube will complement the two existing 3,250 metre long Gubrist Tunnel tubes.

The Assignment

Amberg Engineering joined forces with additional engineering firms to realize the challenging project encompassing the disciplines of tunnel construction, foundation engineering, structural engineering, road construction and ventilation (1st through 3rd tube) with excellence.

The 3rd Gubrist Tunnel comprises the two cut-and-cover sections at the Affoltern and Weiningen portals as well as the driven tunnel section with a length of 3 km. In addition, the Sonnenrain control centre with a volume of about 5,000 m³ will also be constructed underground. This spoil will be removed via the construction site's own railway loading station.

The Challenges

- Densely built-up, hilly landscape above
- Tight quarters for the installation site as well as the loading station and equipment
- Strict environmental protection requirements
- Geology with loose rock sections at the portals
- High requirements with respect to safety and availability



RAILWAYS: GOTTHARD TUNNEL

Gotthard, Switzerland

The Gotthard route is one of the most important sections of the international north-south transalpine axis. The base tunnel with a length of 57 km and a maximum overburden of up to 2,300 m is the longest railway tunnel in the world and enables a top speed of 250 km/h. It consists of two parallel single-track tunnels as well as various access tunnels, 178 cross-cuts and shafts as well as two multifunction stations.

The Assignment

Amberg Engineering was involved right from the start: From the development of the ordinance project to the construction project, from the tendering to the final design with the structural documentation and on-site construction supervision. The stability and structural safety verification was drafted, geotechnical consulting

for the construction provided and risk analyses were made. Amberg Engineering was involved in the planning and invitation to tender as well as in the testing and commissioning of many operational and safety technology infrastructure items – especially the extraordinary tunnel ventilation.

The Challenges

- Alpine geology, massive tectonic fault zones
- Overburden of up to 2,300 m, rock temperatures of up to 44°C
- Yielding interior fittings with radial deformation of up to 0.8 m
- Long project duration, complex logistics
- High demands for quality and durability
- Very high safety and availability requirements



METRO: UNDERGROUND LINE U5

Berlin, Germany

The U5 Line represents a gap closure measure between the existing U5 and U55 lines and the stations Alexanderplatz and Brandenburger Tor. This entailed the construction of two 1.6 km long single-track metro tunnels and three metro stations in the centre of Berlin.

The Assignment

In this Berlin metro project, Amberg Engineering provided the planning for the proposal and the tendering. Moreover, Amberg Engineering assisted the clients in the contract awarding for the construction work and drafted the final planning for construction activities.

The Challenges

- Inner urban, very heavily built-up area with historical buildings
- Minimal overburden of approx. 5.50 m
- Undercrossing of the Spree and Spree Canal
- Crossing with existing tunnels with a minimal distance of approx. 4.0 m
- Tunnelling in groundwater and in difficult geological conditions with sand and gravel sediments containing blocks
- Piercing of historic timber pile foundations, pile walls and foundations



CAVERN: SHA TIN SEWAGE TREATMENT WORKS

Hong Kong, China

As part of the development strategy to create better living space in the city of Hongkong and to ensure the long-term sustainable development, the Sha Tin Sewage Treatment Works is being moved into caverns. This will free up 28 hectares of valuable land in the city area.

The Assignment

Amberg Engineering performed tasks in multiple fields, such as a quantitative risk analysis (QRA) for the proposed design (jointly with Enprodes). All possible threats and relevant emergency scenarios were evaluated in a systematic manner. The safety level was compared with relevant risk guidelines and international state-of-the-art practices through similar projects worldwide. All

project phases from feasibility studies, design planning, and also contractors' support in tender design are also being handled by us.

The Challenges

- The analysis of the QRA had to account for a wide spectrum of possible threats and incident scenarios related to present hazards and the complexity of the cavern.
- Advising on underground space related topics such as pilot studies on housing data centers and archives in caverns with multiple considerations and stakeholders.



