INNOVATION UNDERGROUND

AMBERG ENGINEERING

ABOUT AMBERG ENGINEERING AG

Amberg Engineering is a specialised engineering designer for underground structures. For more than 40 years, we have been developing solutions in the fields of underground railways and roads, caverns and infrastructure tunnels. We are one of the world's leading engineering companies in underground construction.

We have over 200 employees. Our specialists have access to many years of national and international experience and have comprehensive knowledge in all disciplines of underground construction. They are supported in their work by up-to-date tools.

We provide clients with professional and cost-effective solutions, from planning, design, site supervision and commissioning through to renewal and refurbishment of structures. Alongside this, our expertise includes project management and consulting, as well as inspections and state assessments.

Amberg Engineering is located in Switzerland in Regensdorf, Sargans, Chur and Berne. We have further branches in Brno (Czech Republic), Bratislava (Slovakia), Madrid (Spain) and Singapore. Amberg Engineering is part of the Amberg Group, which also includes the companies Amberg Technologies Ltd., Hagerbach Test Gallery Ltd. and ASIT Ltd. Felix Amberg, Chartered Civil Engineer ETH/SIA, is the CEO and owner of the group.

GOOD REASONS…

…to talk with us

A wide range of services
Amberg Engineering offers solutions for all tasks occurring in underground construction – no matter how demanding and complex they are.

In-depth knowledge
We dispose of proven experts, no matter whether from geology, construction technology, logistics, materials technology or organisation. You can place your trust in our experienced engineers.

One contact
During all project phases, an expert contact is personally at your disposal for all questions and requirements – even for interdisciplinary tasks.

Close to the customer
Our engineers develop solutions together with the client and his designers and experts. Further we show the client the consequences of his choices. In every case we try to follow customer needs which we consider imperative for a successful completion.

Fast and reliable
With us, you profit from well-established procedures and a short decision-making process. We react quickly to changes in conditions or unforeseen circumstances with the network of our specialists.

WHAT MAKES US SPECIAL?

Underground construction is an interdisciplinary challenge. We endeavour to be the single contact, which unites all the disciplines and optimises the project. Amberg Engineering, together with the Amberg Group companies and partners offers all services necessary for the creation, maintenance and even the dismantling of underground facilities.

Our sister company, Amberg Technologies Ltd., develops systems for survey, geophysical exploration and structure monitoring. Our other sister company is the Hagerbach Test Gallery Ltd, which owns over 5 km of tunnels to test equipment, systems, materials and processes for underground construction. In its own laboratory the company also does material testing. In parallel, at the International Centre for Safety in Tunnels, questions regarding safety are investigated and training is carried out.

We use our knowledge and experience to provide our clients with innovative and needs-oriented solutions. Development of processes and technology for underground construction is an important matter for us. In order to succeed in this, we continually invest in the training and further education of our employees and work actively in research and development with expert panels and universities – not only nationally, but also internationally.

Of central importance to us is achieving the specified quality, as well as working within the given programme and budget to the client's satisfaction.

Our business is focused on continual and long-term success. We invest our profits in the development of the company and employees.

COMPLEX TASKS REQUIRE SPECIFIC SOLUTIONS

Space in populated areas is becoming ever more restricted; as a consequence, more and more infrastructure is being shifted below the earth's surface. But underground projects are complex, interdisciplinary undertakings with widely varying requirements necessitating high safety and quality standards and associated technologies from all involved. At the same time, budgets and timing schedules are tightly defined. The conditions and requirements from public authorities, the public and politics are increasing. Amberg Engineering faces up to these challenges.

Experienced specialists

Both large and small projects require proven technical expertise and a great deal of experience in project management. Experienced specialists from Amberg Engineering will support you throughout all project phases. Proximity to the customer and fast, direct and open communication are, in our opinion, central factors for success. Through experience and knowledge, our project managers recognise issues early and can formulate customised solutions. In this way, time and money is used in the most effective possible way.

