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# CONSTRUCTION WORLDWIDE

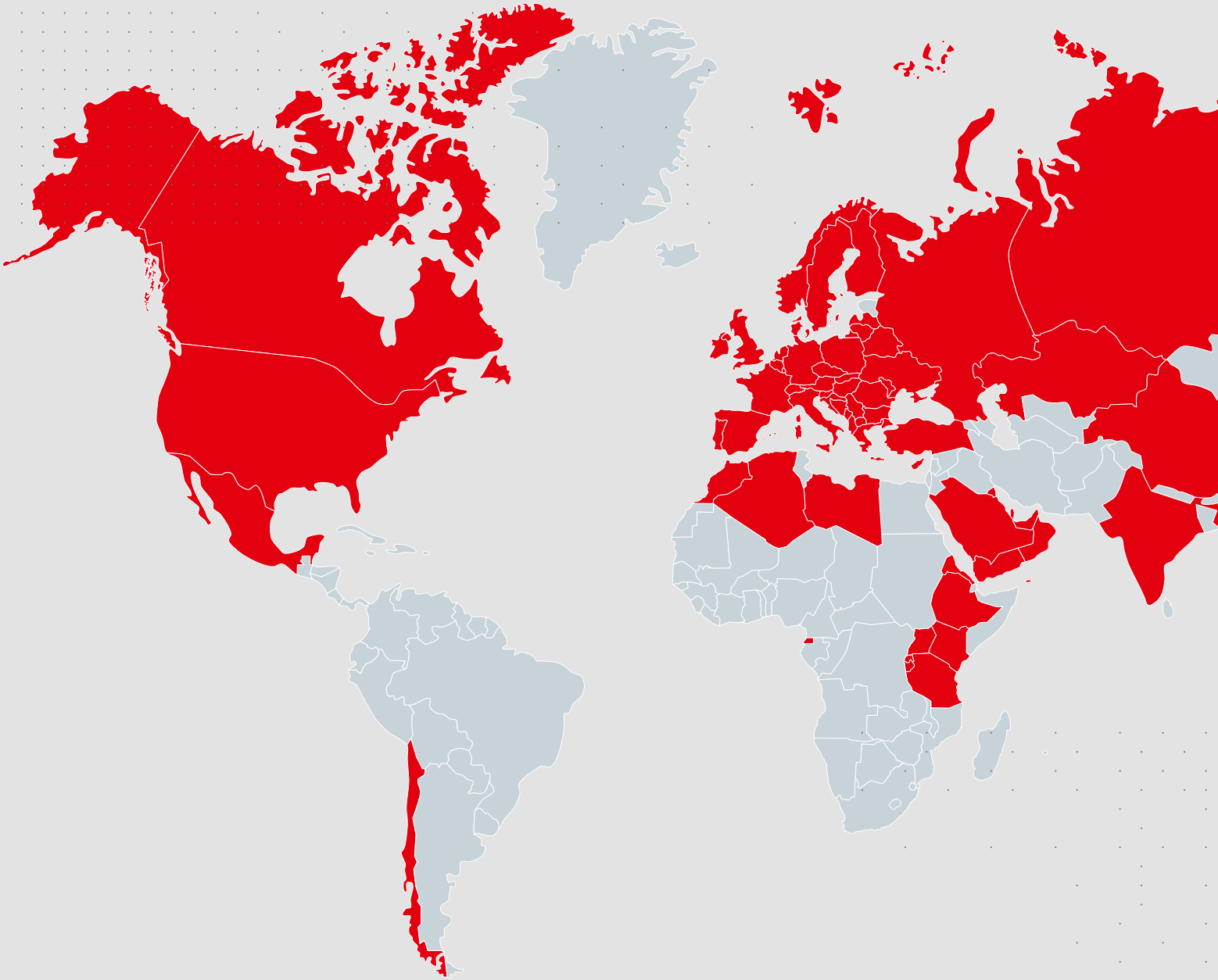
STRABAG

ZÜBLIN

# CONTENT



Cover+1: Sheikh Zayed Desert Learning Center & UAE World Desert, Al Ain, United Arab Emirates



# STRABAG GROUP

## WORLDWIDE EXPERIENCE

With our experience in constructing international projects at the highest level we have made a name for ourselves - worldwide. Vision, courage and expertise have been the keys to our success all around the world. Since our first international operation in 1891, we have been implementing global projects and have left our mark on all continents. For example, we were in Argentina in 1911 with harbour facilities, built railways in Iran in 1938, hydro electric power plant in Iraq in 1953. The first international railway in Nigeria was built in 1959, 1965 we finished water barrage in Pakistan and in 1967 dams in Morocco. Today, the STRABAG Group has operations around the world - in more than 60 countries worldwide in all classical and niche construction segments.

Ed. ZÜBLIN AG, majority-owned by STRABAG Group since 2005, was founded in 1898 by the Swiss engineer Eduard Züblin in Strasbourg (Alsace). Branches were subsequently established in several European countries. After 1918, some of these branches were transformed into legally independent companies. Since 1919, Ed. Züblin AG, with its head office in Stuttgart, has been continuing the business activities of the original company within Germany. Since 1953, Züblin has been active in over 50 countries worldwide, carrying out design, management, construction and turnkey projects.

The STRABAG Group's worldwide activities executed by its subsidiaries STRABAG International GmbH and ZÜBLIN International GmbH include transportation infrastructure projects such as roads, railways or airports and automotive proving grounds. Another main sector of our portfolio is building construction from turnkey projects to industrial facilities. Our operations in civil engineering include bridges, dams, LNG Tanks as well as tunnels and harbour facilities. Foundation for our success is the international cooperation within our strong network. The STRABAG Group covers the construction industry supply chain, with a workforce of more than 70,000 employees generating construction works worth more than € 14 billion every year.

For each project, an individual approach is adopted that takes into account the specific individual demands. For us it is important to always find the best customised solution and to make construction projects a success in terms of technology as well as economical efficiency.

1 Worldwide STRABAG Group's Activities
2 STRABAG Group Organisation

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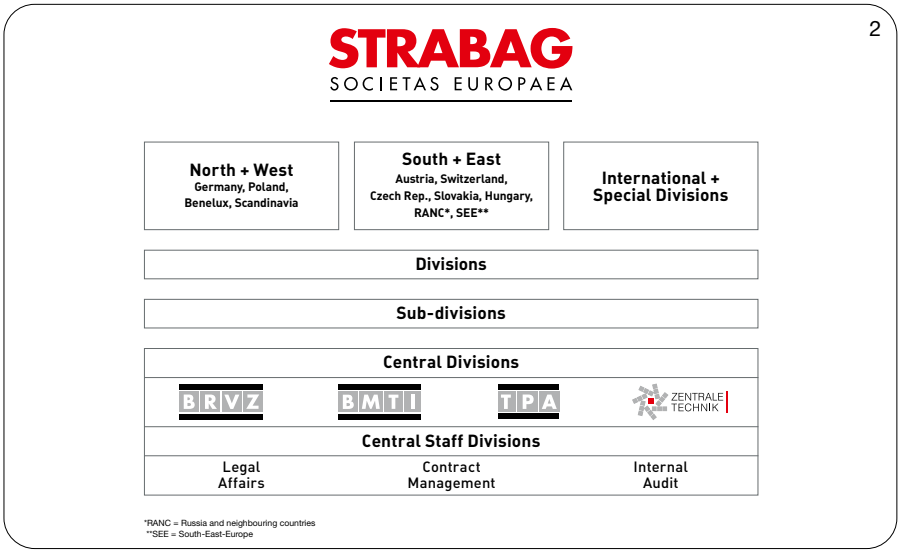


sophisticated structures

# CIVIL ENGINEERING

- BRIDGE CONSTRUCTION
- DAM CONSTRUCTION
- HYDROELECTRIC POWER PLANTS
- LNG TANKS
- TUNNELLING
- PIPE JACKING/MICROTUNNELLING
- GROUND ENGINEERING
- ENVIRONMENTAL TECHNOLOGY
- HARBOUR FACILITIES

## SERVICES

- Design and operation
- Arch formwork
- Incremental launching
- Cantilever construction
- Composite steel bridges
- Cantilevered false work
- Side span construction
- Cable-stayed bridge
- Use of prefabricated girders with own pre-cast facilities
- Formwork launching
- Ultra-high performance concrete
- Mobile batching plants (onshore and offshore)

## BRIDGE CONSTRUCTION

STRABAG Group has designed and executed bridges, elevated roads and flyovers using innovative construction techniques. Through numerous novel design and construction methods developed in-house, STRABAG Group has made a substantial contribution to the state-of-the-art of bridge construction.

