MAX BÖGL

# Tunnel Construction

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Competent. Modern. Interdisciplinary. Team-oriented.

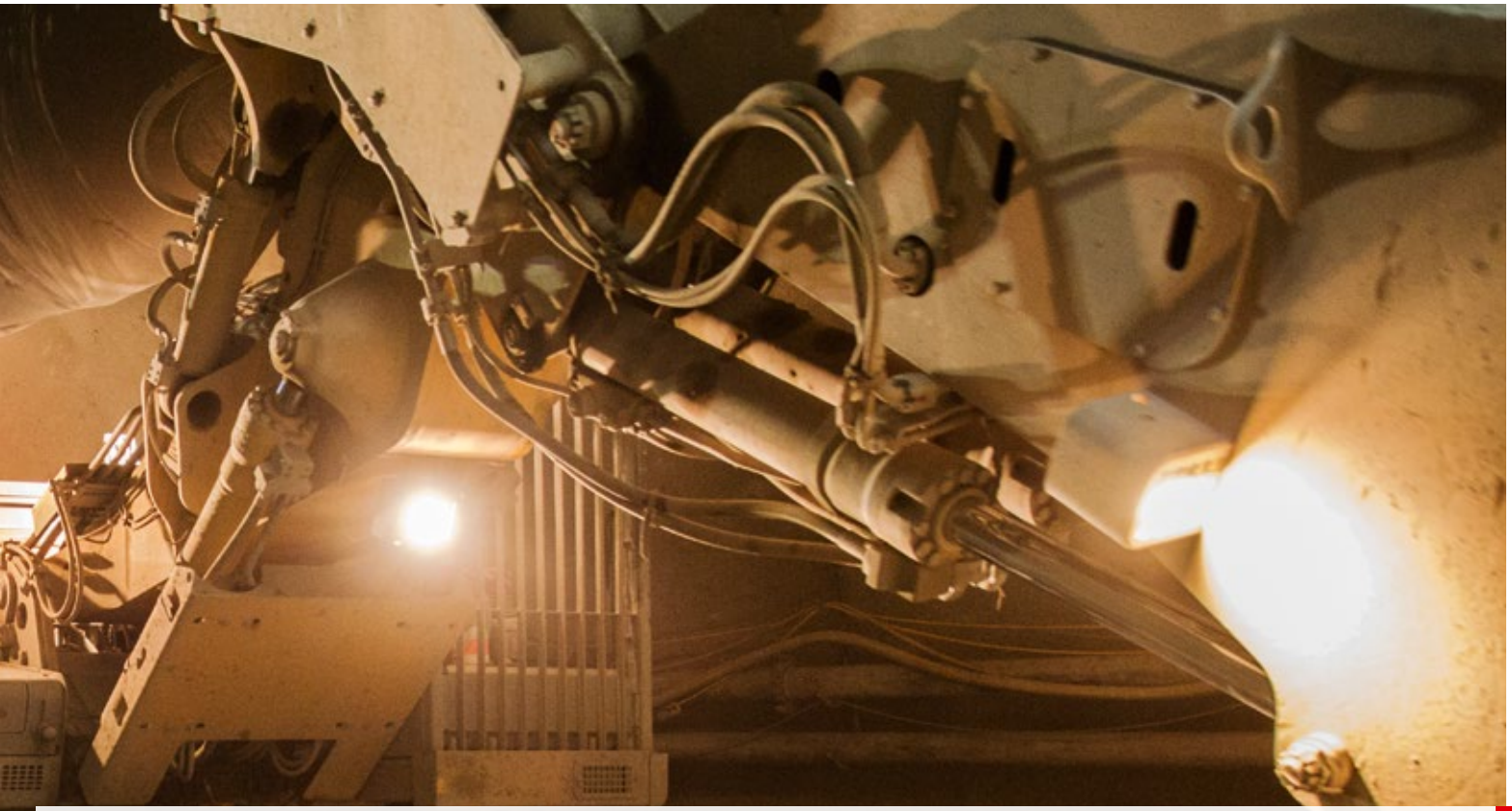
# About us

Tunnel construction is one of the most fascinating, but also one of the most demanding tasks in the construction sector. Numerous projects within Europe demonstrate the versatility and complexity of modern underground working – such as the tunnels of the new high speed railway line of Deutsche Bahn AG, the road tunnels for motorways and bypasses, tunnel renovations in existing tunnels as well as inner-city underground and suburban trains of the transport companies.