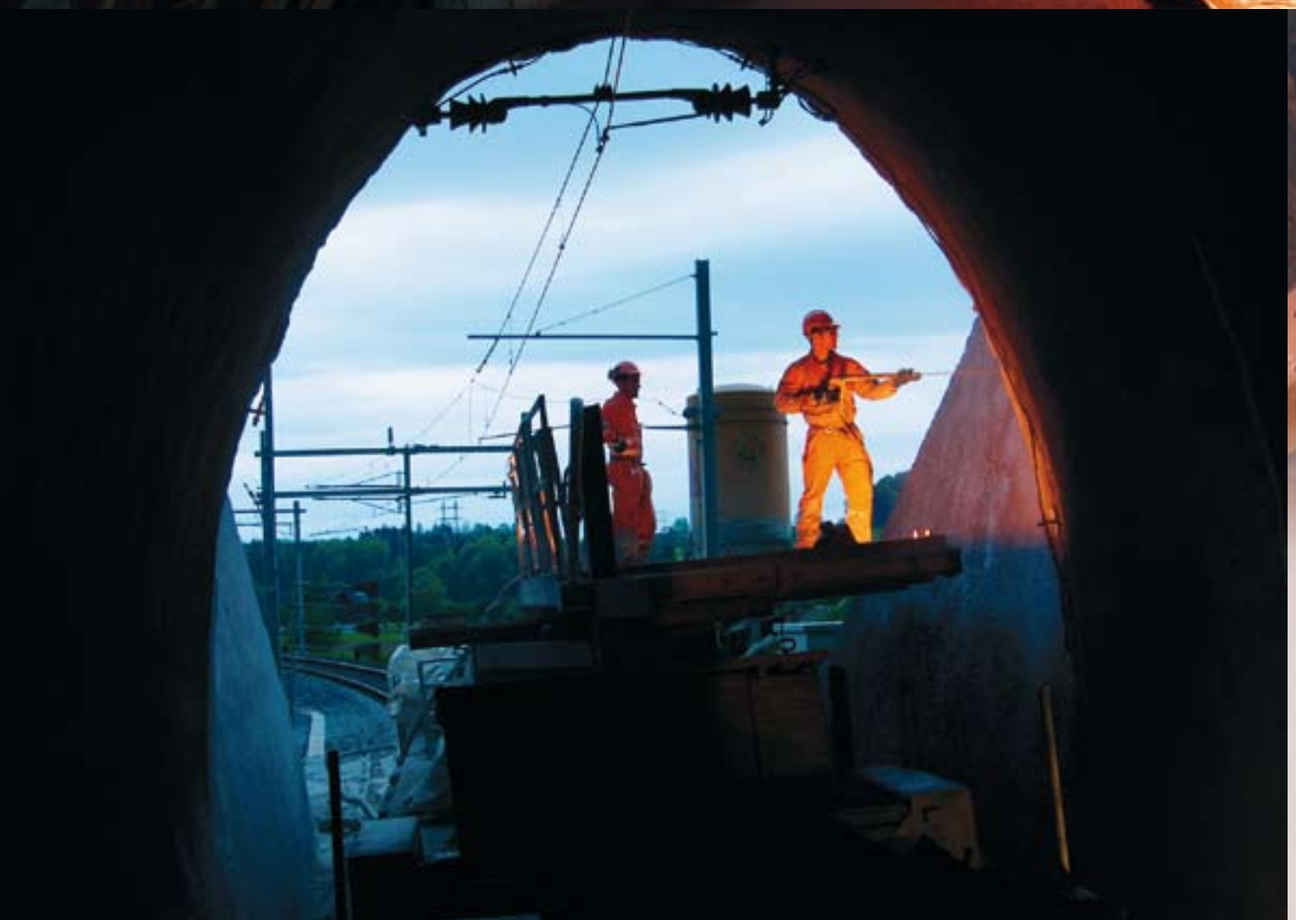
Quality and safety

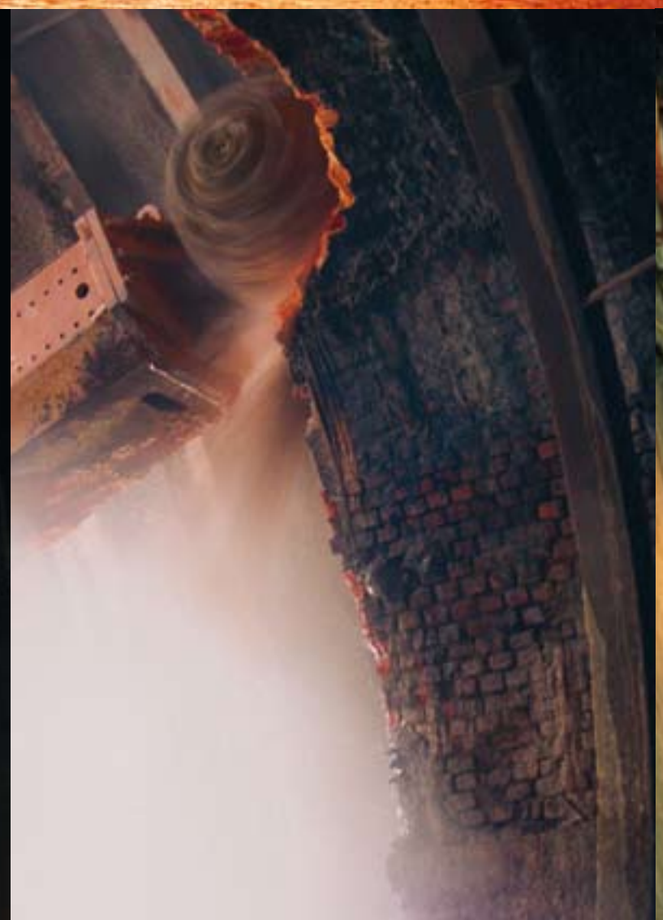
Our engineers and specialists in the fields of geotechnical design, project management, maintenance, materials technology, surveying, equipment and safety guarantee professional, state-of-the-art design and implementation. We promote quality and safety by continuous training of our employees in the latest developments in underground construction. Training is supported by practical application in the tunnels at Hagerbach Test Gallery.

In all phases

Amberg Engineering realises innovative, customised solutions in civil engineering for underground roads and railways, caverns and infrastructure tunnels. From planning and realisation to operation, our staff will support you throughout the entire lifecycle of a structure.

Three phases and comprehensive services





Roads – Uetliberg Tunnel

SAFELY AND COMFORTABLY AROUND ZURICH

With the Western Bypass, Zurich is getting an environmentally sustainable, safe and comfortable road bypass of the centre. Amberg Engineering is designing and supervising the construction of the core part of this Western Bypass – the 4.4 kilometre long Uetliberg Tunnel.

The challenge
With its two three-lane tunnel tubes, the Uetliberg Tunnel passes under inhabited areas as well as an existing tunnel belonging to the Swiss Federal Railways. The tunnel leads through soft ground and solid rock. At some points, the tunnel is below the groundwater table.

The solution
After a comprehensive and detailed feasibility study, it was decided to excavate the sections in soft ground using the core method and various construction support measures, such as pipe screen, lances and lowering the groundwater with filter wells. The excavation of the extraordinarily large cross-sections was completed on time and without incidents.

The stretches in solid rock were driven with an open tunnel boring machine. Previously driven exploratory tunnels with a diameter of 5 m were extended with a tunnel bore extender to the final diameter of approximately 14.5 m, using undercutting technology. This technology, used for the first time in the world, allowed the rock to be cut in a significantly more energy efficient manner.

Thanks to Amberg Engineering's performance, the client was able to implement the project efficiently with a lean organisation.