We stand for many new developments and patents worldwide and are one of the pioneers in reinforced and prestressed concrete construction. Bridge construction has always been one of the company's core activities. This tradition has been successfully continued by our innovative and competent business unit as competence centre for bridge construction. Utilising this outstanding expertise and experience in conjunction with the highest level of skill and reliability guarantees every client a cost effective solution and the highest quality in bridge construction work.

STRABAG Group's engineers and staff meet any challenge, and are particularly well prepared for projects that demand special design proposals or comprehensive project management.

1 Sheikh Khalifa Bridge, Abu Dhabi, United Arab Emirates
2 Dubrovnik Bridge, Croatia
3 Ting Kau Bridge, Hong Kong, China


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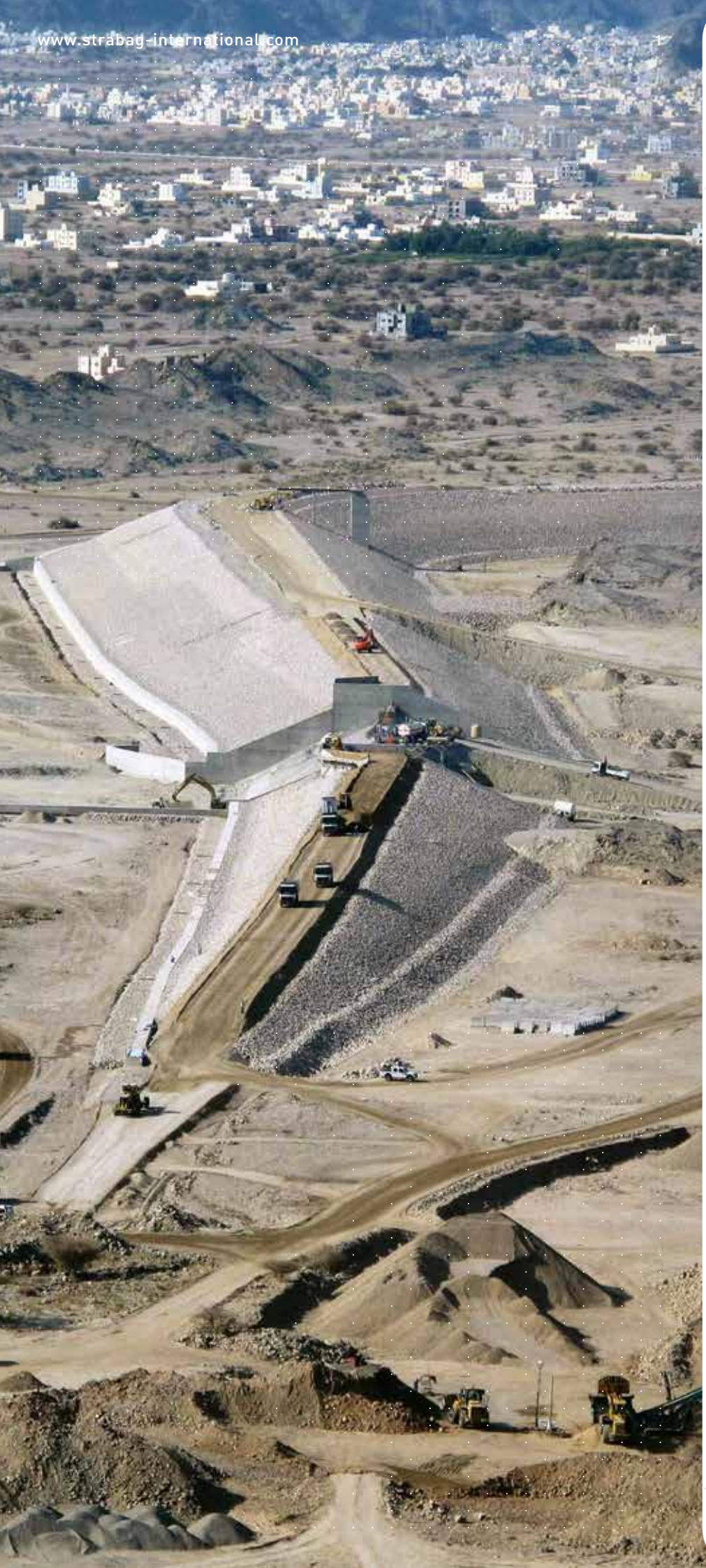

# SERVICES

- Earth and rockfill dams
- Gravity and arch dams
- Roller-compacted concrete dams
- Drilling and grouting
- Water channels
- Asphalt concrete cores and linings
- Landfill sites

1 Flood Protection Dam at Al Amerat Heights, Oman
2 Homestake Dam, Colorado, USA
3 Rehabilitation of Wahnbach Dam, Germany
4 Salalah Interceptor Guard Dam, Oman
5 Extension of Pumped Storage Power Plant, Vianden, Luxemburg
6 Flood Control Reservoir, Rennersdorf, Germany

## DAM CONSTRUCTION

STRABAG Group's engineers provide outstanding services for developing complete solutions in the construction of earth or rockfill dams, as well as concrete gravity, arch and roller-compacted concrete dams.

A wide experience combined with environmentally friendly construction methods and economic execution of the construction works guarantee the creation of safe and economic dams and reservoirs. STRABAG Group has had a significant share in the construction of some of the largest dams worldwide, for example Zillergründl Dam in Austria, Thika Dam in Kenya and Xiaolangdi Multi Purpose Dam in China.

A speciality of STRABAG Group came up during the 1950s: The use of asphalt for making dams impermeable underwent professional development: This was the start of machine-assisted installation of asphalt concrete cores and linings.

STRABAG Group was the pioneer, producing more than 200 asphalt sealings for dams, water reservoirs, canals and landfill sites. Recent examples of successful projects include the Salalah Interceptor Guard Dam in Oman, the Homestake Dam in Colorado, USA and the extension of the Pumped Storage Power Plant in Vianden, Luxemburg.


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# SERVICES

- Integrated seawater desalination plants
- High head plants
- Run-of-river plants
- Pump storage plants
- Thermal power plants

1 Hydroelectric Power Plant, Middle Marsyangdi, Nepal
2 Hydroelectric Power Plant Quilleo, Chile
3 Dam Yacyretá, Paraguay
4 Hydroelectric Power Plant, Muratli, Turkey

# HYDROELECTRIC POWER PLANTS

Since the start of its overseas activities the STRABAG Group has constructed hydroelectric power plants including associated structures such as dams, barrages, caverns, tunnels, spillways, switchyards. We are internationally engaged as a renowned problem solver and specialist in construction, repair and extension works on hydroelectric power plants. Our engagement originated in the early 50s. Since then, STRABAG Group has built gigantic structures for run-of-river power plants on all continents. Such power stations use the potential height difference between headwater and tailwater which may range from just some meters to more than 150 m. The water volume available in large rivers, such as the Paraná River in Argentina, is far above 10,000 m³ per second.

