



# Tunnelling Division

Metro Algier, Algeria



**ZÜBLIN STRABAG**  
TEAMS WORK.



STRABAG AG  
Tunnelling Division  
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STRABAG Group  
Tunnelling



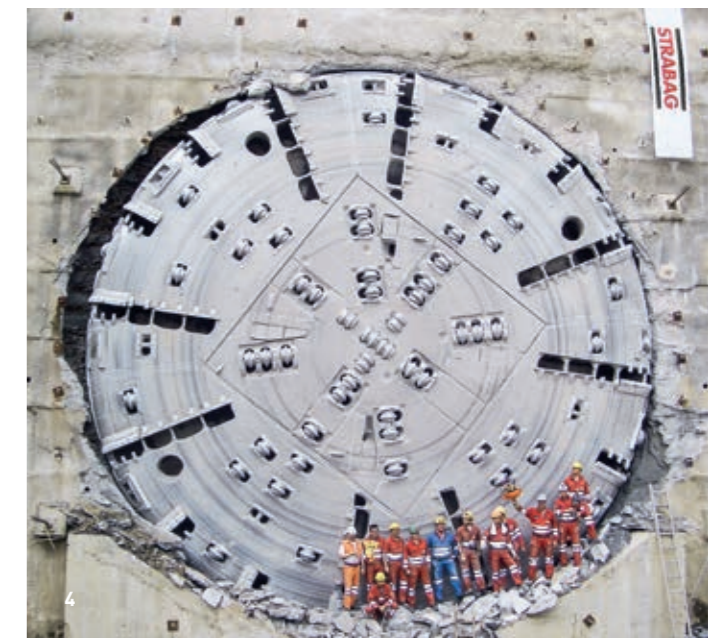
**ZÜBLIN STRABAG**  
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Cover Gotthard Base Tunnel, Switzerland/ Cover top Randstad rail, Netherlands/ 1 Niagara Tunnel, Canada

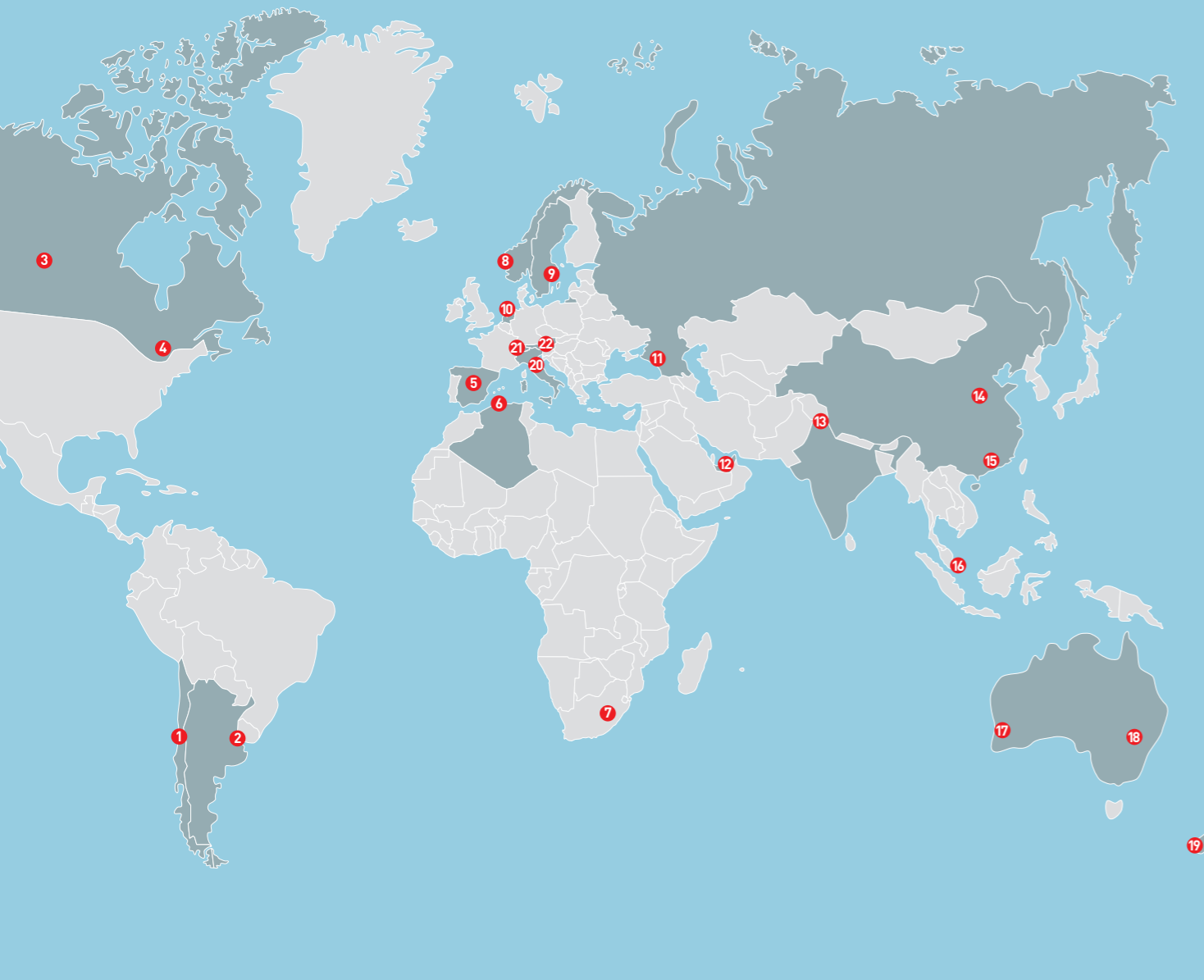
# Content

- 4 Tunnels built by STRABAG
- 5 Our Company
- 8 Team and Methods
- 10 Tunnelling Projects
- 14 Service and Quality
- 16 From a Single Source
- 20 Special Competence



