



ENGINEERING AT ITS BEST

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

AMBERG
ENGINEERING

MORE THAN 50 YEARS OF INNOVATION

Over more than 50 years Amberg Engineering Ltd has realized over 800 projects worldwide, spread through the 5 continents and in more than 25 countries. Projects like the Vereina Tunnel, the world longest narrow-gauge rail tunnel with its 19 km, the 57 km long Gotthard Base Tunnel, the currently longest railway tunnel, the Brenner Base Tunnel, the one that will be the future longest railway tunnel in the world with its 64 km are part of Amberg's portfolio as landmark ones. Metro lines were as well designed by our teams in more 10 cities in 10 countries spread over 3 continents. Tunnels for hydroelectric project in Europe, Asia and South America are as well mastered by Amberg engineers. Specific and particularly technically complex underground infrastructures, such as caverns with cross sections of over 300 m² and large projects in which more than 1.5 million m³ are excavated and mined in a single project complement the broad portfolio.

Founding

- 1966 Rudolf Amberg sole founder and sole proprietor
- 1977 Conversion into a stock corporation
- 1983 Name change to Amberg Ingenieurbüro Ltd
- 2002 Merger of the Swiss offices/businesses under one brand and company Amberg Engineering Ltd

Corporation

Family owned and family managed company with headquarters in Regensdorf-Watt

Owner

Felix Amberg, chartered civil engineer, ETH/SIA

Locations

- Switzerland: Regensdorf, Sargans, Chur and Bern (ASIT)
- Worldwide: Madrid (Spain), Oslo (Norway), Innsbruck (Austria), Brno (Czech Republic), Bratislava (Slovakia), Gurgaon (India) and Singapore (Singapore)

Employees

- Approx. 110 in Switzerland
- Approx. 140 in the subsidiaries

Market Segments

- Roads
- Railways
- Metros
- Caverns / Underground space
- Hydroelectric power
- Service tunnels
- Nuclear waste repositories

Areas of Expertise

- New construction
- Structural maintenance
- Project management
- Ventilation & safety

Clients

Public and semi-public entities as well as private companies.

Project Teams

Interdisciplinary project teams set-up according to client's needs and comprising experts and engineers from across the universe of Amberg Group companies.

Quality Management

We are ISO 9001 certified. Moreover, the Hagerbach Testing Gallery laboratory is accredited by the Swiss Federal Institute of Metrology.

Shaping the Future

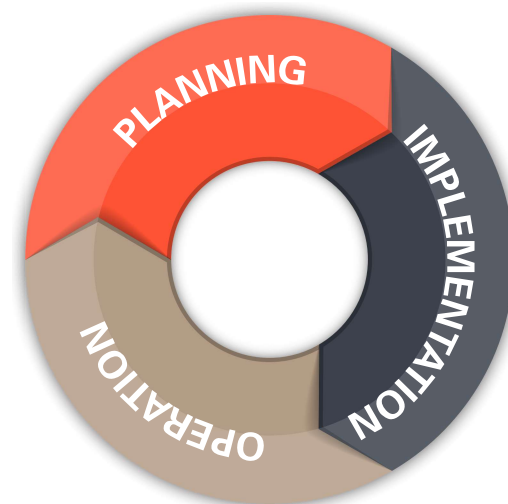
Amberg Engineering masters the challenges of the future. Through the use of big data and cloud-based applications, new processes and working methods such as BIM are being developed and the company is positioning itself to face the future. The exciting, international working environment offers outstanding opportunities for development as well as a solid perspective for the future.

Everything From a Single Source

The close collaboration among all Amberg Group – Amberg Technologies, Amberg Loglay and the Hagerbach Test Gallery – enables Amberg Engineering to meet customer needs even beyond its specific scope of expertise. Whether exploratory work, measuring technology, construction site logistics or the development of construction technologies – our clients benefit from the synergies within the Amberg Group.

Services in all Phases

With Amberg Engineering, questions and needs which arise in any project phase can be handled by dealing with a single competent partner – even with interdisciplinary tasks. Well established practices make for short decision-making processes enabling quick and competent reactions to changed conditions or unexpected events.



Additional Information

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OUR SERVICES

The construction of an underground structure – whether tunnel, cavern or infrastructure service tunnel – is always a challenge. Amberg Engineering reviews projects, plans, visualizes, consults and offers technical expertise. No matter whether it's a feasibility study, project implementation, final design or construction supervision, our employees with their many years of experience, commitment and passion see to it that projects all around the world are a success. Amberg Engineering specializes in innovative solutions for underground and foundation engineering and is amongst the leading global engineering firms for the utilization of subterranean space.