The building of structures used for the exploitation of hydropower is deemed one of the most demanding structural engineering tasks. This applies to planning and design as well as to construction itself. The STRABAG Group can boast tremendous technological and operative know-how in this field.

Examples of power plants with capacities of 60 to 85 MW can be found on the Rivers Rhine, Danube, and Inn in Austria. However, the damming of the Yellow River Huang-He at Xiaolangdi in China is much more impressive, as it provides for a capacity of 1,800 MW. One of the most outstanding projects is the Yacyreta Dam, a huge 3,200 MW run-of-river power plant between Argentina and Paraguay at the River Paraná.


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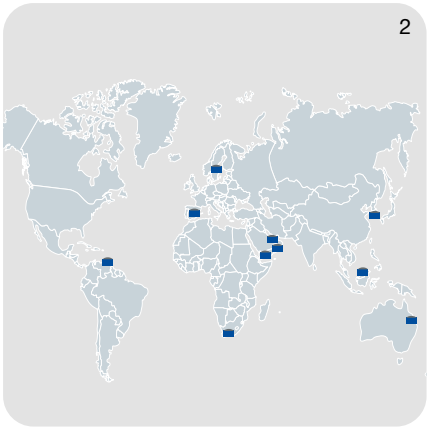
# SERVICES

- Basic research and feasibility studies
- Development of different solutions, comparative studies of operational safety and economy, costs and period of construction
- Risk analysis
- Collection of reference data on material properties, performance of structures and materials under cryogenic conditions by laboratory experiments and model tests
- Basic and detail engineering
- EPC contractor not only for concrete works and full containment tanks, but also for the coordination of the steel and plant erection
- Supervision, quality assurance and control

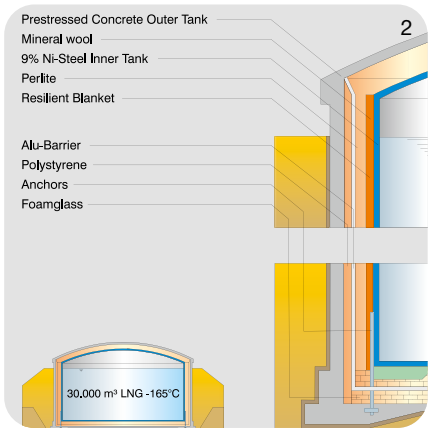
1 Tongyeong LNG Terminal, South Korea
2 Executed Projects

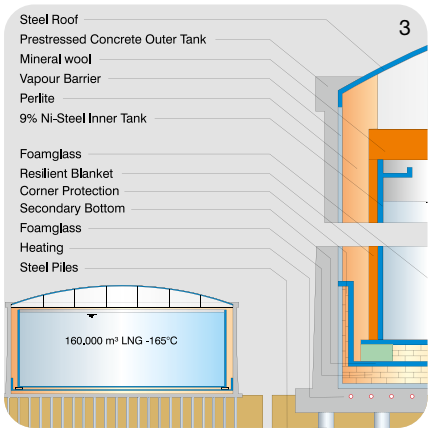


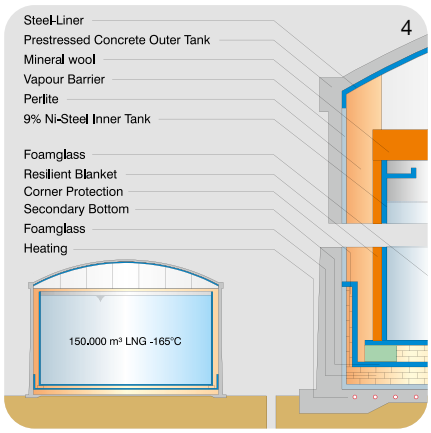
# LNG TANKS

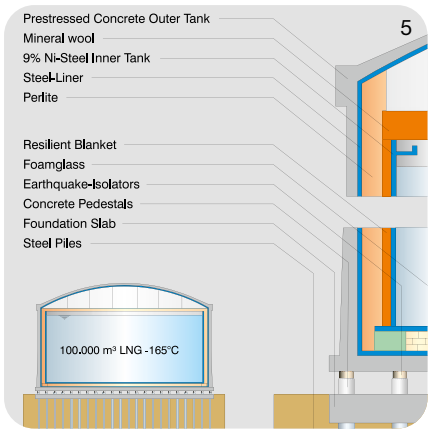
- STRABAG/DYWIDAG LNG Technology has been involved in the development of LNG storage systems right from the beginning and built its first prestressed concrete protective tanks in the late 60s.
- By exchange of experience and knowledge between engineering and construction, the permanent development and improvement of the engineering methods and design solutions is guaranteed.
- STRABAG/DYWIDAG LNG Technology offers solutions for liquefied gas storage systems which meet all protective requirements, e.g. spillage, liquid impact, explosion, missile impact, fire.
- STRABAG/DYWIDAG LNG Technology is actively involved in the development of isolators in order to damp seismic influence on the tank structure.
- Together with their international operating partners STRABAG/DYWIDAG LNG Technology offers the entire scope for the engineering, design and construction of on-shore Export and Import Terminals - starting from the FEED to Cool Down.

1 LNG Tanks 1–4, Sagunto, Spain
2 LNG Tank, Stuttgart, Germany, 1968
3 Atlantic LNG Tank 4, Trinidad & Tobago, 2002
4 Regassagunto LNG, Sagunto, Spain, 2002
5 LNG Tanks, Inchon, South Korea, 1993

# SERVICES

- Open cut method
- Cut and cover method
- Conventional tunnel drive
- Mechanized hard-rock tunnel drive
- Mechanized soft-ground tunnel drive

1 TBM Gotthard Base Tunnel North, Erstfeld-Amsteg, Switzerland
2 Breakthrough Gotthard Base Tunnel North, Erstfeld-Amsteg, Switzerland
3 TBM “Big Becky”, Niagara-Falls, Canada
4 Gotthard Base Tunnel North, Erstfeld-Amsteg, Switzerland
5 Koralm Railway Tunnel Graz – Klagenfurt, Austria

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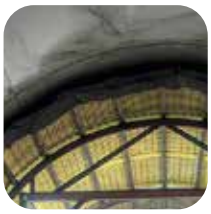
# TUNNELLING

For the last five decades, the following factors have contributed to STRABAG Group becoming one of the leading international companies in the field of tunnel construction: successful execution of numerous large and technically complex tunnel projects both in Europe and around the world, development of technically and economically advanced tunnel construction methods and, last but not least our skilled, competent engineers. Two examples of our present tunnelling construction projects are Rohtang Pass highway tunnel at 3,000 m above sea level in the western Himalaya region in India and the major tunnelling facility project at the Niagara falls in Canada.

Our many years of experience enable us to utilise the most economical methods of construction and operation as well as realise innovative alternative proposals. We lay the foundation for an environmentally friendly method of construction right from the planning stage. This includes groundwater protection, conservation of natural resources, dust reduction and blasting vibration control. Before tendering the most applicable and cost-effective construction method, for example, we make extensive analyses of the subsoil conditions.

With our experienced and efficient workforce, we can take on the challenges of today's competitive construction market.