2 Södermalm, Sweden/ 3 Quadrilatero, Italy/ 4 Perschling, Austria

# A selection of worldwide evidence built by the STRABAG Group



1 CHILE Santiago // Hydropower Electric Complex Alto Maipo SpA (Hydropower) / 2 ARGENTINA Buenos Aires // Extension Metro B (Metro) / 3 CANADA Edmonton // Waterproofing NLRT Tunnel (Waterproofing) / 4 CANADA Toronto // Niagara Tunnel Facility Project (Hydropower) / 5 SPAIN Madrid // Water Supply Tunnel Valmayor (Hydropower) / 6 ALGERIA Algiers // Extension A, B and C Metro Line 1 (Metro) / 7 LESOTHO Maseru // Water Tunnel Project C124, C125 and C126 (Hydropower) / 8 NORWAY Bergen // Nye Ulriken Tunnel / UUT21 (Rail) / 9 SWEDEN Stockholm // CityBanan Söderströmtunnel (Rail) / 10 NETHERLANDS Amsterdam // Metro N-Z Line (Metro) / 11 RUSSIA Sochi // Consulting Motorway Tunnel Adler (Rail) / 12 UNITED ARAB EMIRATES Abu Dhabi // Sewerage Tunnel STEP 2 (Sewer/Collectors) / 13 INDIA Rohtang Pass // Highway Tunnel (Road) / 14 CHINA Luoyang-Henan // Multipurpose Dam Xiaolangdi Lot 2 (Hydropower) / 15 CHINA Hong Kong // High Speed Tunnel & Viaduct C512 / Tsing-Yi (Rail) / 16 REPUBLIC OF SINGAPORE Singapore // North-East Metro Line C706 (Metro) / 17 AUSTRALIA Perth // Alkimos Waste Water Treatment Project (Sewer/Collectors) / 18 AUSTRALIA New South Wales // Rio Tinto / TBS Northparkes (Mining) / 19 NEW ZEALAND Manapouri // Manapouri Trailrace Tunnel (Hydropower) / 20 ITALY // Val di Chienti (Road) / 21 SWITZERLAND // Gotthard Base Tunnel (Rail) / 22 AUSTRIA // Brenner Base Tunnel (Rail)

## STRABAG Group

We are a European-based technology group for construction services and a leader in terms of innovation and financial strength. Our services span all areas of the construction industry and cover the entire construction value chain – from design to planning, from construction to property and facility services, from financing to operation all the way to demolition. We create added value for our clients through our specialised entities which integrate and assume responsibility for the most diverse services. We bring together people, materials and machinery at the right place and at the right time in order to realise even complex construction projects – on schedule, of the highest quality and at the best price.

Thanks to the hard work and dedication of our international teams and close to 72,000 employees, we are one of the few companies capable of offering services that promise one thing above all: perfect coordination. The decisive factors for our success therefore are how these people communicate with each other, how they work together and, above all, how they come together as a strong whole. In this way, we generate an annual output volume of about € 14 billion.

We work with the understanding that all STRABAG entities form a single team on each project: the STRABAG Group.

The STRABAG Group unites several big names in the construction industry under one roof. Their long success story stands for expertise and competence, client orientation and reliability. Our main brands for our international tunnelling projects are:

