

**SOUTHERN
LINE** || EXPERIENCE
MORE



1 h 15 min

SHORTER TRAVEL TIME
VIENNA – KLAGENFURT

80 km

NEW TUNNELS
AND UNDERPASSES

~90

MODERNISED RAILWAY STATIONS
AND TRAIN STOPS

33 km

KORALM TUNNEL, ONE OF THE LONGEST
RAILWAY TUNNELS IN THE WORLD

18

NEWLY BUILT RAILWAY STATIONS, TRAIN
STOPS, AND FREIGHT TRAFFIC FACILITIES

45 min

SHORTER TRAVEL
TIME GRAZ - VIENNA

210,000

NEW SEGMENTS ARE BEING
BUILT IN THE TUNNEL

250 km/h

POSSIBLE MAXIMUM
LINE SPEED

200 km

EXTENDED, MODERNISED
RAILWAY LINE

> 5,000

EMPLOYED WORKERS

14,000,000

TONNES OF EXCAVATED AND
EXTRACTED MATERIAL

170 km

NEW CONSTRUCTION ROUTE

150

NEW BRIDGES AND
UNDERPASSES



Experience more.

When we say "experience more", we mean all the many dimensions of human travel: arriving, living and learning.

In the future, trains will speed from Vienna to Klagenfurt in just 2 hours and 40 minutes and from Graz to Klagenfurt in 45 minutes. Covering a total of 470 km, they will pass through numerous new railway stations and through the Semmering and the Koralpe mountains at the highest of speeds. And when it comes to more "experiences" - just wait until Austria's new Southern Line opens!

SHORTER TRAVEL TIMES

VIENNA – GRAZ	2023: from 2 h 40 min	2030: 1 h 50 min
VIENNA – KLAGENFURT	2023: from 4 h	2030: 2 h 40 min
GRAZ – KLAGENFURT	2023: from 2 h (by bus)	2025: 45 min

**SOUTHERN
LINE** | EXPERIENCE
MORE

The future of travelling and transport

The Southern Line is one of the largest and most spectacular infrastructure projects of the coming decade. 200 kilometres of railway lines will be modernised and 170 kilometres newly built. This project has already led to the employment of 5,000 people and is expected to create 15,000 more jobs in the future. This new line will allow millions of tonnes of goods to get to their destination faster and for less money.

Increased Mobility**Fewer detours**

3.5 million people live in the Southern Line's commuter belt. They want to be mobile and enjoy internationally imported goods from all around the world. Austria's largest creator of railway infrastructure, ÖBB-Infrastruktur AG, is dedicated to fulfilling this wish. One of its most important tasks is to expand the North-South railway connection. In concrete terms, this translates into more than a quarter of a century of hard work and dedication for 170 kilometres of new and 200 kilometres of modernised railway lines.

More Europe**Fewer borders**

ÖBB-Infrastruktur AG is working on more than 100 large and small scale projects along the so-called Baltic-Adriatic Corridor from north to south. Stretching between the Baltic and Adriatic seas, this area covers a total of 1,700 kilometres. The corridor is both favoured and co-financed by the European Union. For Austria, the inclusion of the Southern Line in this far-reaching, trans-European connection means valuable access to emerging economies and the most important seaports.

More Railway**Less road use**

The Southern Line includes: the expansion of the Northern Line, the modernisation of the Vienna - Bratislava route, the new Vienna Main Station, the Freight Centre Vienna South, the Pottendorfer line (soon-to-be a high-performance line), the Semmering Base Tunnel, eight modernised railway stations between Bruck and Graz, the revamped Graz Main Station and the 130-km Koralm Line. Together, this mix will lay the foundation for future-orientated passenger and freight transportation.

More Freedom**Shorter travel times**

Every year, 37 million passengers travel on Austria's long-distance trains – twice as many as before the turn of the millenium. People leave their cars at home and travel by train if attractive connections are available. Proof of this could be seen after the expansion of the 300-km-long Western Line between Vienna and Salzburg. We expect the same development for the approximately 470-km-long Southern Line (including the Northern Railway), whose commuter belt is home to more people than the Western Line.