# SERVICES

ZÜBLIN provide comprehensive customised tunnelling solutions, including

- Trenchless tunnelling
- Vertical cast pipe
- Microtunnelling
- Pipe jacking
- Shaft sewing
- Pipe production
- Tunnelling studies
- Construction planning
- Project management
- Pre-cast concrete pipe production

1 Alkimos Wastewater Treatment Plant, Carabooda, Australia
2 International Tunnelling Award
3 Earth Award


# PIPE JACKING/MICROTUNNELLING

1 Lowering the TBM in the launch shaft, Alkimos Wastewater Treatment Plant, Australia
2 Jacking Pipe Segments
3 Inside intake tunnel, Southern Seawater Desalination Plant, Australia
4 Recovery of the TBM from the sea bed
5 Tunnel construction on Southern Seawater Desalination Plant Project, Australia




With over 540 km of tunnels bored around the world, 190 km of walk-in pipelines using pipe jacking and over a 100 cut-and-cover tunnels, ZÜBLIN is a global leader in tunnelling technologies. Tunnelling requires tremendous skill and enormous experience of all the people involved. ZÜBLIN are specialists in providing technically optimised end-to-end tunnelling solutions worldwide. As part of the STRABAG Group ZÜBLIN are constantly setting new standards in technically optimised tunnels which bring clients improved efficiency and cost-savings in tunnel construction. From the initial tunnel design, manufacture and installation, clients see ZÜBLIN as their primary resource for all tunnelling requirements. Our highly skilled and professional workforce utilise the latest in innovative tunnelling technology to complete projects to the most exacting standards. With over 40 years of extensive international tunnelling experience, we are experts in providing tunnelling solutions for many industries, including mining, oil and gas, water and construction.

ZÜBLIN's specially developed Dual Mode system allows the Tunnel Boring Machine (TBM) to operate in both Earth Pressure Balance (EPB) mode and Slurry mode. These modes can be changed during a drive depending on soil conditions, which provides greater flexiblity, safety and efficiency during tunnelling operations. Using the TBM also ensures that any potential obstacles and curves in the tunnel direction will not delay tunnelling process. The TBM saves time as well as ensuring we remain on budget through innovative and efficient tunnelling solutions including Microtunnelling or Segmental Tunnelling for Shore-crossings of Utility Tunnels, Water Intake Tunnels and Outlet Tunnels. We design and manufacture our own pre-cast concrete products to order, providing a complete managed tunnelling solution which delivers upon our clients' expectations.

When compared to conventional open trenching techniques used in tunnel construction, our innovative trenchless tunnelling reduces both social and environmental impact. This technology means that, among other benefits, we can significantly reduce construction related $CO_2$ emissions by 90%, as well as reduce the potential damage to the surface environment and existing structures. Our unique Desander process also reduces environmental impact through separating the water from the soil during the construction process in a closed circuit system. The water is then returned to the tunnelling process and is later recycled to be used again in other areas to minimise water consumption.


## SERVICES

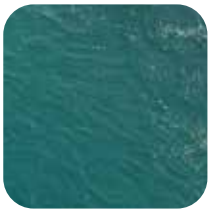
- Diaphragm walls
- Piles
- Retaining walls
- Grouting
- Ground anchors
- Turnkey construction of deep excavations
- Immersed tunnels
- Soil freezing
- Pile driving
- Geothermal engineering
- Offshore wind foundations

## GROUND ENGINEERING

Building in and with the subsoil has always been a special engineering challenge. Construction pits, grout blankets or foundation slabs are of fundamental importance and constitute the backbone of every structure. The STRABAG Group is well aware of the great responsibility it carries and has suceeded in building an excellent reputation in this engineering discipline. The range of services offered includes the construction of demanding immersed tunnels, turnkey urban construction pits, as well as high-quality bored piles, diaphragm walls, anchors, soil freezing, and grouting. In the course of infrastructure and traffic projects, sheet piling and hydraulic engineering works are also carried out.

Moreover, in ground engineering we always strive for technological development and innovation, and seek the best technical and economic solution for every client. This is what our teams of engineers have dedicated themselves to. During a project, they work closely together and jointly develop all details, from structural designs to construction methods. All processes are coordinated and optimised. Utilizing the wealth of experience available, even the most difficult ground engineering tasks can be tackled. We are ready for new challenges – every day.

1 Offshore wind measurement mast, Arkona, Lubmin, Germany
2 Foundation Sheikh Khalifa Bridge, Abu Dhabi, United Arab Emirates



## SERVICES

- Waste Treatment
- Site Decontamination
- Renewable Energies
- Flue Gas Treatment
- Environmental Services
- Water Treatment
- Wastewater Treatment

## ENVIRONMENTAL TECHNOLOGY

As one of the pioneer companies in the field of environmental technology STRABAG Group has taken on the challenge of offering both ecologically and economically sound solutions to environmental problems. In addition to remedial and protective measures as routinely carried out on contaminated sites, STRABAG Group also focuses on renewable energies, flue gas treatment and environmental services.

The growing worldwide awareness of the need to protect the environment and the natural resources has resulted in a growing demand for effective waste water treatment plants and waste management systems. Our Water and Waste Management Department is specialised in the turnkey erection of Water and Wastewater Treatment Plants using our own process design including construction, commissioning and operation.

The company offers consulting, planning and construction of Environmental Treatment Plants as well as services such as operation, financing and after-sales.



1 The potential for offshore wind energy is almost unlimited. In Germany alone, maritime power stations should be covering about 15 per cent of the electricity requirements by 2030.
2 Incineration Plant, Ulm, Germany
3 Biomass power plant, Ospitale di Cadore, Italy
4 Biowaste Treatment Plant, Lisbon, Portugal
5 LINDOX®-Plant, Nuremberg, Germany
6 Removal of former hazardous waste landfill, Kölliken, Switzerland

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## SERVICES

- Harbour engineering
- Locks
- Weirs
- Coast protection
- Offshore facilities
- Profile dredging
- Clay puddle seals
- Geotextile and mineral filters
- Revetment construction
- Capital dredging and maintenance dredging
- Sand and gravel extraction

## HARBOUR FACILITIES

Over the years, STRABAG Group has executed numerous harbour projects in all parts of the world, even in the most difficult subsoil conditions. We are specialised in realising demanding marine works projects, such as quay facilities, locks, weirs, and coast protection structures to the highest quality standards, with state-of-the-art construction methods on schedule and with economic efficiency.

Every year we move several million cubic metres of fill in the large-scale hydraulic engineering field. To deal with such masses requires an equipment pool that is state-of-the-art and, above all, high-performance. We use our three hopper dredgers to carry out dredging work up to 35 m deep. For offshore areas, we also have several seaworthy pontoons at our disposal which carry cable-operated or hydraulically-operated excavators with shovel sizes up to 25 $m^3$.

Coastal protection traditionally involves extensive earthworks, hydraulic excavation and revetment work. The STRABAG Group has implemented more than 150 km of new dyke structures and reinforcing measures in the past 25 years. We have also adapted and developed around 175 km of inland waterways in line with the latest requirements.

We can offer a patented burnt-clay hollow tile method for the installation of underwater clay puddle seals. This method can be used to seal both the excavation slopes and bottoms of inland waterways and lakes in a controlled and secure manner.


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1 Khalifa Port Industrial Zone, Abu Dhabi, United Arab Emirates
2 Jade-Weser-Port, Wilhelmshaven, Germany
3 Container Port Sepangar Bay, Kota Kinabalu, Malaysia

# BUILDING CONSTRUCTION

## TURNKEY PROJECTS

## TEAMCONCEPT

## INDUSTRIAL FACILITIES


ALDAR

## TURNKEY PROJECTS

Building projects for administration, business, education and residential purposes have been successfully executed by the STRABAG Group in many parts of the world. Quite often this has included the architectural design, structural analysis and working drawings.

Modern building techniques in conjunction with sophisticated project management and local expertise have been the basis for uncompromising quality and on-time performance even under difficult conditions or in remote locations.

Turnkey administration buildings, residential developments or industrial facilities – complex and demanding construction projects require extraordinary competence. With our know-how we are your expert partner to implement your very special projects. We design in a realistic and cost-efficient way to make your vision come true – be it a new development, an extension or enlargement or the refurbishment or conversion of existing buildings.

Our Technical Head Office (ZT) in Germany (see page 52) supports all our construction sites worldwide with state-of-the-art technology. Over 600 engineers provide services from design and construction management to mechanical engineering and plumbing (MEP).