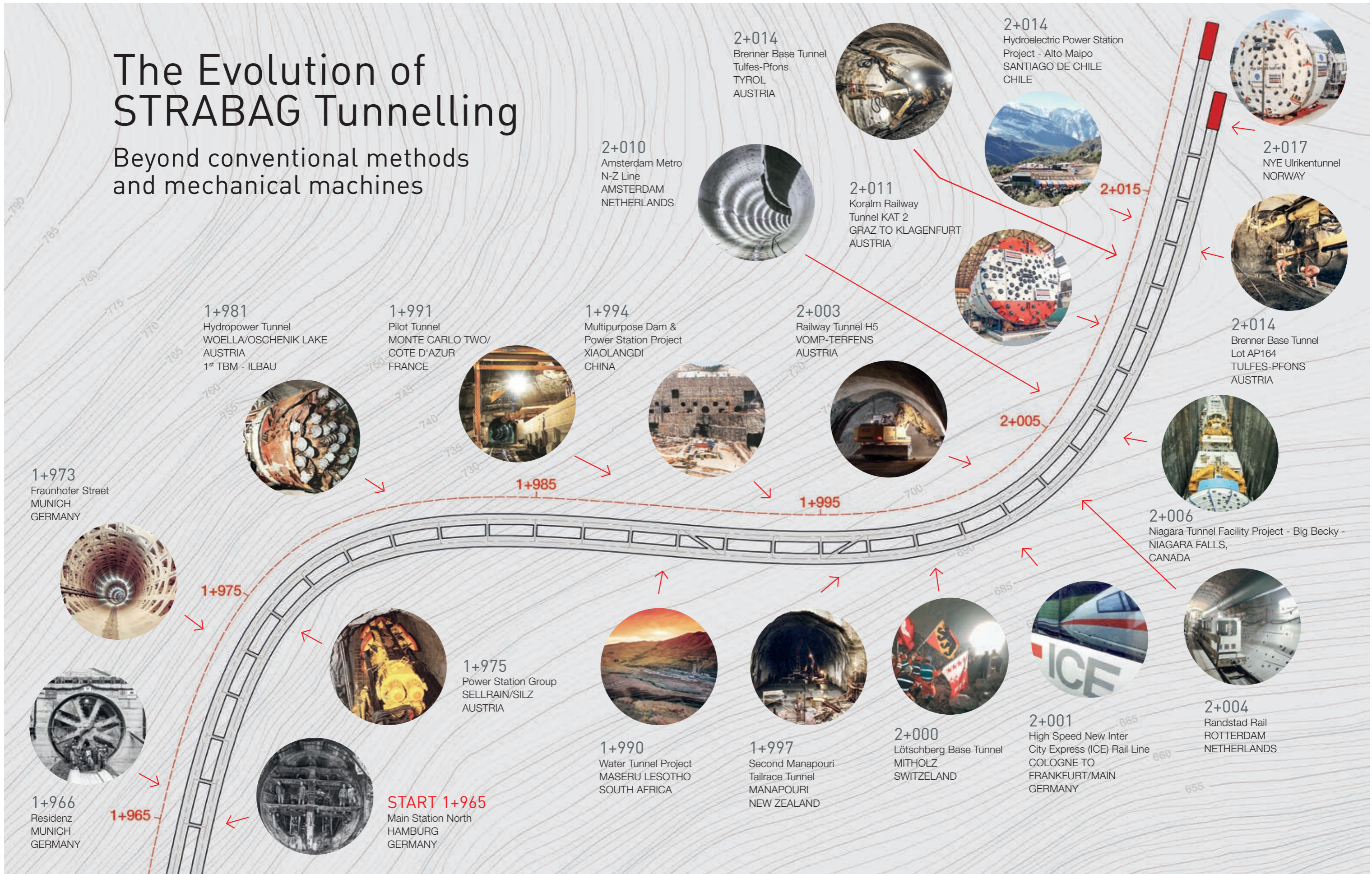
**ZÜBLIN STRABAG**

1 STRABAG TEAMS WORK.



# The Evolution of STRABAG Tunnelling

## Beyond conventional methods and mechanical machines



## Who are we?

### → SAINT BARBARA

For many tunnel projects around the world, December 4<sup>th</sup> is a special day of veneration of Saint Barbara as the patron saint of tunnellers and miners and all who work and visit underground construction environments. She is invoked for protection against thunder and lightning, and all accidents caused by gunpowder explosions.



STRABAG is a global leader in tunnelling technologies. Vision, passion, extraordinary engagement and expertise have been the keys to our success all around the world. Tunnelling requires tremendous skills and extensive experience from all the people involved. STRABAG is a specialist in providing technically optimised end-to-end tunnelling solutions worldwide.

Over recent decades, the following factors have contributed to the 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
- Our skilled, competent and innovative engineers and workforce

From the initial tunnel design, manufacture and installation, clients see STRABAG as their primary partner for all tunnelling requirements.

Our highly skilled and professional employees utilise the latest in innovative tunnelling technology to complete projects to the most exacting standards.

1 Subaquatic Tunnelling Söderströmstunnel, Sweden /  
2 Pipe Jacking STEP, Abu Dhabi



3 Conventional Tunnelling, Rohtang Pass, India



4 Mechanised Tunnelling, Jenbach H8, Austria



5 Concrete Tunnels/Open Pit Tunnels, Quadrilatero, Italy

## What do we do?

Deep or shallow, in mountain areas or in complex innercity boundaries, small or big – we cover it all. Our core expertise in tunnelling in all geotechnical conditions, including pipe jacking, enables us to successfully handle:

### Conventional Tunnelling

Excavation using drilling and blasting methods (explosives) or mechanical excavators, New Austrian Tunnelling Method (NATM), mucking, placement of the primary support elements such as steel ribs or lattice girders, soil or rock bolts, sprayed or cast in situ concrete/shotcrete method.

### Mechanised Tunnelling

All kinds of techniques in which excavation is performed mechanically by means of teeth, picks or discs. We are a worldwide leader with expertise in all kinds of hard and soft tunnel boring machines (TBMs) and shield machines with fluid face or earth pressure balanced (EPB) support. We are also highly experienced in working with air compressed TBMs. This method is especially suited for excavation in unstable soils with the presence of water, as for example our Jenbach H8 Railway Tunnel constructed in Tyrol (Austria).

### Concrete Tunnels/Open Pit Tunnels

Surface tunnelling encompasses all the construction methods for underground structures built by means of a temporary or permanent open trench on the surface, such as the open-cut or cut-and-cover methods.

### Pipe Jacking/Microtunnelling

With over 200 km of walk-in pipelines built using pipe jacking and over a 100 cut-and-cover tunnels, STRABAG is also a global leader in pipe jacking and microtunnelling technologies. When compared to conventional open trenching techniques used in tunnel construction, our innovative trenchless tunnelling reduces both social and environmental impact. In South East Asia the Pipe Jacking Division has successfully completed several projects under the brand ZÜBLIN.