The construction industry has undergone enormous structural change. Megatrends such as digitization, climate change, mobility and urbanization determine the future of modern construction. The Max Bögl group of companies recognized this development years ago and has logically and consistently dealt with the effects of this change. Thus, the need to change is a central subject for the management.

In the BIM sector, the company group has occupied a leading position for many years. Lean management and standardised project management are just as intensively trained, used and promoted as modern methods. The company group Max Bögl has a competent and efficient technical department in the field of tunnel constructions in Munich, which implements projects in a customer-oriented manner from tender processing to execution and successful handing-over. A standardised and quality-proofed project management is carried out and supported by modern digital applications, lean construction methods and a continuous improvement process. This is progress. The basis of our success is formed by our motivated employees in office and field service with the necessary vision as well as the close cooperation with our geotechnical specialist department and the departments Transportation and Equipment, Precasting Plants, Civil Engineering, Raw and Construction Materials, Formwork Technology and Technical Planning located at our headquarters in Sengenthal. We see our memberships in STUVA - Studiengesellschaft für Tunnel und Verkehrsanlagen e.V., DAUB - Deutscher Ausschuss für unterirdisches Bauen e.V. and Bundesfachabteilung für Unterirdisches Bauen (specialised federal department for underground construction) of the Bauindustrieverband and Österreichische Gesellschaft für Geomechanik (Austrian Society for Geomechanics) as recognition of our work in the field of tunnel works among experts. The Infra South central division at the Munich location, which was restructured in 2018, consists of three supra-regionally operating divisions: Tunnel Construction (including pipe jacking), Soil Freezing Technology and Special Foundation Engineering, as well as Civil Engineering (regional South Bavaria and Austria) and the companies Goller-Bögl (South Tyrol) and Max Bögl Schweiz AG.

Further information can be found on our website tunnelbau.max-boegl.de.



# Tunnelling by Mining Technique

By using mining technique, the NÖT (New Austrian Tunnel Construction Method), partial cross-sections of tunnels will be excavated from the mountains and afterwards secured with shotcrete.

United

# High-tech and rough craftsmanship

The tunnel is excavated conventionally by blasting, excavating or milling. It follows the loosening process, the excavated material is removed and the unsupported area is secured with steel arches, anchors and shotcrete.

The Tunnel Construction Division has extensive references in the handling of loose and solid rock. Tunnels have been safely excavated in in explosion-hazard environments, large groundwater inflows have been mastered and tunnelling in karst mountains with advance exploration has been successfully implemented.

Cooperation with other specialist departments of the group – such as Soil Freezing Technology, Special Foundation Engineering or the Raw- and Construction Material Department – enables integrated technical solutions and high added value. The shotcrete construction method represents the core business of the Tunnel Construction Division.

# Underground and suburban railway projects

Underground and suburban trains are the arteries of public transport.

Inner-city construction is a special feature due to the external circumstances.

GLÜCK AUF
TUNNEL MARLIES
TEREX

Holistic solutions

# Interdisciplinary strong

For complex infrastructure measures, the Tunnel Construction Division is able to bundle the experience and competence in the group of companies and to bind long-term, reliable external partners. This ensures the success of the project and, as a result, public acceptance.

In the case of deep excavation pits or the use of special construction methods – such as DSV (jet blasting method), pipe shields, pipe jacking or ground freezing technology – risks resulting from subsidence or harmful environmental influences must be identified and kept under control. The logistics and delivery of materials and personnel to the construction site must be planned intelligently and the monitoring of the surrounding existing structures is of particular importance.

Many successfully implemented major inner-city projects, usually involving major logistical and construction challenges – e.g. in Munich, Düsseldorf, Berlin, Vienna or Nuremberg – give our customers the security of having the right partner on their side.

# Special projects

Special underground mining projects are a special attraction for the tunnel construction sector:

Usually it takes a lot of experience as well as ideas and innovative solutions, because no construction project is like another.