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1 Injazat Data Centre Abu Dhabi, United Arab Emirates
2 Education City Housing Development, Qatar
3 Private Beach Villa, Qatar
4 Buzwair Offices Headquarter, Qatar


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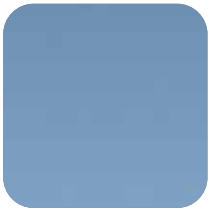
# SERVICES

- Office and administration buildings
- Shopping malls
- Commercial buildings
- Residential buildings and hotels
- Research centres
- Universities & schools
- Housing
- Hospitals
- Refurbishment and conversion of existing buildings

## TURNKEY PROJECTS

With hospitals, shopping centres and commercial properties ranging from office buildings to logistics centres, our service portfolio comprises all types of structures imaginable. We will also implement universities or schools, your housing projects or leisure properties.

All our service departments offer expert support on issues like design or work planning. With efficient logistics and engineering power, we provide for scheduled and top-quality execution of your project.



1 Dancing Towers, Hamburg, Germany
2 Duty Free Warehouse Facilities, New Doha Int. Airport, Qatar
3 Rheinauhafen Kranhaus, Cologne, Germany
4 Hospital, Spittal an der Drau, Austria

## SERVICES

- Early involvement
- Common goals
- Quality certainty
- Scheduling certainty
- Cost transparency
- Minimising of risk
- Joint controlling
- Models for dispute resolution

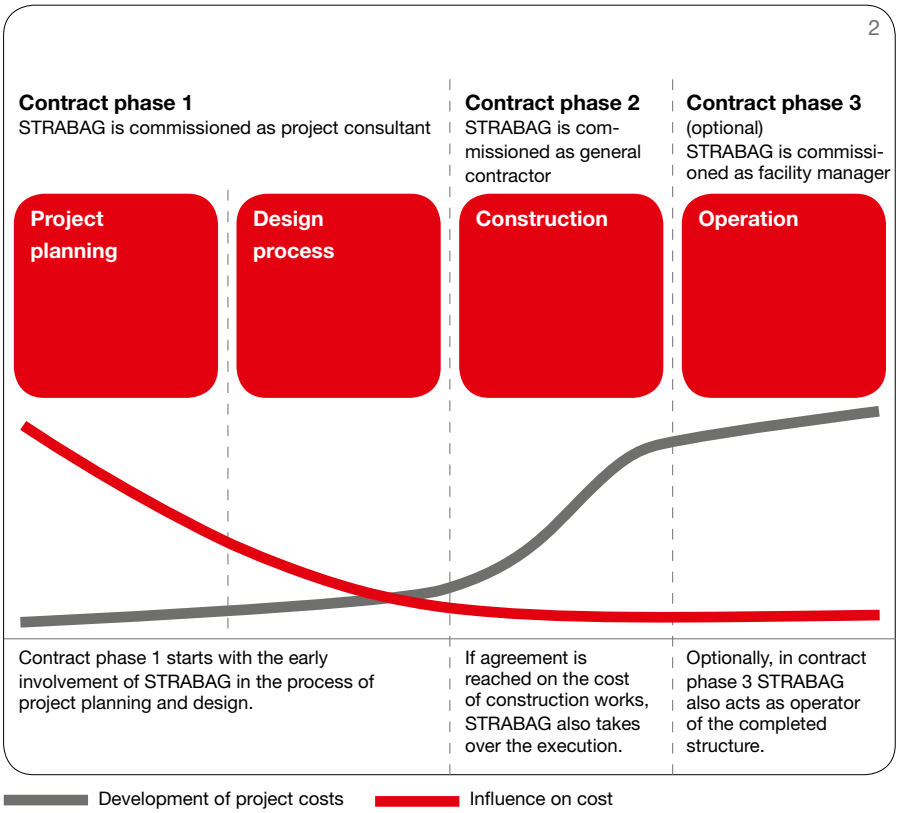
## TEAMCONCEPT

The complexity of modern construction projects is permanently rising, increasing the demands on the people who realise them. Successfully reaching project goals is only possible if all involved parties work together in an open, constructive and trustworthy manner. This is the elementary principle of the Züblin teamconcept.

The ultimate economic success of a challenging construction project is decided long before the foundations are laid. Even during the process of project planning and design, accurate preparatory conceptual work can have a significant influence on around 80 per cent of all subsequent construction and operational costs. In other words, the earlier the contractor's competence is involved, the greater the potential for optimisation.

**Teamconcept** allows us to provide you with a successful method of project realisation that guarantees optimum efficiency from the very beginning, not only in all phases of planning and construction, but also throughout the entire life cycle.

**Teamconcept** is a business model that transforms the basic principles of partnering into tangible, contractually defined procedures and methods of operation. It offers maximum transparency and efficient organisational structures, enabling prompt and appropriate response. Risks and potential conflicts can be identified and controlled from an early stage by jointly agreeing on well-balanced contractual arrangements.




1 Office building, ADAC Head Office, Munich, Germany
2 Contract Phases of teamconcept


# SERVICES

- Cooling towers
- Production plants
- Processing and administration buildings
- Petroleum refineries and petrochemical plants
- Grain silos
- Cement works

1 Kayan Cooling Tower, Saudi Arabia

# INDUSTRIAL FACILITIES

For the STRABAG Group, the construction of industrial buildings is an important sector. The tradition of our worldwide companies to be efficient and progressive also in this area of civil engineering dates back over a century. Since then turnkey projects, including planning, detailed engineering, procurement, construction, commissioning and, if desired, process design, have been executed with particular respect to the importance of meeting deadlines and stipulated costs.

We have over 100 years of experience in international industrial construction such as power plants, cement, steel and petrochemical plants. In close cooperation with our customers, we establish the best design and optimise construction methods to perfectly suit their specific needs.

Nowadays, the trend is towards turnkey projects for production lines or factories, and in consequence reliable contractors with appropriately qualified staff are essential. Every project demands the highest safety and quality standards and completion on schedule. Examples of these competence segments in China are the Stihl manufacturing plant in Qingdao and the new R&D Center and Asian Headquarters for the Schaeffler Group in Anting.

Cooling towers dissipate heat into the atmosphere where air diffusion spreads it over a large area to avoid the unacceptabale impact on the local ecosystems which would be the case if heated water were to be returned to its source. Four decades of experience in adaptive structural design and construction of all kinds of cooling towers as well as our efficient management, quality focused operations and safety orientated execution have gained us a worldwide recognized reputation, especially through the seawater towers and plants in the Middle East.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1 Stihl Factory, Qingdao, China
2 NCP (National Chevron Phillips) Warehouse, Jubail, Saudi Arabia
3 Boysen Extension, Shenyan, China
4 Coker Unit, Jubail, Saudi Arabia
5 Grain Silo, Abu Dhabi, United Arab Emirates


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# TRANSPORTATION INFRASTRUCTURE

## ROAD CONSTRUCTION

## AIRPORT PAVEMENTS & BUILDINGS

## RAILWAY TRACKS & STATIONS

## RAILWAY PRODUCTS

## AUTOMOTIVE PROVING GROUNDS

# SERVICES

- Subsoil exploration
- Design
- Subsoil and building material surveys & suitability investigations
- Construction work
- Road maintenance
- Noise barriers
- Safety barriers

1 Kicukiru-Nyamata-Mayange (Nemba) Road, Rwanda
2 Nizwa – Jibreen Road, Oman

# TRANSPORTATION INFRASTRUCTURE

## ROAD CONSTRUCTION

Roads connect people, cities and countries. They are the arteries of the world and the basis for global interaction. It is with pride, passion and excellence that we strive to achieve continuous improvement, to exceed future demands on today's projects and exceed expectations on all projects we execute. STRABAG Group has already constructed more than 10,000 miles of roads all over the world, including many in the Middle East and Africa. Extraordinary quality and selection of first-grade construction materials are a priority throughout the project execution. We guarantee that our roads have appropriate surfaces suitable for traffic loads, with optimum grip, driving comfort and an above-average service life.