### Subaquatic Tunnelling

Whenever there is a need to cross water, there is the possibility of using an immersing tube tunnel, for example in Ireland the Limerick Tunnel, which was awarded the title of project of the year.

STRABAG's know-how and expertise enables us to offer a complete, innovative and integrated project solution, with our international team committed to ensuring the successful delivery on time for your project around the world.

# Tunnelling Projects

## → STRABAG TUNNELLING

STRABAG Tunnelling is highly experienced in working with the drill & blast, and the NATM method. NATM is based on the concept that the ground around the tunnel not only acts as a load, but also as a load-bearing element.

## Drill & Blast

Several international projects have been built by STRABAG using the drill & blast method.

### ALTO MAIPO C620/C630, HYDRO POWER PROJECT, SAN JOSÉ DE MAIPO, CHILE

The project area is located in the community of San José de Maipo, southeast of the city of Santiago de Chile, in the province of Cordillera and is being realised by STRABAG SpA Chile with over 2,400 employees from over 20 nations. The aim of the project is the construction of two hydroelectric power plants, Alfalfa II and Las Lajas. The contract performance includes the design and construction of tunnels, caverns, earthworks, civil works and the installations of hydraulic steelworks. Several tunnels and shafts will be built with a total length of 48.68 km, of which 22.3 km will be driven by two TBMs. The remaining tunnelling method is drill & blast. Furthermore 1.65 km of the shafts will be built by raise boring.

### ROHTANG PASS TUNNEL, ROAD TUNNEL, HIMACHAL PRADESH, INDIA

The Rohtang tunnel in India's northern Himachal Pradesh region is an ambitious project to provide year-round access to a remote group of communities. The 8.8 km single bore road tunnel is located in the north of India, in the Himachal Pradesh region, at over 3,000 m above sea level. When completed it will be the longest tunnel above an altitude of 2,500 m in the world.

### VOMP-TERFENS H5 TUNNEL, HIGH SPEED RAIL VOMP, AUSTRIA

The 8,480 m long tunnel contract section H5 was constructed using a conventional tunnelling method – NATM (drill & blast and mechanical excavation using tunnel excavators). The transition to the Terfens gallery was constructed in an open cut. Due to the changing ground conditions, which are challenging as they comprise hard and loose rock as well as water pressure, the tunnel has been excavated using conventional tunnelling methods (NATM). The use of NATM allowed us to use the best approach for every type of ground conditions with a combination of special measures like pipe roof umbrellas at more than 1,200 meters and a compressed air drive at more than 600 meters of tunnel.

1 Vomp-Terfens, Austria / 2 Rohtang Tunnel, India /  
3 Brenner Base Tunnel, Austria / 4 Alto Maipo, Chile



### BRENNER BASE TUNNEL, RAIL TUNNEL, TULFES-PFONS, AUSTRIA

The Brenner Base Tunnel (BBT), the heart of the new rail connection between Munich and Verona, runs for 55 km between Innsbruck and Franzensfeste (Fortezza). Including the existing Innsbruck bypass, which will connect with the BBT, the stretch of tunnel through the Alps comes to a total of 64 km, making it the longest underground railway connection in the world.

STRABAG has been awarded the contract to build a twin-tube rail tunnel between Tulfes and Pfnos as well as most of the contract sections for the preliminary works for the BBT – exploratory tunnels, new rescue tunnels running parallel to the existing Innsbruck bypass, shafts and two connecting side tunnels – and had proved its qualifications as a technical leader under geologically difficult conditions. The construction time for the approximately 38 tunnel kilometres is scheduled at 55 months.

Total cost for the whole Brenner Base Tunnel project, which is to be completed in 2025, is estimated at € 8.6 billion.

## TBM

### GOTTHARD BASE TUNNEL, LOT 252 AMSTEG/LOT 151 ERSTFELD, RAIL TUNNEL, SWITZERLAND

The Gotthard Base Tunnel in the Alps has a key function in transit traffic between Austria and Switzerland. The tunnel has a length of 57 km.

STRABAG was awarded the tender for the construction of two of the five main lots of the tunnel, namely the Amsteg and Erstfeld tunnels.

In the beginning each tube was excavated by using drill and blast to allow the assembly and installation works for the two tunnel boring machines, which excavated the main parts of the tunnels (2 x 7.8 km and 2 x 11.3 km). The same two tunnel boring machines used for the excavation of the Amsteg Tunnel were generally refurbished and then used for the tunnel excavation at the Erstfeld Tunnel.

### VIANDEN, HYDRO POWER PROJECT, LUXEMBOURG

The Vianden pumped storage plant, one of the most efficient plants of its kind in Europe, was upgraded by its operator SEO by an 11th machine unit (turbine capacity 195 MW). The project included several tunnels and caverns, buildings, mechanical equipment and electrical equipment as well as various measures to increase the available capacity of the upper and lower reservoirs. Construction of an underground powerhouse with an adjoining cavern housing the power transformers; the 250 m long headrace tunnel with a 290 m long vertical shaft; the approx. 480 m long tailrace tunnel; several access tunnels and connecting tunnels.