COMPREHENSIVE SERVICES IN ALL PHASES

Planning

Our experts prepare the planning for all phases of your project, elaborate on the risk management and identify all important milestones for the proper evaluation of the progress and follow-up of the project:

- Geological surveys
- Project design from A to Z across all project phases
- Geomechanical and static model analyses
- Ventilation and safety technology planning
- Client assistance and project management

Operation

We can execute and prepare a comprehensive planning and monitor the progress of the maintenance or refurbishment of underground infrastructures under exploitation, comprising:

- Structural inspection and assessment analysis
- Conservation of value and maintenance planning
- Refurbishment
- Conversions and dismantling
- Operational safety

Implementation

In the realization phase, we monitor the progress of the project and evaluate measures in the event of any occurrences with disruptive potential for the project, including planning changes and corrective measures:

- Project management and control
- Construction supervision
- Resource scheduling
- Quality control

Services Over the Entire Life Cycle

Our teams master all phases of the life-cycle of underground infrastructures and are capable to advise and provide support to implement future oriented solutions:

- Project review
- Construction management as client's representative
- Safety and risk management
- Consultancy

OUR AREAS OF EXPERTISE

New Construction

The construction of new underground structures, whether a tunnel, cavern or the like, poses great challenges to all the ones involved in its implementation. Yet support from our experts makes projects of this nature succeed. Our specialists can lead the planning process, the revision and quality checking of design, advise investors by contributing with its immense engineering expertise. They model and develop geomechanical calculations, perform static analysis and monitor the stability. With their expertise and specialised knowledge and many years of experience, our employees handle projects worldwide from the feasibility study to the project implementation and on to supervision of the construction.

Project Management

Our project management team has been successfully handling a diverse and interdisciplinary array of tasks in its projects, by doing project management consultancy, handle client representation or overtaken the overall project management on behalf of the owners of the infrastructures. Interdisciplinary teams bring a wide range of expertise to projects and offer great flexibility and dynamism in mastering difficulties and challenges. With their foresight and determination to achieve the best results, our experts ensure that projects are handled in a timely and cost-effective manner. The dedication of our experts also impacts the budget – both experience and controlling make costs transparent and lower the fixed costs.

Structural Maintenance

The individual tasks involved in structural maintenance are integrated seamlessly: In the areas of structural monitoring and condition assessment, defects and damage are ascertained using the latest technical tools. Our employees develop an action plan for the refurbishment and renovation of the structure based on the results. This establishes a foundation for value conservation and maintenance planning. They will outline the work that needs to be carried out, the time frame and the appropriate budget. This allows the client to plan for renovation or maintenance over the long-term. We ensure that your structure is future-proof. With our knowledge and our experience, we can handle any project – from the preliminary study on to the construction supervision during execution.

Ventilation & Safety

Our specialists for ventilation and safety conceive, plan, design the project and take care of measures for ventilation and safety systems in tunnels and other subterranean installations – from the preliminary study to the operating phase. Simulations and risk analyses enable the development of solutions which suit the circumstances of the structure and optimally meet the relevant requirements. When doing so, all major influencing factors which could lead to a damage scenario are taken into consideration. Ultimately, the key factor in deciding which measures to take is a comparative analysis of the investment versus the risk reduction potentials involved. Our internationally acclaimed team will ensure we find a solution for every challenge.



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 BASE 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 crosscuts 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: CHIP FACTORY, WAFER FAB

Sargans, Switzerland

Idea, planning, project design and execution of the world's first subterranean chip factory. The underground fabrication facility offers various advantages, such as the possibility of vibration-free manufacturing under consistent temperature and humidity conditions.

The Assignment

In this special project, Amberg Engineering made the fundamental preparations and drafted the preliminary design. The planning for the conceptual design, the approval and the execution was also provided. In addition, Amberg Engineering was responsible for the on-site construction supervision.

The vault lining was executed as a single shell and was equipped with a waterproof concrete floor slab. The excavation pit was secured with an anchoring soil nail wall. The total volume of spoil amounted to about 50,000 m³. For monitoring purposes, crack patterns were recorded and both deformation and vibration measurements were carried out.

The Challenges

- Interdisciplinary project design with different areas of expertise
- Rolling planning due to tight scheduling constraints
- Geology / hydrogeology
- Void stability (near the surface, large cross-section)



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, water-bearing



SERVICE TUNNEL: HARDHOF

Zurich, Switzerland

Internal refurbishment of the rainwater and sanitary sewers, flood relief as well as the control and electromechanical equipment of the service tunnel.

The Assignment

Amberg Engineering was engaged for the final planning of the refurbishment as well as the construction supervision. This also included the electromechanical control system, the static analysis and material control as well as supervision of the execution. The bearing structure of the individual sewers remained intact, while defective internal surfaces were replaced with new, impervious material. Control of inflow to the sewage plant was accomplished by means of an automatic, autonomous control system.

The man inflow sewers leading to the sewage plant are man-sized, cast-in-place concrete structures. To protect the groundwater, it was necessary to refurbish and seal all 4 internal sides of the sewers. The sewers remained in service throughout the construction period. The system is to be operated continuously for 50 years.