HYDROPOWER: GRIMSEL STORAGE POWER STATION

Innertkirchen, Switzerland

Grimsel 3 serves primarily to ensure a compensation between power generation and the electricity demand. Power generated that exceeds demands (e.g. from the sun and wind, but also from caloric power stations) can be stored by pumping water from the Räterichsbodensee lake into the higher Oberaarsee reservoir. The Grimsel 3 hydroelectric power station was designed for a capacity of 660 MW, whereby a flow rate of 130 m³/s over an elevation difference of 550 m is required.

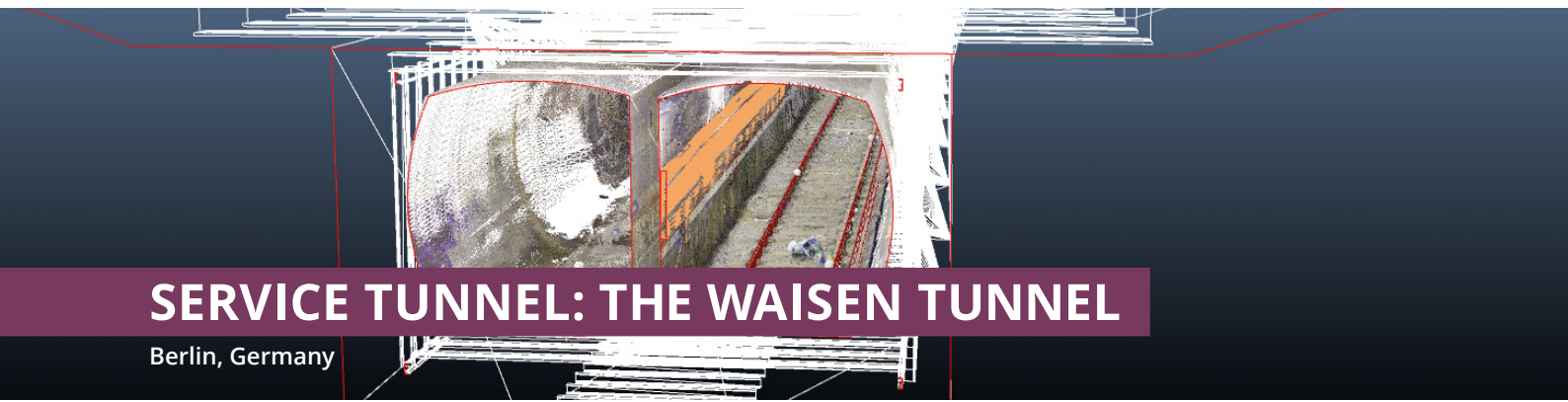
The Assignment

Amberg Engineering assumed responsibility for the overall design of the underground structures in the Grimsel 3

project. This also included the study on variants, the regulatory approval design, the construction project and the tendering. The main components of the Grimsel 3 project were a pressure shaft, a penstock tunnel, a power station control room and various ancillary structures.

The Challenges

- Construction site in high-Alpine region
- Logistically demanding supply and waste management of the various different headings
- Varying overburden, high horizontal rock tensions
- Geology, Grimsel granodiorit, with steep fault zones and reduced strength, in part, waterbearing



SERVICE TUNNEL: THE WAISEN TUNNEL

Berlin, Germany

The existing Waisen tunnel undercrosses the river Spree in the center of Berlin. It serves as an operating tunnel, connects the U5 and U8 lines and will continue to be an important element for the operation of the future metro network in Berlin. Built in 1917, it is a piece of contemporary history that is now showing its age.

The Assignment

In order to ensure functionality in the future, a thorough renovation is needed. Amberg Engineering has been working on the project in an engineering consortium, together with ZPP for the client Berliner Verkehrsbetriebe (BVG), represented by BVG Projekt GmbH since the beginning of 2021. Amberg Engineering handles the deputy overall project management, the overall BIM coordination as well

as the structural planning and is significantly involved in the service phases 1 (basic investigation) to 6 (preparation of the tender award). The temporal dependencies are visible using a 4D BIM model, so that the construction processes can be checked and optimized.