5 Vianden, Luxembourg /  
6 Gotthard Base Tunnel

### KORALM TUNNEL, KAT 2, RAIL TUNNEL, AUSTRIA

The 32.9 km Koralm tunnel is part of the 130 km high speed rail link from Graz to Klagenfurt in southern Austria. The route is part of a key trans-European route, the Axis 23 Adriatic-Baltic corridor, which will connect Gdansk on the north coast of Poland with Venice in north-east Italy. KAT 2 is the largest of the three main contracts, and has been underway since early 2011, with around 2 km of conventionally excavated tunnel required for each bore and then long TBM drives through the hard rock of the Koralm mountains - 17.1 km on the south side and 15.7 km in the north. The rail siding from the national rail system is used to import all of our used pea gravel, cement and fly ash to produce all segments as well as construction concrete for the inner lining. Further it is used to export unused muck to an external deposit area. Around 30 % of our total muck is reused for concrete production. The outstanding 70 % of muck are used to backfill around 20 km of rail track, rail dams, to fill up three different landfill areas and for one external deposit area connected to the rail siding.

### NIAGARA HYDROPOWER PROJECT, BIG BECKY CANADA

The project involved the construction of a water tunnel and associated structures to increase the capacity of electricity production of the Sir Adam Beck Power Generation Station. The client OPG chose STRABAG on a best value basis, taking account of the construction approach, taking into consideration design, cost, risk profile, tunnel flow capacity, schedule and project team, as well as H&S, environmental and quality management. Construction of the Niagara Tunnel involved the use of "Big Becky", the world's largest hard rock tunnel-boring machine, with 14.4 m diameter (TBM), which was as high as a four-story building, longer than a football field and weighed about 4,000 t.

The tunnel is nearly twice the diameter of the railway tunnels in the Channel Tunnel, and delivers an additional 500 m<sup>3</sup>/s of water to hydrostations, facilitating an increase of 1,600 GWh (14 %) in the average annual clean renewable and reliable energy production.

### NYE ULRIKEN TUNNEL, NORWAY

The project includes the second tube of the railway tunnel between Arna and Floen as well as works at both portals of the tunnel, which will connect the Bergen and Arna stations in western Norway. The 7,640 m long tunnel is being driven from the portal at Arna towards Floen/Bergen. 794 m of the tunnel are being excavated by drill & blast with sections up to 300 m<sup>2</sup> (2-track and 3-track tunnel). The bored tunnel has a length of 6,846 m and is a single-track tunnel. Two diagonal tunnels and 16 cross passages connect the new tunnel with the existing tunnel.

The single-track tunnel is being driven by an open gripper TBM with a diameter of 9.30 m. Water and frost protection is to be installed for the inner lining, slab track system for the rails.

This project will be delivered by using the largest tunnel boring machine in Norway to date.



1 "Big Becky", Canada / 2 Koralm Tunnel, Austria / 3 Ulriken Tunnel, Norway

## Mining

### Core expertise

- Tunnels, mine shafts, chambers, drifts
- Underground Mining (Services – Processes – Exploitation)
- Underground Civil Engineering Works
- General Civil Engineering Works
- Open Mining Excavation (Services – Processes – Exploitation)

→ "GLÜCK AUF!"



„Good luck!“ This traditional miners' greeting describes the workers' hope that lodes (of ore) will be opened, because when mining for ore, without prospecting no one could predict with certainty whether the miners' work would be rewarding or not. The greeting also expressed the desire that miners or tunnellers would return safely from the tunnel after their shift. Above every tunnel entrance you will find the hammer and pick symbol with the greeting Glück auf!

Our mining experience covers a wide range of projects in the mining environment, from innovation projects with Rio Tinto in Australia to a successful long-term mining business in Chile. For example in Chile we have extensive experience in the world's largest open pit copper mine Chuquicamata and are also working on the El Teniente and in the Andina mine.

As a competitive advantage, STRABAG is able to offer new technologies, technical support and maintenance in mining worldwide. Furthermore, it has continuously upgraded implements on hand, with state-of-the-art technology and equipment. STRABAG's innovative and technological capacities and its stable financial base ensure the company occupies a strong position in national and international markets.

A selection of our mining experience in Chile:

- Over 30 years mining in Chile with our subsidiary ZÜBLIN International GmbH Chile SpA.
- More than 12 million tons of underground exploitation of ore loading and transportation.
- Over 5.4 million cubic metres of surface exploitation including ore loading and transportation.
- Over 20,000 metres of intake tunnels for hydroelectric generation plants.
- Over 20,000 metres of mine transport and injection shafts.
- Over 180,000 metres of tunnels and drifts.
- More than 400 items of equipment and machinery available for our clients.
- More than 2,000 people working to offer an excellent service to our clients.
- A machine shop that is unique in the region.



3-4 Mining Chile



## Public-Private Partnerships/BOT

This is one of the main pillars of the strategy of the STRABAG Group. We operate and have equity stakes in some 30 PPP projects. The aim behind this part of our portfolio is to contribute to national and municipal modernisation. Such partnerships allow implementation of public construction projects within a shorter timeframe, along with a reduction in the investment and the operating expenses in many areas.

We guarantee the transfer of know-how and transparency of service at all stages of a project. 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 Proton Therapy Centre Essen are representative of our commitment to PPPs.