Rail – Gotthard Base Tunnel

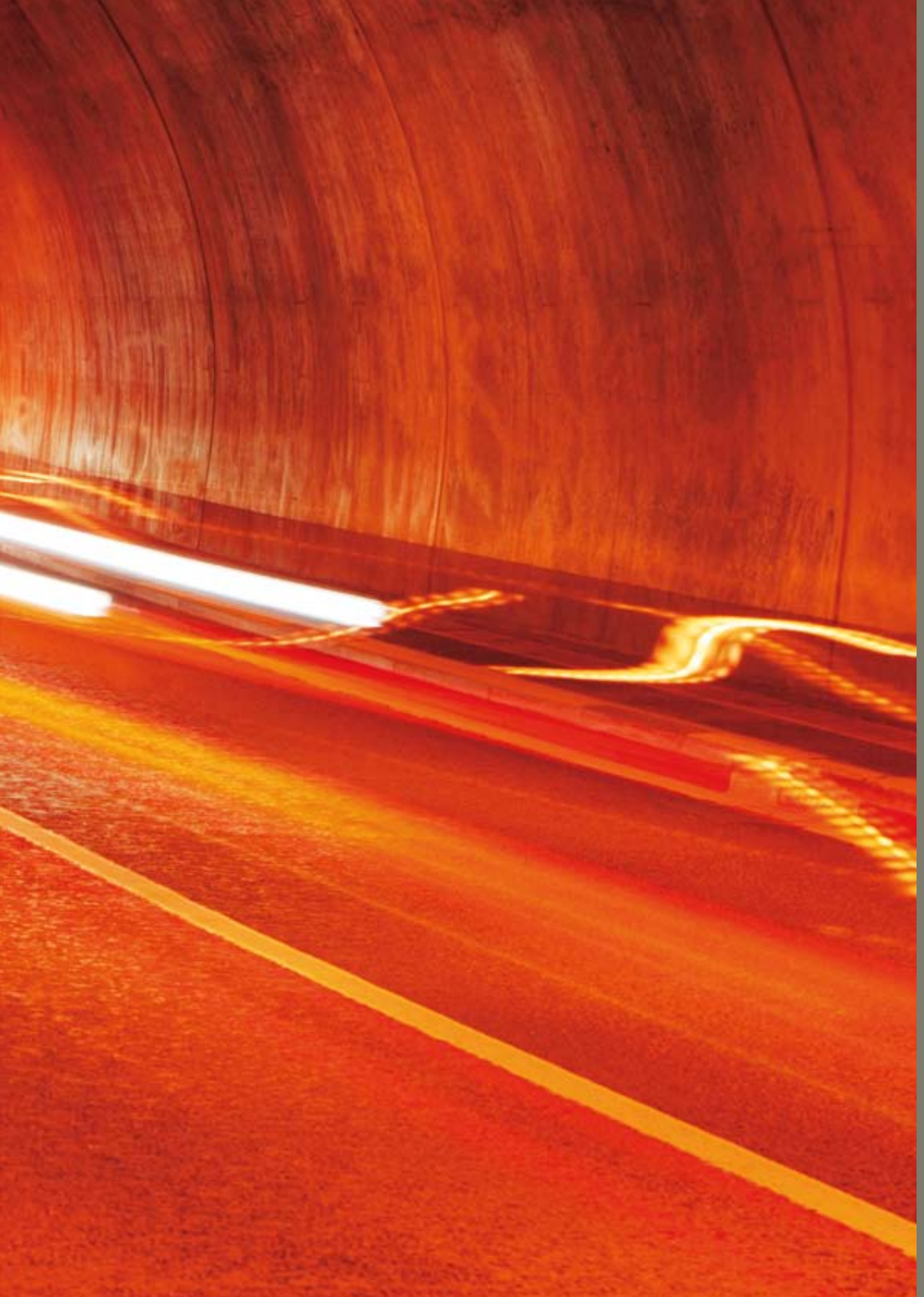
WORLD PREMIERE AT THE GOTTHARD

The new alpine railway link through the Gotthard creates an efficient rail network between northern and southern Europe. The two-tube Gotthard Base Tunnel is at the heart of the new rail connection with design speeds of up to 250 km per hour. At 57 km in length, it will be the longest railway tunnel in the world. Amberg Engineering and partners are responsible for the design and supervision of construction work on the three southern sections, Bodio, Faido and Sedrun, with a length of 39 km.

The challenge
The geological conditions vary from very compact hard rock layers to soft and squeezing interference zones and sections of soft ground. The tunnel's maximum overburden is 2,500 m. Rock temperatures of more than 50°C are expected at some points. Construction is defined by labour intensive construction processes and demanding logistics.