The Challenges

- Construction during full operation
- The construction site led through the groundwater protection zone of the city of Zurich's drinking water abstraction

ROADS

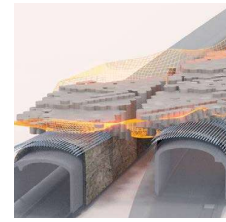
Förbifart Bypass, Stockholm, Sweden

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

Metro New Construction in Delhi, India

3 units of the subway section of the 2nd phase of the Delhi Mass Rapid Transport System (MRTS)

Project duration: 2007 - 2016

Client: ItalianThai Development Public Company Ltd.

Construction costs: approx. € 644 million

Key figures: Single-track twin tunnels, length: 2 x 4,050 m, 2 x 3,130 m, 2 x 5,450 m

A total of 9 subway stations, mechanical excavation with EPBS-TBM, project design and consulting activities for the preparation of the tendering documents, risk analysis, construction site logistics, construction of crosscuts.



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

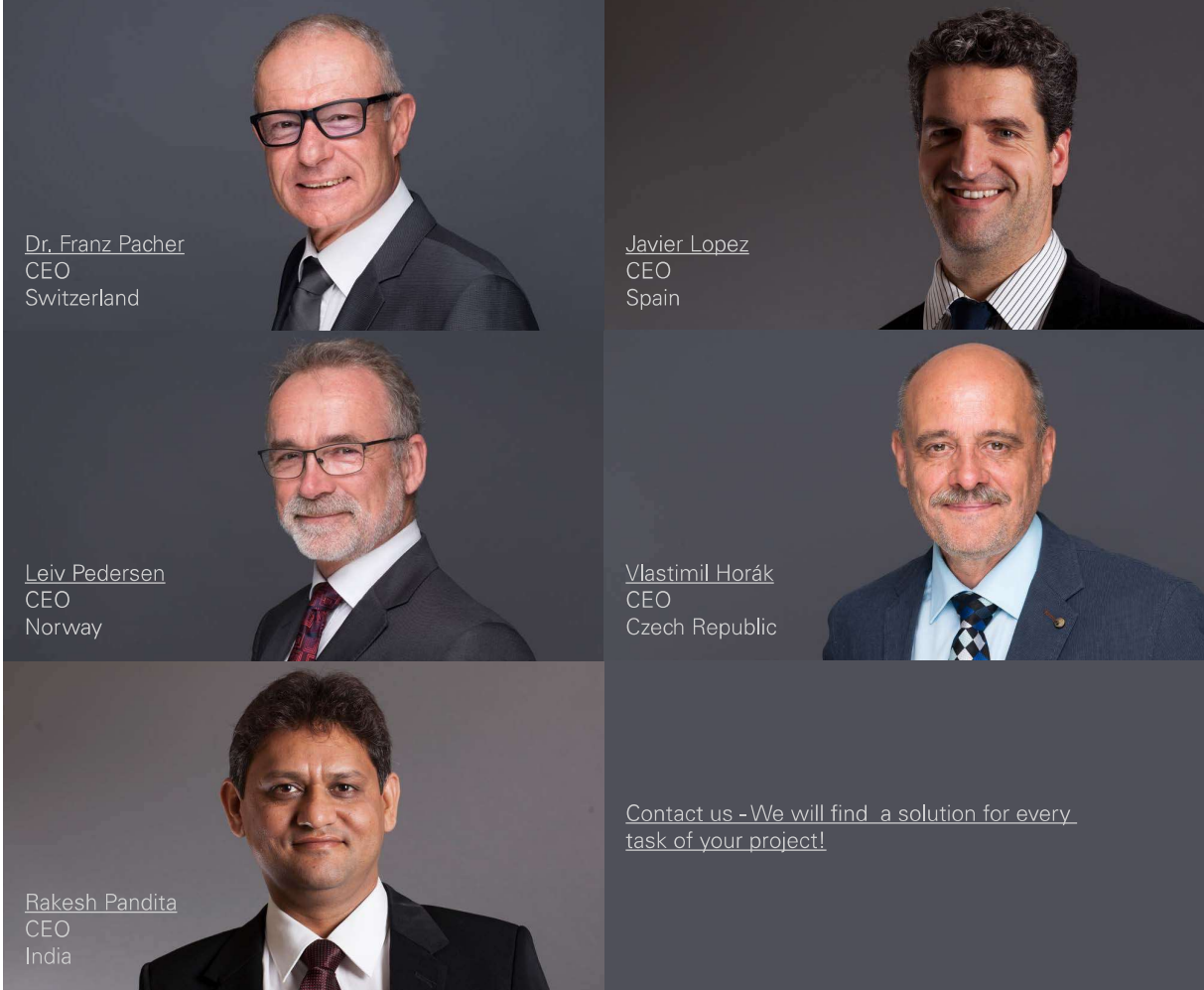
Refurbishment costs: approx. € 60 million

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 MANAGEMENT TEAM



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