Since the STRABAG Group has been gaining ground in the field of PPP, we now also offer build-operate-transfer agreements, another typical outsourcing model. Examples of BOT are the construction and operation of the Euphrates Barrage Birecik BOT project, the Storebælt Railway Tunnel and the Don Muang Tollway in Bangkok.

## Turnkey Projects

Modern 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. 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.

Here we offer to fully design, construct and equip a manufacturing, business or service facility for you, and will hand it over to you when it is ready for final operation.

Two examples of turnkey tunnelling construction projects are the 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.

## Qualified Locals & Expatriate Staff

We want the skill and potential of our employees to be recognised and used as best as possible. To this end, we systematically identify and manage potential to ensure that our employees possess the necessary skills and potential required within the company now and in the future.

The aim is to assess their skills, potential and performance and to develop them in order to fill defined key positions within our own ranks. Our objective is to eliminate barriers within the professional development of our employees. Employees can take advantage of career opportunities such as working abroad or internal staff movements.

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. We strive to promote equal opportunities for all and to create an environment characterised by fair conduct and free from discrimination and any form of harassment. Our values and principles for honest and ethical business practices are anchored in our Code of Conduct that is valid throughout the group.

Start your international STRABAG career here:  
[www.karriere.strabag.com](http://www.karriere.strabag.com)



1 Alto Maipo project, 2,400 employees from more than 20 nations, Chile

## Health, Safety and Environment

STRABAG Tunnelling believes 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. We have 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.

The STRABAG HSEMS encompasses aspects of each project we have completed, using lessons learned to apply a proactive approach to continual improvement. Our incident- and accident-free workplace has resulted in the provision of excellent education and training systems which underline our commitment and emphasis on hazard identification, risk assessment and risk management methodology in the creation of desired beliefs, behaviours, culture and systems.

We provide a thorough training programme for all managers, supervisors and workers as well as induction processes for visitors, to ensure that everyone who enters a STRABAG Tunnelling project has the knowledge and background to act in a safe manner.

## Corporate Social Responsibility

Corporate Social Responsibility (CSR) within the STRABAG Group. At STRABAG, we define sustainability as the balance between achieving our business objectives and at the same time respecting social and environmental aspects. Our strategy is geared toward the long term, and we prefer a solid balance sheet and capital structure to short-term results.

We are shifting our focus toward new, innovative performance and products, in particular within the field of renewable energy. At the same time, we are working to develop and enhance the right methods and tools to control our impact on the environment.

## Innovation

STRABAG innovates to find balanced sustainable solutions. Innovation is essential for the development of our business and for creating high-level solutions in the built environment. In the last 10 years we have developed more than 100 innovations just for the tunnelling sector. Safety first combined with innovation! For example, in Chile our basic website features a QR Code that has brought our safety reporting system Actúa Ahora to life and has given it a new dimension in this changing technological world. The Actúa Ahora system itself allows all of our colleagues to report in real time safety hazards and concerns in their workplace in order for us to follow up on and make our site safer.

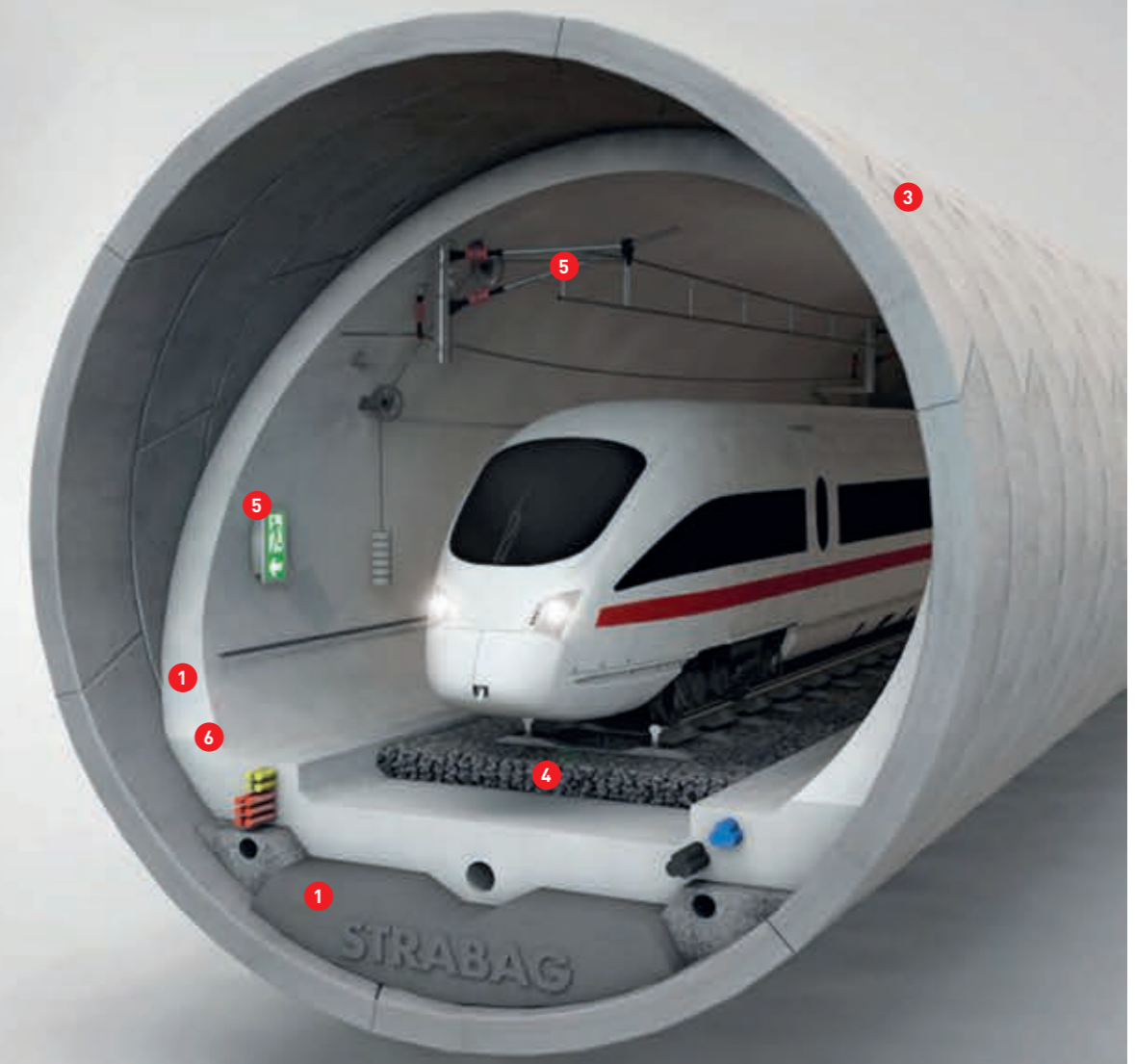
2 Actúa Ahora – reporting system from our QHSE award-winning team in Chile