Safe handling

# Unique challenges

In 1944 and 1945 in particular, the Third Reich regime ordered that underground tunnel systems have to be built by concentration camp priosoners in forced labour. These tunnels were to be extended – invisible to the enemy – to later production sites, e.g. for combat aircraft. One of these tunnels is the Dogger tunnel in Happurg near Nuremberg.

As a measure of the General War Consequences Act (AKG), the tunnel construction division took over the sectional securing and backfilling of the tunnel system in order to counteract possible collapse hazards. An insulation product was used, which was developed by the company group, and a machine technology was adapted to this project to avoid robbery and provide security.

We are happy to meet the challenges that arise in special projects such as this one.

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# Mechanical shield tunnelling

Large pipe jacking units do the work, where pipe jacking methods are no longer applicable due to the diameter and shotcrete jacking is uneconomical.

Shield tunnels with segment lining are more similar to industrial production.

Logistics is decisive

# The right drive

The Unterinntalbahn (Lower Inn Valley railway), which is a part of the northern access to the Brenner base tunnel of the project H3-4 Münster-Wiesing, includes a double-track railway tunnel and has a total lenght of 40 km of which 32 km are tunnels. The Tunnel Construction Division was awarded by Brenner Eisenbahn GmbH (BEG) as a joint venture.

For driving the 5,767.5 km long tunnel, one of the largest shield driving machines in Europe with a liquid-supported working face was used. The diameter of the cutting wheel was 13.03 m. It was manufacture on site in a mobile field factory provided by Max Bögl, the tunnel was extended in a watertight manner with segment rings.

The 8,280 meter long Finnetunnel in Thuringia was realized by the Tunnel Construction Division as Co-TGF (technical leadership) with two convertible Mixshields Hydroshield in closed and open mode for DB Netz AG.

The extention of the 93 m² great full section was made with Tunnel segments and the driving of the 16 cross cuts was done with shotcrete under the protection of glaciation, which was carried out by the experts of the Soil Freezing Technology Department.

# Tunnel renovations

Since roads and railway lines have existed, tunnelling has been carried out. Most of these tunnels, which date of manufacturing can be traced back to the 19th century, have been getting on in years.

Lifting included

# Turning old into new

Operational reliability and stability can often not be guaranteed for older existing tunnels, so that extensive rehabilitation measures are necessary. Cross-sections will be widened, the concrete structure will be renewed and the entire tunnel structure will be adapted to the latest standard safety technology.

Sometimes a line can be completely closed for the duration of this work, as it was the case, for example, with the renewal of the DB tunnel in Oberstaufen by the Tunnel Construction Division. However, this is often not feasible in view of the high volume of traffic. In this case, solutions must be found which make it possible to carry out the renewal measures while maintaining the existing traffic.

The Max Bögl Group is intensively active in this field in order to develop progressive, safe and high-quality construction methods that reduce traffic congestion to a minimum.

# Pipe jacking and mechanical engineering

The underground laying of pipelines is an increasingly important part of modern sewer, pipeline and line construction.

Partly dilapidated sewer and pipe systems in the cities and a denser development of our urban settlements increasingly demand intelligent construction methods.

Made-to-Measure

# An all-round solution by experts

Owing to technical know-how and its own mechanical engineering sector, the Pipe Jacking Division at Max Bögl, who is a specialist in the field of closed construction methods, has played a major role in this development.

The Special Department within the Tunnel Construction Division, based in Schwabach near Nuremberg, offers technical, economical and environmental friendly solutions in the areas of pipe jacking using full and partial cutting technology, microtunnelling, compressed air work and special mechanical engineering.

Pipe jacking in particular, which is currently probably the most environmental friendly construction method, has increasingly developed into an economically interesting alternative to conventional open pipe trenches.

Professional qualification, innovative ideas and the energy of the employees have made the Pipe Jacking Department in its 35-year history a renowned specialist in various civil engineering and tunnel construction tasks.

With around 55 employees, the Pipe Jacking Department is involved in numerous construction projects of all dimensions and degrees of difficulty at home and abroad – from the planning and execution of tunnelling projects, the creation of alternatives to conventional solutions, to the design, construction, leasing and sale of complete driving equipment.

The entire machine technology required – from simple manual dismantling to highly engineered full cutting technology – is developed, designed, manufactured in-house or adapted and rebuilt to the project-specific conditions on site.