Whether working on motorways, country or urban roads, new roads or rehabilitation projects, asphalt or concrete structures, our highly qualified staff devote their outstanding technical know-how and personal commitment to developing solutions. STRABAG Group provides the full range of road construction solutions in any weather climate. Special emphasis is given to a sustainable and environmentally viable solution, starting from the initial planning stages through to maintenance of the roads. Evidence of this is given by our best advertisers: our clients.


1 PPP A2 Toll Motorway, Poland
2 Concrete Pavement for PPP Motorway Maisch-Offenburg, Germany
3 Tripoli International Airport Road, Libya
4 Duqm Port Road, Oman




# SERVICES

- Subsoil exploration
- Design
- Subsoil and building material surveys
- Suitability investigations
- Building construction work and interior
- Runways, Taxiways and Aprons

1 Airfield Lighting Sohar, Oman
2 International Airport Sofia, Bulgaria

# TRANSPORTATION INFRASTRUCTURE

## AIRPORT PAVEMENTS & BUILDINGS

Well equipped airports play an ever increasing role in the economic development of a country. Smooth operations depend to a great extent on the quality of airfield pavements. These have to be extremely durable and withstand extreme thermal, mechanical and dynamic loads: a particular challenge for man and material. STRABAG Group has been involved in a large number of highly complex projects in this sector of business, demonstrating how capable the company is of coping with these high demands. STRABAG Group offers numerous references, including Kigali, Sohar, Lagos, Basrah, Mongomeyen, Sofia or Riga as examples of the skills and reliability of our construction team.

With our worldwide experience and the extensive know-how of our specialist companies, we achieve constantly high quality by specifying the construction details, selecting materials and designing airport pavements and buildings. We provide turnkey construction for new airports including all necessary buildings, terminals, infrastructure and runways by applying state-of-the-art design and international standards required by transport and air traffic control authorities. Additionally, we provide solutions for the extension or repair of existing airports, buildings as well as runways. Our runways and airstrips are appreciated not just for their technical perfection, but above all, for their economic efficiency. The use of innovative equipment is part of our basic repertoire and produces robust low-noise surfaces with excellent grip. It is self-explanatory that executing projects on time belongs to our highest priorities.

1 Runway, Oman
2 Apron Rehabilitation Kigali, Rwanda
3 Airport Mongomeyen, Equatorial Guinea
4 Airfield Marking Sohar, Oman








## RAILWAY TRACKS & STATIONS

In the field of railway infrastructure we were the first in Germany to develop a slab track system in the late 1970s. Since then we have been consistently improving the technology according to the highest quality standards. We have set the basis for today's standards in slab track technology and are now one of the leading specialists for high-speed slab track applications worldwide. Latest examples of our projects are the high-speed railway links between Zhengzhou and Xi´an in China (505 km) and between Frankfurt and Cologne in Germany (120 km).

With our highly innovative new track system "MSB 2010" STRABAG Group has extended the precision, efficiency and quality of the former Maglev track system far beyond common standards.

The know-how and experience of 30 years of noise barrier development and construction is shown in numerous projects worldwide. In the last 30 years, a multitude of construction methods for roads and railways have been developed, planned and implemented. Our latest innovation, a concrete and aluminium system, is currently being put to use on the high-speed railway lines of Deutsche Bahn and in China.

Supported by the inhouse engineering division Technical Head Office with more than 600 engineers, STRABAG Group is able to provide innovative design solutions for metro lines and stations.

The profound know-how of a diverse range of track systems has enabled the STRABAG Group to meet the high expectations and requirements of its customers internationally. This experience ensures an optimised combination of superstructure with substructure (elevated and underground works) for metro systems.

For STRABAG Group, railway construction means developing turnkey railway traffic systems in Europe and around the world. Within the system of "railway construction", we draw upon more than 85 years of experience to provide valuable input during the planning stages and in setting high-quality standards during the construction phase, while adhering to deadlines and budgetary constraints.

1 Noise Barrier Concrete System
2 Metro Delhi, India
3 Highspeed-Train Cologne-Frankfurt, Germany
4 Metro Algiers, Algeria
5 Feste Fahrbahn, Highspeed-Train Cologne-Frankfurt, Germany
6 Lehrter Bahnhof Main Station Berlin, Germany
7 High Speed Rail Test Track, Zhengzhou, China


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# SERVICES

**Consultation on areas ranging from maintenance services to project management for general contractors.**

**Construction of rail track systems with ballasted tracks for**
- High-speed traffic
- The urban railway and regional trains
- All infrastructure providers
- Industrial railways and feeder lines

**Mechanical rail track conversion**
(renewal train/ballast cleaning)

**Rail milling technology**
(rail-bound and rail-road-truck milling technology)

**Tramway systems**

**Mechanical flash butt track welding**

**Sound-absorbing elastic footing for sleepers**

**Track-bound underground engineering**
- Installation of substructures (PSS), frost protection layers (FSS) and drainage systems
- Laying of railway cables

**All types of level crossings**

**Cable duct systems**
- Track-bound cable duct systems including shafts
- fully equipped above-ground switch-gear houses and subterranean stations

**Platforms**
- platform21 – Prefabricated component platform system
- lift21 – Modular elevator shaft system
- tunnel21 – Modular underpass system
- Mobile makeshift platforms

**Railway engineering**
- Forward-shift construction type railway-bridges
- Auxiliary bridges

**Recording and measurement of the tracking system**

**Railway logistics**

**Overhead lines for short- and longdistance Traffic**

**Switches and large switch parts**

## RAILWAY PRODUCTS

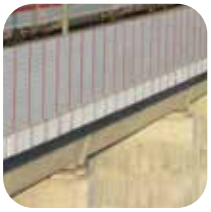
Meeting individual customer requirements and focusing on future demands. STRABAG Group is continuously researching and developing new and existing products:

- Turnout production for standard turnouts up to a radius of 500 m (STRABAG is Q1 supplier of DB AG with all necessary certification)
- Precast element solution in the area of stations: platforms, subways and lift shafts
- Fastening systems for sleeper application (RST) and direct fastening for slab track
- Sleeper pads for heavy haul traffic and reduction of noise and vibration
- Own fabricated products for overhead lines
- Sleeper for slab track system and other customized solutions
- Noise barrier (concrete and aluminium system)



1 High-performance road bed cleaning
2 Rail switch
3 Overhead line
4 Noise Barrier Aluminium System
5 Sleeper pads
6 Loading sleeper pad






# SERVICES

- Design
- Consultancy
- High-speed ovals
- Dynamic skid pads
- Braking tracks
- Steep tracks
- Noise measurement tracks
- Endurance tracks
- Survey
- Quality assurance

1 Proving Ground Volkswagen, Arizona, USA
2 Proving Ground Daimler AG, Wörth, Germany
3 Proving Ground GM, Shanghai, China
4 Proving Ground Audi, Neustadt, Germany

## AUTOMOTIVE PROVING GROUNDS

Cars today are no longer just a means of transport, but have become a symbol of freedom, adventure and status: They generate emotions. This is accompanied by increasing demands in terms of performance, safety and comfort. Before a new model can be launched, it has to be put through its paces. To this end, the automotive industry needs proving grounds that demand from their prototypes in just a few weeks what a normal car will experience in its whole “life”.

Here we construct high-speed test tracks with parabolic curves with an inclination of up to 50 degrees for driving without lateral forces, large dynamic skid pads, braking tracks with many different surfaces for simulating all conceivable road conditions, steep tracks with different gradients, noise measurement tracks, endurance tracks and many other comfort tracks.

The best car makers in the world ask for excellence in everything they do. That is why they entrust us with the construction of their proving grounds.