# STRABAG Tunnelling's ONE-STOP SHOP



# From a Single Source



## 1 STRABAG AG

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.



[www.tunnelling.strabag.com](http://www.tunnelling.strabag.com)

## 2 STRABAG INTERNATIONAL GMBH

The STRABAG Group has already constructed more than 10,000 miles of roads all over the world, including in the Middle East and Africa. We guarantee that our roads have appropriate surfaces suitable for traffic loads, with optimum grip, driving comfort and an above-average service life.



[www.strabag-international.com](http://www.strabag-international.com)

## 3 STRABAG AG, INFRASTRUCTURE DEVELOPMENT UB4W

Public-private partnerships, build-operate-transfer, maintenance – we have successfully worked in this business field for over two decades, mainly in Central and Eastern Europe. In the field of Building Construction and Civil Engineering our portfolio comprises a total of 33 projects.



[www.strabag.com](http://www.strabag.com)

## 4 STRABAG RAIL GMBH

STRABAG Rail is an international railway construction company and part of the STRABAG SE Group. With more than 90 years of experience, we provide valuable momentum in the planning phase of railway construction projects and set high standards of quality for the execution of construction work.



[www.strabag-rail.com](http://www.strabag-rail.com)

## 5 STRABAG INFRASTRUCTURE & SAFETY SOLUTIONS GMBH

STRABAG Infrastructure & Safety Solutions offers as general contractor for transport and tunnel technology communication and safety solutions for public institutions, public and private transport, industry and companies in a variety of sectors.



[www.strabag-iss.com](http://www.strabag-iss.com)

## 6 MOBIL BAUSTOFFE GMBH

Specialist in the production of concrete for large-scale construction projects such as tunnels, dams and similar major projects around the world. We can produce any quantity of concrete required by the client to the agreed quality and within the specified time frame.



[www.mobil-baustoffe.com](http://www.mobil-baustoffe.com)

## Central Technical Division – One-stop address for technical know-how

The Central Technical Division (Zentrale Technik, ZT) is the Group's centre of technological competence. ZT is organised as a central division with 750 highly qualified employees at 24 locations worldwide. ZT supports the Group's operating units in geotechnical engineering and tunnelling, structural engineering and turnkey construction. The services which ZT renders cover the entire construction process, from the early acquisition stage, through tendering and construction design, all the way to expert site management.

### TUNNELLING

Design and engineering services in tunnel and underground construction have been a special competence and core business of ZT for more than 30 years. The quality of the services and products of ZT is due to the know-how and ambition of its staff, who work on behalf of the operating units and have produced the engineering design for more than 20 tunnelling projects around the globe during the last five years alone.

Our special focus lies on ensuring high customer satisfaction through technical competence and quality, efficiency and innovation skills in all construction phases, the education and training of enthusiastic and ambitious staff for our company, the pooling of tunnelling know-how and the dissemination of this throughout the Group.

### BIM.5D

Building Information Model (BIM) 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 enable the construction delivery team to explore options and manage solutions better than ever before due to the accurate interface of design, programme and engineering costs. At the Central Technical Division of the STRABAG Group, innovative tools to help realise effective and transparent cooperation are tested and implemented in the 5D Design department.

[www.bim5d.strabag.com](http://www.bim5d.strabag.com)



### Products of the Central Technical Division

- **SOFIA – Software for grouting works:** Design and monitoring of low-pressure grouting such as compensation grouting in urban tunnels or grout injections in tunnels through the ground.
- **Shield Transfer System (STS):** Development of a special shield-bearing structure used for the longitudinal transport in stations, where conventional longitudinal shifting is not possible for geometric reasons.
- **Energy tunnel lining segment (Energietübbing®):** Tunnel lining segment equipped with geothermal technology to extract heat and cold from the soil.
- **RFB tunnel lining segment:** Steel lining segment allowing for free orientation of freezing and grouting boreholes.
- **Q-Bolt:** Coupling bolt for the transmission of strong transverse forces in tunnel lining segments and other prefabricated concrete elements.