More Possibilities**Fewer restrictions**

In addition to some 37 million passengers per year on the southern line, 22 million tonnes of goods are transported by the ÖBB along it and over the country's borders to Southern European destinations, such as the Adriatic ports. An extended, high-performance line allows these goods to reach their destination even faster. Thanks to its new, large tunnel, the Semmering is no longer a lengthy, expensive obstacle and the new Koralm Line bypasses the narrow Mur Valley and the steep Neumarkter Sattel.

More Efficiency**Less consumption**

This straightened line enables freight trains to carry heavier loads for longer periods of time, with just one traction unit to boot. This decreases road traffic, protects the environment, and drastically reduces transport costs. Each tonne of freight that is transported by train rather than truck decreases carbon dioxide emissions thirteenfold.

NEW ROUTES

The Southern Line at a Glance:

The projects are lined up like pearls on a string, covering a total distance of 470 kilometres from the northern to the southern state borders. The goal: better connections between Austria and the neighbouring countries, between the four federal states and between the three state capitals.

SOUTHERN LINE

01 NORTHERN LINE

ANTICIPATED OPERATIONAL START 2026

02 EXTENSION MARCHEGGER OSTBAHN

2015 - 2025

03 VIENNA MAIN STATION

FULLY OPERATIONAL DECEMBER 2015

04 FREIGHT CENTRE VIENNA SOUTH

OPERATIONAL START 2016

05 POTTENDORFER LINE

OPERATIONAL START 2023

06 SEMMERING BASE TUNNEL

COMPLETION 2030

07 MODERNISED RAILWAY STATIONS AND INCREASED QUALITY

2013-2027

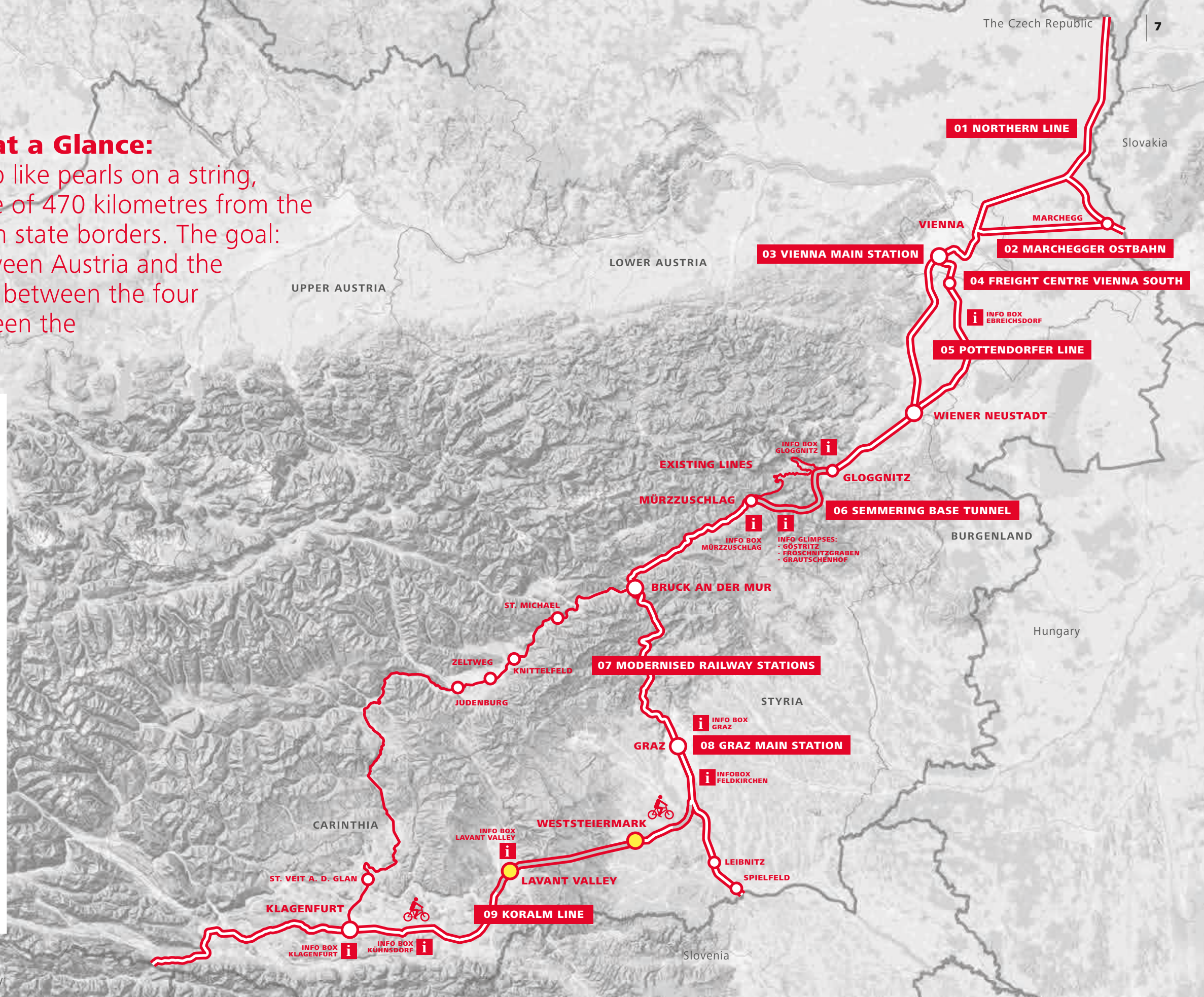
08 GRAZ MAIN STATION

NEW SINCE OCTOBER 2015

09 KORALM LINE

OPERATIONAL START 2025

		
SOUTHERN LINE	TUNNEL	EXISTING LINE
		
RAILWAY STATION	FUTURE RAILWAY STATION	INFO BOX
		
		BIKE INFO PATH



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SOUTHERN LINE | EXPERIENCE MORE

01 NORTHERN LINE

More Connections – Fewer Borders

Bringing Europe closer together

17 new train stops on the way through the Weinviertel

ÖBB-Infrastruktur is developing the Northern Line across 66 kilometres between the Vienna Süßenbrunn station and Lower Austria's Bernhardsthal station. This will make the railway line along the Czech border faster and safer. Busy railway crossings will be closed and replaced with underpasses and overpasses; the 17 train stops will be remodelled to become barrier-free and equipped with rail-free access to the platforms.