The solution
The entire logistics for the Sedrun site, with up to four simultaneous drill and blast headings, take place via two 800 m deep shafts. Cooling had to be installed to counteract the high temperatures inside the mountain.

For cutting through geologically difficult zones, excavation and safety concepts were developed for the drill and blast headings in the design. The tunnel boring machine must be able to react flexibly to changing rock behaviour. The concepts were confirmed during the successful implementation of the works.



Metro – Metro Delhi

TRAVELLING AT SPEED IN THE METROPOLIS OF DELHI

Delhi has been suffering from a significant increase in traffic for years. An initial metro line for the east-west axis has already been implemented. A second line should ensure connection to the south. A contractor awarded Amberg Engineering the design and support for construction work for the tunnels around the “Khan Market” and “Jawaharlal Nehru Stadium” stations.

The challenge
The two tube tunnel passes under densely populated urban areas, including the locations of some listed buildings. Along its entire length, the tunnel passes through partially water-saturated soft ground, composed of clays and marls, sometimes interspersed with single boulders.

The solution
The entire tunnel section is driven with an earth pressure balance shield. The tunnels, with an inside diameter of 5.7 m, are clad in pre-cast concrete segmental lining. In the process, Amberg Engineering optimised the segmental lining for the contractor. Tunnel connections were constructed conventionally using various construction support measures.

The construction procedure for the emergency exits was investigated in detail. Instead of using a mined solution, shafts were sunk from the surface. We have developed a monitoring concept, which provides dense measurement coverage with intensive monitoring programmes.

Infrastructure tunnels – X-Ray Laser XFEL

REVOLUTIONS IN RESEARCH

The Deutsche Elektronen-Synchrotron DESY builds an x-ray laser (XFEL) that will create completely new and unique research possibilities. With the extra-short, intensive and laser-like x-ray flashes generated by, molecular and atomic processes can be filmed and snapshots of atomic details in materials and bio-molecules can be taken. Within a joint venture, Amberg Engineering does work on the preliminary and detailed design and the tender documents for the x-ray laser structures. In addition, it manages the supervision of all the construction work.

The challenge

One of the challenges is to match the requirements of research in the designed solution. Among others, these requirements are the precision required in the positioning of equipment and the demanding grounding of all elements for high currents. The building developed with a large number of different cross-sections, shafts and a demanding split into construction lots creates a challenge in respect of the logistics and the construction processes. All structures underground are below the groundwater table.

The solution

The European x-ray laser, XFEL, is an approximately 3.4 km long facility, which for the most part runs underground. The core component is the approximately 1.5 km long linear accelerator for electrons, which is located in a straight tunnel. After the straight section, the tunnel fans out, splitting into a total of two times five single tubes in the experimental hall, where the research stations are situated.

All tunnels are excavated using a hydroshield TBM. Shafts are built using high pressure grouting. All the equipment fixed to the tunnel complies with special requirements for dimensional precision. The equipment is fixed by welding to the lining by cast in steel bands.

Caverns – Wafer Fab

BETWEEN HISTORY AND HIGH-TECH

Wafer Fab, the first underground chip factory in the world, will be built in Sargans. Manufacturing chips in Gonzen mountain in Sargans has decisive advantages, such as the possibility for vibration-free manufacturing under constant temperature and humidity conditions. Amberg Engineering is responsible for design and construction supervision for the underground cavern in which chip production will later take place.

The challenge

The project is characterised by a very short design and construction time. In the area affected by vibrations from the blasting there is a historically significant 17th century chapel, which may not be endangered. Also, there are several special requirements to be taken into account in the co-ordination of the design for the chip manufacturing facility. In addition, the main cavern has a large crosssection.

The solution

In a very short time we have developed the specific requirements into a design and made it ready for construction together with an interdisciplinary team. The project involves two access tunnels, the main cavern of which is 18 m wide, 100 m long and 18 m high, a cross cavern and the excavation for the pre-cut. The lining is carried out with a single shell and has a watertight concrete invert to avoid fluids leaking into the ground. To monitor the church above, surveys were established and vibration measurements defined. If these measurements exceed given limits, the blasting charges will be reduced.

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