In 2010 SMB Construction International GmbH, a permanent Joint Venture with Max Bögl Group, was founded and since then is acting as your reliable partner in proving ground construction.

International examples of our diverse and client-orientated proving grounds are Bridgestone in Italy, Ford in Belgium, Nissan in Spain, Shanghai Volkswagen and GM Shanghai in China, Volvo in Sweden and Audi, Daimler, Opel and Volkswagen in Germany.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www.strabag-international.com

# OUR SPECIAL COMPETENCE

- TECHNOLOGIES FOR THE FUTURE (TPA)
- TECHNICAL HEAD OFFICE
- HIGH QUALITY & HSE STANDARDS
- BMTL
- QUALIFIED LOCAL AND EXPATRIATE STAFF
- PPP & BOT

1 STRABAG Headquarters, Vienna, Austria

# SERVICES

**Concrete technology**

- Initial tests for all cement-bound building materials
- Development of component-related concrete designs/initial tests
- Optimization from a technical and economical aspect
- Preparation of quality assurance concepts

**Traffic areas**

- Concrete technology advisory services
- Tests for base layers using hydraulic binders and concrete for traffic areas (including exposed aggregate concrete)
- Monitoring of all primary materials and building material mixtures
- Determination of air void characteristics in fresh and hardened concrete
- Mortar viscosity measurement

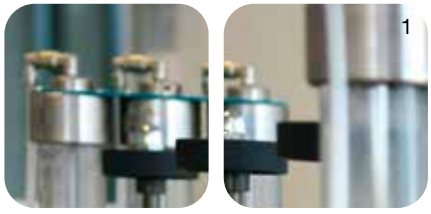
# TECHNOLOGIES FOR THE FUTURE (TPA)

## CONCRETE TECHNOLOGY

Concrete is no longer the classic 3-component mixture that it used to be. Today's high-tech concrete is now used in almost all areas of construction as a 6-component system. We adjust its composition specifically for each defined use. To find the optimum recipe for the individual requirements of our customers, we offer them technical support and carry out feasibility studies – and we do this at the stage of cost quotation. This means we avoid unnecessary costs and ensure that the building material is perfectly matched to requirements.

We also support our customers during the execution of construction works. In addition to the optimization of materials, we ensure a smooth construction process for the production of structural components that conform to requirements. We accomplish this by applying continuous quality control and a seamless quality assurance system which requires us to determine warning and limit values. We also act in an advisory capacity for our customers in the event of warranty questions. This is where the country-specific and technical expertise of our employees really makes a difference. However, we never lose sight of our aim while working: total customer satisfaction.

1 Water permeability test
2 Non-destructive strength test
3 Exposed aggregate concrete surface
4 Compressive strength measurement
5 Test of fresh concrete







## SERVICES

**Asphalt technology**

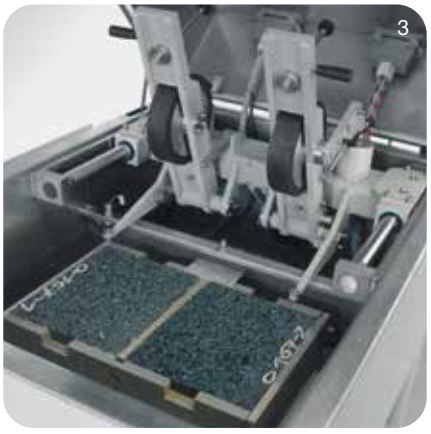
- Initial tests, production inspection and optimization of construction
- Extended tests (EN, SHRP, ASTM, BS, AFNOR, AASHTO, GOST etc.)
- Tests of functional properties
- Suitability tests and designing of asphalt for traffic infrastructure with high operational demands
- Development of asphalts with special properties, e.g. open porous asphalt pavements, coloured asphalt, etc.
- Factory production control at asphalt mixing plants

## TECHNOLOGIES FOR THE FUTURE (TPA)

### ASPHALT TECHNOLOGY

Traffic areas of all types require pavements that meet the requirements placed on them, not only when they are opened for traffic but also long-term. The recipe of the asphalt used is a key factor, bearing in mind specifically the effort and expenditure required for maintenance and repair. The specialists of TPA work closely with asphalt manufacturers and asphalt constructors to develop needs-based recipes which are tailored to meet specific requirements. Be it traffic areas, streets, railway construction projects, heavy-duty flight operation areas, waterworks or landfill sites – we develop the most appropriate type of asphalt.

The quality of the building materials depends not only on the recipe but also on the methods used for their production and placement. Therefore, in addition to initial tests and production inspections, we also carry out extensive tests on the functional properties of asphalt as well as extended tests in accordance with all common standards (such as EN, SHRP, ASTM, BS, AFNOR, AASHTO, GOST). Beyond this we also optimize installation on site. By using state-of-the-art equipment technology, we ensure maximum asphalt quality from the beginning to the end of the production chain.





1 Viscosity test
2 Bending tensile test
3 Rutting test
4 Skid resistance prediction test
5 Universal testing machine

# TECHNICAL HEAD OFFICE

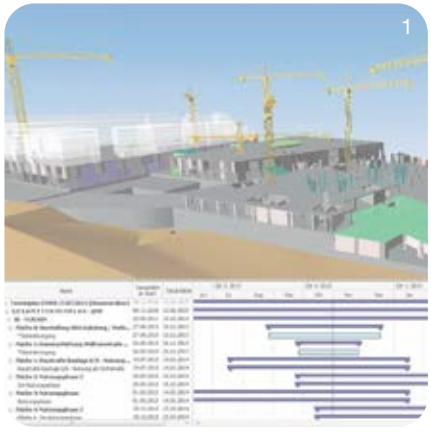
The centrepiece of our company, where all our technical know-how is pooled, is the Technical Head Office (Zentrale Technik, ZT). Here, the know-how needed for supporting all the Group's divisions, from geotechnical engineering and tunnelling, structural engineering to turnkey construction, is concentrated. Our operating units are supported by ZT throughout the entire construction process, from the early acquisition stage through tendering and construction design all the way to site management.

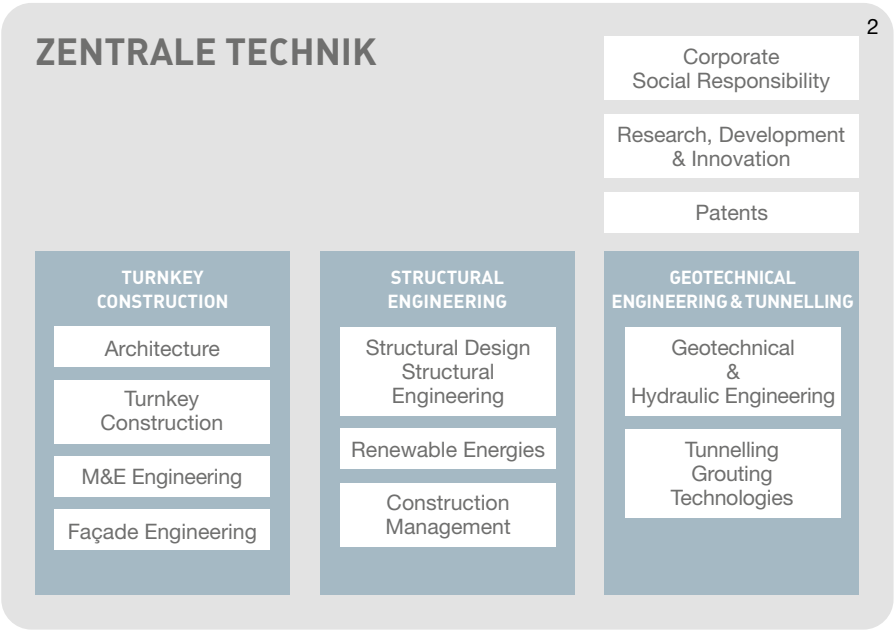
With a view to further strengthening the company's competitiveness, ZT also carries out specialised and interdisciplinary research, development, and innovation tasks. Other important responsibilities assumed by ZT are the protection of patents and the maintenance and refinement of tools for design and construction.