At 160 km/h to Prague

The goal is to bring Austria and the Czech Republic even closer together. Starting in 2026, Northern Railway trains will race back and forth at 160 km/h. Passengers will be able to travel from Vienna to the South Moravian village of Breclav in just an

hour; the journey to Prague will take a mere 3 hr 45 min, an entire half an hour faster than it is now. Freight transport will equally benefit from this line expansion.

Gdansk and Bologna are around the corner

Planning for the new Northern Line has begun. The first step will be an environmental impact assessment, i.e. the assessment of possible effects on mankind, animals, and the environment. At the same time, discussions and negotiations will be conducted with our Czech neighbours in order to coordinate project activity. The Baltic-Adriatic Corridor between Gdansk and Bologna is one of the EU's defined aims; in 2009, 14 European regions signed a declaration for it to be implemented quickly.



“A modernised northern line will bring us even closer to our neighbours in the North.”

Gernot Scheuch
Project Manager Northern Line



02 MARCHEGGER OSTBAHN

Nine modernised stations, more Park&Ride and Bike&Ride

Austria's longest straight track is made ready for the future

The fastest way to enjoy the comfort of the train

Over the next few years, around 37 kilometres of track will be expanded on the Austrian side, so that Vienna and Bratislava are linked with a modern and efficient railway infrastructure. The greater part of the route, covering 32.5 kilometres, goes straight through the countryside, making it the longest straight track in the Austrian railway network. Without doubt, it is the shortest way, but in the future, it will also be the quickest, with trains travelling safely and comfortably at 200 km/h because the current single track diesel powered route is being expanded to a two-track, electrified high speed line. 90 kilometres of railway tracks are being newly laid, nine stations are being modernised, 14 railway crossings are being abandoned and replaced by underpasses or overpasses. The expansion project is being continued on the Slovakian side.