## TPA – Technologies for the future

Concrete is no longer the classic 3-component mixture that it used to be. 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 cost quotation stage.

We also support our customers during the execution of construction works. In addition to the optimisation of materials, we ensure a smooth construction process for the production of structural components that conform to requirements.

### CONCRETE TECHNOLOGY:

- Material processing of excavated materials: The approach to develop processes for re-use of excavated material as aggregate in concrete to reduce deposit area sites and therefore save environment and resources.
- Initial tests for all cement-bound building materials
- Development of new technologies
- Concrete designs/initial tests
- Optimisation 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

## BMTI – International Machinery & Logistics Service

STRABAG Tunnelling generally uses the services of BMTI for construction projects abroad. The purpose and objective of BMTI is to supply and equip sites and production locations with the appropriate technically reliable and properly functioning construction machines, equipment, material and systems.

### IN THIS RESPECT, THE MAJOR SERVICES PROVIDED BY BMTI COMPRISE:

- Investment management
- Rental/leasing management
- Repair/monitoring management
- Procurement of equipment and material
- Logistics/transport (road/sea/air)



# TEAMS WORK. – Success comes from working together!

TEAMS WORK. reflects the essence of what matters in our construction industry: namely, people working together and cooperating smoothly. In this way, we breathe life into our vision. Teamwork – on a small or large scale, internally or externally, across brands, countries and organisational boundaries – makes it possible to achieve what cannot be done alone.

## BECAUSE WHEN GROWTH IS DIFFICULT, PEOPLE GROW WITH THE TASK.

The desire for growth is one thing, but market conditions are another, and in the short term they can prevent the construction cranes towering upwards. Those who recognise this as a challenge to become even more professional and work even better as a team will be the ones who benefit. Now is the time for us to learn from one another and to grow together – into an efficient and productive whole.

## BECAUSE THE CULTURE OF COOPERATION WILL DECIDE THE COMPETITION OF THE FUTURE.

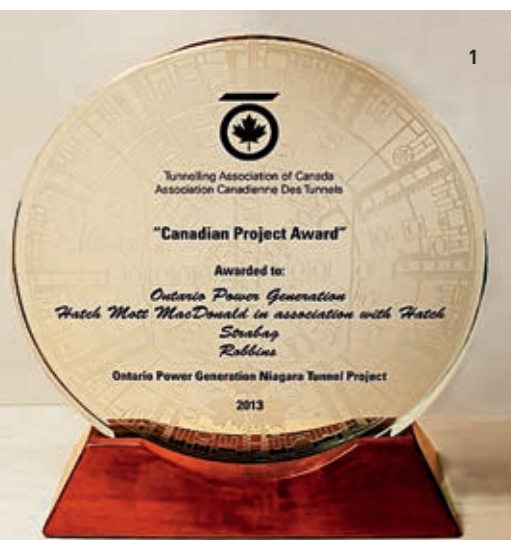
Whoever succeeds in winning over the best individuals with varied skills from the most diverse educational and personal backgrounds, develops them and forms them into a coordinated team, will emerge victorious from the competition. This is why the STRABAG Group places team philosophy at the centre of its policies and action. TEAMS WORK. places people and teams where they belong: at the very top.

## Our Awards

A selection of our awards:

- International Safety Award for Alto Maipo Chile 2016 and 2017
- International Safety Award for Pipe Jacking Singapore 2017
- International Safety Award for Offshore Gas Pipeline Russia 2017
- Tunnel Project of the Year NTP in Canada 2013
- Constructing Better Health (CBH) in the United Kingdom 2013
- Target Zero Commendation Award in the United Kingdom 2013
- Green Line for Environmental Engagement in the United Kingdom 2013
- Work Environment Award in Sweden 2012
- International Tunnelling Award Project of the Year in Australia 2011

1 Canadian Tunnelling Project of the Year 2013/  
2-4 International Safety Awards 2017



# Highlights of extensive tunnel experience

We bring together people, materials and machinery at the right place and at the right time in order to realise even the most complex construction projects - on schedule, of the highest quality and at the best price.

- Strong financial structure
- Extensive tunnelling experience
- Highest standards for HSE
- Global awarded player
- Capability from a single source
- In-house design & innovation centre
- Highly experienced people
- Excellent experience on 6 of 7 continents

> 50

More than 50 years of tunnelling experience

> 250

More than 250 tunnels built worldwide

> 2,000

More than 2,000 km total tunnel experience

50

Sole contractor for Alto Maipo, one of the biggest private construction contracts in South America (48.68 km)

14.4

Built with the world's largest 14.4 m width hard rock TBM (Niagara Tunnel) – "Big Becky"

1,000

Over 1,000 group innovations and more than 100 on the topic of tunnelling since 2005

1/3

Sole contractor for 1/3 of the world's longest railway tunnel (the 57 km Gotthard Base Tunnel)

9

STRABAG SE owns 9 patents in civil engineering, 4 of them especially for tunnelling.

**ZÜBLIN STRABAG**  
TEAMS WORK.

27.8

High experience in tunnelling in mining environment with an incline of 27.8%