# Segment production

Concrete tubbings are very easy to install due to the short construction times and the resulting cost advantages are indispensable in modern tunnel construction processes.

For many years, high-quality tubbings have been produced stationary as well as on construction sites by the Precast Plant Department of our company group.

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Precision technology

# Hard shell and soft factors

State-of-the-art multifunctional production facilities form the basis of our high quality standards. With an experienced team of engineers and technicians, Max Bögl is always in a position to react flexibly to the individual wishes of its customers with all its know-how.

Due to the constant further development of the building material concrete, numerous tests, inspections, controls and measurements are necessary to ensure the high quality standards. Highly qualified engineers also research on high-performance building materials and state-of-the-art production solutions.

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An essential criterion here is the precision of the end product, the segment ring. Because of accuracies of +/- 0.3 mm, production facilities, manual skills and engineering services in planning and execution are required at the highest level on a daily basis.

Computer-aided CAD and CAM control ensures consistent quality and coordinates all manufacturing processes. The segment construction at Max Bögl completely covers the high requirements of precision, economy, adherence to deadlines, fire protection, durability and functionality.

We have our own efficient fleet of vehicles equipped with the latest technology for transport. Due to increasing demands on environmental protection and logistics, we increasingly organise and carry out water and rail transport in addition to conventional road transport.

# Focus on the project

The particular focus at Max Bögl is the construction site regarded as a "core value creation". Processes and technical concepts of the project must be professionally planned and optimally prepared. This also requires the active support of internal technical services – from the quotation phase to project completion.

Specialists and experts, who are our in Munich located internal service providers, support the project management on building sites.

The entire spectrum of modern construction management is covered, by standardized project handling, work preparation, calculation, lean construction, scheduling and schedule control, quality management, invoicing, contract management and cost control.

Regular team meetings, in-house training courses, mentoring and our own company wiki for tunnel construction ensure the transfer of knowledge and information as well as the interdisciplinary qualification and development of our employees.

This ensures efficient and cost-effective project management owed to the construction sites which are the source of core value creation throughout all phases of project implementation – from quotation processing to the end of the warranty period.

# Geotechnics and environment

The Tunnel Construction Division has its own experts who deal with a wide range of topics in geotechnics, geology, dewatering and the environment. The specialist department has already been responsible for the geotechnical management of several tunnel construction projects. We are also in the position to assess and evaluate questions professionally concerning subjects in the area of dewatering, special foundation engineering, monitoring, earthworks and disposal.

The engineering geological competence for the assessment of tendered subsoil parameters in homogeneous areas on the contractor side is required. At the latest with the introduction of the new DIN ATVs 18300 for earthworks, 18301 for drilling work and in particular 18312 for underground construction work.

Especially in tunnel construction, the medium of the subsoil must be assessed in advance and a construction method must be defined. The risks to the subsoil must be minimised, which requires intensive technical project support by an engineering geologist. Geological deviations and their effects on construction operations are analysed and measures derived.

An internal optimization of construction processes on tunnel construction sites has come into action in order to realise resource -friendly constructions by means of sustainability management and environmental awareness carried out by our employees.

# Max Bögl Group

With over 6,500 highly qualified employees at 40 locations worldwide and an annual turnover of over 2 billion euros, Max Bögl is one of the largest construction companies in the German construction industry. Since its foundation in 1929, the company's history has been characterised by innovative strength in research and technology - from tailor-made individual solutions to constructionally and ecologically sustainable overall solutions.

With forward-looking in-house developments on topics of our time, such as renewable energies, urbanisation, mobility and infrastructure, the Max Bögl Group is already realising solutions for the megatrends of our globalised world. Based on many years of experience and competence in high-precision precast concrete construction, Max Bögl is also positioning itself as an important driving force in the development of innovative products, technologies and construction processes.

The wide range of services and the high level of vertical integration with our own steel construction, our own precast plants, the most modern fleet of vehicles and equipment as well as our own raw materials and building materials guarantee the highest quality. The use of BIM, lean management/ production and standardised project management ensures adherence to schedules and cost-effectiveness from the initial concept idea to the finished building product.

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Progress is built on ideas.