ZT with its personnel of about 650 is based in Stuttgart. It has 7 other locations in Germany and 10 locations in Europe and also provides local support to a multitude of construction sites. ZT is an attractive place for young engineers to start their careers. Here, they can gain insights into the entire range of our business fields and activities with the goal to later assume responsibilities at one of our construction sites. The wide variety of internal training courses available for the individual disciplines is very popular among our employees.

Building Information Model (BIM) 5D is a highly sophisticated project control method which allows STRABAG to simulate and manage a project 'model' in 'real time', The BIM 5D process and techniques allow the entire turnkey construction delivery team – clients, engineers, architects, operators, main contractors, subcontractors, manufacturers and materials suppliers to share and understand a single 'real-time' view of the entire project. This BIM 5D approach is also dedicated to enabling the construction delivery team to explore options and manage solutions as never before due to the accurate interface of design, programme and engineering costs. At the Technical Head Office of the STRABAG Group, innovative tools to help realise effective and transparent cooperation are tested and implemented in the 5D Design department.

1 BIM 5D – what you see in advance is what you will get in reality
2 Main fields of activity of Zentrale Technik



# OUR SPECIAL COMPETENCE

## HIGH QUALITY & HSE STANDARDS

STRABAG believe that all injuries and industry related diseases are preventable and that an “Incident and Accident Free” workplace is achievable, we continuously strive to improve our health and safety performance as it is fundamental to our business success.

STRABAG has established systems and standards which meet or exceed International Standards for all operations in which we participate on a worldwide basis. Through the implementation and monitoring of our accredited and vigorously audited Health, Safety and Environmental Management System (HSEMS), STRABAG consistently achieves the identified objectives and targets. Our HSE Management System, KPI’s, targets and vision are reviewed at least once a year by our Board of Directors. The STRABAG HSEMS encompasses aspects of each project we have completed, using lessons learnt to apply a proactive approach to continual improvement. Utilising this methodology our HSEMS is continually updated with new innovations which assists us to achieve our corporate goal: an “Incident and Accident Free” workplace. Key to making our workplaces “Incident and Accident Free” is the application of our Corporate Standards within all Business Units and Countries of operation.

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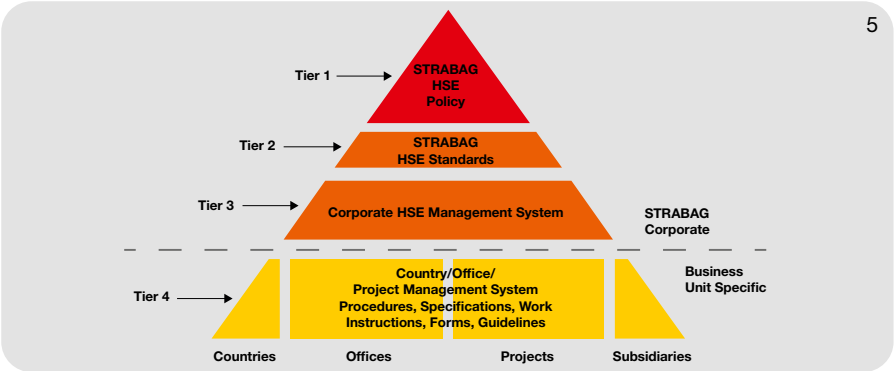


The STRABAG goal of an “Incident and Accident Free” workplace has resulted in the provision of excellent education and training systems which underlines our commitment and emphasis on hazard identification, risk assessment and risk management methodology in creating our desired beliefs, behaviours, culture and systems. Our commitment to HSE is cascaded down from our Board of Directors throughout the entire organisation, senior managers proactively visit projects and complete HSE tours and interact with our employees. We provide thorough training program for all managers, supervisors and workers as well as induction processes for visitors to ensure that everyone who enters a STRABAG project has the knowledge and background to function in a safe manner.

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1–4 ISO Certificates
5 Structure of HSE-Management System
6 1,500,000 manhours LTI-free on a project in Qatar

# BMTL – A DIVISION OF BMTI GMBH

The International Division generally uses the services of BMTL for construction projects abroad. The purpose and objective of BMTL is to supply and equip sites and production locations with the appropriate technically reliable and properly functioning construction machines, equipment, material and systems. The systematic inspection and maintenance of BMTL is designed to support construction works and/or the manufacturing of building materials in an economical manner and in compliance with the respective operative requirements.

**In this respect, significant services of BMTL comprise the following:**

- Investment Management
- Rental/Leasing Management
- Repair/Monitoring Management
- Procurement of equipment and material
- Logistics/Transport (Road/See/Air)

The STRABAG Group has construction and logistic equipment with a value of more than € 4 billion at its disposal. For example, our range of equipment includes 23,000 containers, 710 cranes, 1,680 wheelloaders and 3,300 rollers, as well as more than 1,200 Trucks, 20,000 cars and LCVs. This equipment pool is coordinated and maintained by our central service division for international logistics and equipment, BMTI/BMTL.

1 Asphalt Mixing Plant
2 Main Workshop CAT Section
3 Tweisha Yard, Libya
4 Workshop Bus Rapid Transit Infrastructure Project, Tanzania




1 Successful Cooperation on Site

## QUALIFIED LOCAL AND EXPATRIATE STAFF

Our success is mainly driven by the know-how and innovative strength of our staff. In a combined effort, scientists, business economists and top-qualified engineers develop and enhance forward-looking and innovative technologies. STRABAG Group operates with the competencies of around 73,000 employees at over 500 locations around the world. Due to the human-resource-intensive production processes in the industry, workers in the construction sector both form a significant factor for success and represent a critical bottleneck factor.

For this reason we place great value in strategic human resource planning and on the constant and continuous training and further education of our employees. The quality of the cooperation between supervisors, colleagues and all employees is of great importance for the company's success. One instrument to identify the potential of employees is an IT-supported aptitude diagnostics process, the so-call behaviour potential analysis. In order to discover and support suitable young talents and tie them to the company more strongly, we introduced a trainee programme for young skilled employees and executive staff in all countries in which we are present. The measures include an international trainee exchange programme to better accommodate the increasing internationalisation of the Group. Finally, on our international sites we work successfully in highly diverse teams with expatriate specialists and local experts to combine local knowledge with international know-how.

1 Protons Therapy Center, Essen, Germany
2 Toll Motorway Zagreb – Macelj, Croatia

## PPP & BOT

Public private partnership (PPP) is one of the main pillars of the strategy of the STRABAG Group. The STRABAG Group is operating and has taken equity in some 30 PPP-projects.

This part of our portfolio aims to contribute to national and municipal modernisation. PPP facilitates the combination of the strength of private and public sectors. Such partnerships allow implementation of public construction projects within a shorter timeframe, reduction of investment and operating expenses in many areas. A life-cycle-oriented approach from day one and adequate risk optimization provide for a clear efficiency edge for our PPP projects.

In all project stages we guarantee know-how transfer and service transparency. Our fields of work cover schools and other educational facilities, projects in the health care sector, justice and administration buildings, military projects, and cultural and leisure facilities. The Toll Motorway Zagreb – Macelj and the Protons Therapy Centre Essen are representatives of our PPP engagement.

Since the STRABAG Group has been gaining ground in the field of PPP, we also offer Build, Operate and Transfer (BOT) – another typical outsourcing model. The only difference to PPP-projects lies in the method of financing. Examples of BOT are the construction and operation of the Euphrates Barrage Birecik BOT-Project, the Great Belt Storebaelt-Railway Tunnel and the Don Muang Tollway in Bangkok.

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