The Challenges

- Inner-city location with listed historical buildings
- The need to maintain shipping operations on the river Spree
- A demanding but exciting project in the center of Berlin

ROADS

Förbifart Bypass, Stockholm, Sweden

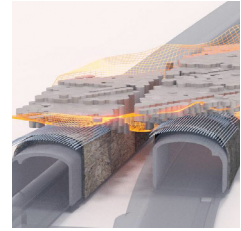
Project duration: 2011 – 2021

Client: Trafikverket, Solna

Construction costs: approx. € 3.5 billion

Key figures: 21 km long motorway section as a western bypass around Stockholm

Consultancy for special problematic situations, review of the construction project, preparation of the tendering, preparation of the final design, on-site construction supervision, BIM for simplified coordination and for collision monitoring.



RAILWAY

Brenner Base Tunnel in Innsbruck, Austria

Project duration: 2014 – 2024

Client: Galleria di Base del Brennero / Brenner Base Tunnel BBT SE

Construction costs: approx. € 9 billion

Key figures: 64 km with two parallel single-track railway tunnels from Innsbruck (AT) to Fortezza (IT)

Services on the Austrian side in the engineering joint venture (IG): Preliminary design, tender planning, final planning, geotechnical construction supervision, oversight of the engineering joint venture.

This involves a section of the two main tunnels with a length of more than 32 km as well as the exploratory adit; two emergency stations (a total of more than 100 km of tunnels), several bridges as well as tunnels in the proximity of the city of Innsbruck.



METRO

Stockholm Metro Extension- Tunnelbana Stockholm, Sweden

Construction of a new Metro line (Tunnelbana), Odenplan – Arenastaden – Hagastaden in Stockholm, total length 4 km

Project Duration: 2014 – 2019

Client: WSP

Construction costs: approx. € 550 Mio.

Key figures: BIM project of new metro line and consulting of client for the entire construction project:

2 km 2 track tunnel, 2 km 1 track tunnel, 2 Intersections, 3 escape routes, 2 access galleries, 2 ventilation shafts, 3 Stations, 2 in rock formation, 1 in cut and cover, Conventional D&B heading, coverage 3 – 40 m



CAVERN

Gotthard Base Tunnel, Multifunction Station Faido, Switzerland

Project duration: 2002 – 2015

Client: AlpTransit Gotthard AG

Construction costs: CHF 525 million (installations excluded)

Key figures: length 1.7 km, cross-section up to 330 m², overburden 1'500 m

1.7 km long underground multifunction station of the 57 km long Gotthard base tunnel, with station for emergency stops incl. waste-air extraction system, tunnel crossovers in direction and technical installations. Design and construction supervision in engineering joint-venture.



HYDROELECTRIC POWER

Storage Power Station, Namakhvani, Georgia

Project duration: 2017 – 2021

Client: Clean Energy Group

Construction costs: 740 million USD

Key figures: Tunnel 5 km, Ø 9 m, 430 MW, 2 dams

Review of the preliminary design incl. geology and geotechnics, value engineering, review of the detailed design, assistance with the construction and contract management.



SERVICE TUNNEL

Refurbishment of the old Elbe Tunnel in Hamburg, Germany

Project duration: 2008 – 2018

Client: Hamburg Port Authority HPA

Refurbishment costs: approx. € 60 million

Key figures: Tunnel with two single-lane tubes of 426 m each

Project review, client assistance for the planning and tendering, on-site construction supervision, client representation, planning review, static survey of the structural condition, safety analysis, safety scheme and safety documentation for the structure.



AMBERG ENGINEERING EXECUTIVE MANAGEMENT



From left to right:

Gerd Wieland, Roman Wahlen (Deputy CEO), Laurence Delplace (CEO), Paul Erdmann, Klaus Wachter and Benoit Garitte

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