Implementation in sections has proven to be successful

The required environmental impact assessment was positively concluded in 2014. In 2015, the Marchegg station was modernised for customer-friendly travel: with secure passenger access to the platform, modern waiting booths, a tactile guidance system and a new Park & Ride facility as well as bicycle stands. From October 2016 to 2018, working is proceeding on the section from Stadlau to Vienna Aspern North. In the new Vienna Aspern North station, the ÖBB route is being linked to the U2 underground line. The next section up to the Slovakian border will be electrified and modernised in sections to two tracks by 2023. Alongside this, the plans for completion will begin in 2021.



**„A big inner-city
project that succeeded
due to all of those who
took part working
together as partners!“**

Werner Schwab | Project Manager Vienna Main Station

03 VIENNA MAIN STATION

More than a railway station

City, campus, Viennese districts and a European station

A hub in the European transportation network

On 109 hectares of land, the full Vienna Main Station project is one of the largest building projects of the last decade in the city and country. It brings together a new station building with the development of a whole district. On what was once the southern station, ÖBB-Infrastruktur built a modern through station from 2010 to 2015. Trains can arrive and immediately leave again from all directions. The Austrian capital has become even more of a central hub than before - not just for regional and national traffic but also now on the trans-European rail network. The large building flooded with light with a diamond-shaped roof, which is now known as the 'StationCity Vienna Main Station', in which there are around 90 shops and restaurants, invites travellers, locals, residents and neighbours to stay and have a look.

Faster Connections between Western Austria and the Airport

Since December 2015 all tracks have come together at the Vienna Main Station. All cross-border European and inland

Austrian express trains now run in and out of the station, including those from the West. A train from Innsbruck, Salzburg and Linz brings passengers directly to Vienna International Airport every 30 minutes. Easy changes, short stopping times, good connections: travelling by rail is getting much easier.

A New City District for 13,000 People

All around the new main station, there is an entire 59-hectare district. In one area, the southern 'midsummer district', 13,000 people have a happy home - in well thought out, energy-saving residential buildings surrounded by a seven-hectare park. Trees have been planted, houses and apartments built, and kindergartens and schools already opened, making it a real urban campus. One where you can go straight to the northern part, the 'Belvedere quarter'. Here, hotels and office buildings are reaching new heights and the ÖBB headquarters are here too. The new district will provide apartments and workplaces for 30,000 people.

“We are building the main station here for goods in East Austria!”

Christian Trummer
Project Manager Freight Centre Vienna South



04 FREIGHT CENTRE VIENNA SOUTH

How to truly combine road and rail

The emergence of a modern freight terminal

55 hectares and hundreds of freight containers

In the south of Vienna, in the district of Favoriten, near the industrial area of Inzersdorf, ÖBB-Infrastruktur is constructing a trading centre, otherwise referred to in the transportation industry as an ‘intermodal terminal.’

30 kilometres of new operational tracks have been laid here, and the necessary operational buildings and access roads have been built. In fully operational mode, the 55-hectare facility will include container storage areas and heavy load gantry cranes. ‘Intermodal’ explained: Different modes of transport and traffic routes meet at one point. For example: one and the same container can be transported by train and then lorry, or vice versa. The goods do not have to be unloaded, moved and reloaded. This saves time and money.

Faster transportation between Vienna and the rest of Europe

The Vienna South Freight Centre is a modern transportation hub from the Vienna region to the most important economic centres throughout Europe. Another key aspect is a good connection to the new economic region in the Balkans.

Together with freight transport to the west, a high-performance network will be constructed, which will optimally connect the Vienna region to trading partners. Transport to the important seaports for international shipping is also a significant function of the freight centre. Harbours, river routes, motorways and railway stations are thus woven together to form a system.

More handling capacity

The first facility, the terminal area of the freight centre, was put into operation at the end of 2016. As part of the second facility, in 2021 the logistic depot was finished. Currently it is possible to handle 210,000 Intermodal Transport Units (ITU) per year. With further expansion the handling capacity will grow up to 315,000 ITU. On top of that there will be further warehouse capacity of 940 TEU (Twenty-foot Equivalent Unit). The second expansion phase will be finished by the end of 2025.

“The planning and construction work is being carried out in close coordination with the surrounding communities and the work will provide these communities with attractive train services with modern infrastructure in future.”

Thomas Schöfmann
Project Manager Pottendorfer Line



05 POTTENDORFER LINE

Four Tracks between Vienna and Wiener Neustadt

Heading south at 200 km/h

Convenient, fast travel into Vienna and back home

Until 2024 ÖBB-Infrastruktur will be modernising the Pottendorfer line, a 52-kilometre-long extension route via Mödling and Baden. This second route begins in Vienna Meidling and goes to Lower Austria, via Wampersdorf, a district of the eponymous area Pottendorf and on to Wiener Neustadt. It will be a modern two-track high-performance route and it is getting faster too; the trains can run at up to 200 km/h on the rails. The updated line between Vienna Meidling and Wiener Neustadt will be used by thousands of commuters on their way to work every day in the offices and shops of the capital. A large part of the railway line is already running as a two-track line and has been through the upgrade already: the section between Wampersdorf and Wiener Neustadt and - apart from one leg - the section between the station of Vienna Meidling and the new Vienna Blumental stop, which is near the existing freight centre Vienna South.

More comfort with five new railway stations

Since 2016, ÖBB-Infrastruktur has been working hard on the Hennersdorf-Münchendorf sections. By the end of 2019, modern and barrier-free stations were built in Hennersdorf, Achau and Münchendorf. The line was extended to two tracks. In 2020, the expansion started in the section between Münchendorf and Wampersdorf with its centrepiece being the new Ebreichsdorf station. The Wampersdorf station will also be completely renovated. On the entire route will all level crossings will be abandoned and replaced with safe overpasses and underpasses. In total, there are 23 new bridges and underpasses, numerous drainage systems and noise barriers 11 kilometres long will be built here.





06 SEMMERING BASE TUNNEL

Vienna – Graz in 1 hr 50 min

In the future, Semmering will be a bottleneck no more

Rapid transportation, even for heavy freight trains

The Semmering Base Tunnel goes from the Lower Austrian Gloggnitz to the Styrian Mürzzuschlag, through the Semmering massif. It is exactly 27.3 kilometres long and creates the conditions for future-orientated passenger and goods transport with its two tunnel tubes, which will be completed in 2030. The travel time for passengers from Vienna to Graz will be reduced by 50 minutes. Unlike the mountain route of the historical Semmering railway, even heavy freight trains can travel with just one traction unit on the incomparable base tunnel. One of the bottlenecks on the Baltic-Adriatic corridor is thus avoided.

The best of 13 track variations

When planning and building the Semmering Base Tunnel, a two-tube tunnel system, sensitivity is given top priority. Long before ÖBB-Infrastruktur even began with the construction, geologists and hydrologists examined the area. They examined stone and water. Even the effects on the settlement area were investigated by experts. From 13 variants, the most suitable route was selected. The undertaking involves hundreds of tasks, such as re-routing roads and flood protection. Now the tunnel is being constructed from several points. When constructing a tunnel, great care is needed every day.

The historic Semmering Train

The new tunnel takes some of the burden off of the time-honoured Semmering and Ghega railways, the first mountain railway to be declared a UNESCO world heritage site. The railway section, the viaducts, the tunnel and the station are currently being renovated and modernised to ensure that operation can be maintained. The railway is steeped in history and remains a beloved travel destination.

07 MODERNISED RAILWAY STATIONS AND INCREASED QUALITY ON THE BRUCK A. D. MUR – GRAZ LINE

RAILWAY STATION MODIFICATIONS

2023 – 2025	MIXNITZ – BÄRENSCHÜTZKLAMM
2016 – 2019	FROHNLEITEN
2021 – 2022	PEGGAU – DEUTSCHFEISTRITZ , MODULE 2
2025 – 2027	GRATWEIN – GRATKORN

Eight modernised railway stations and train stops

Between Bruck an der Mur and Graz, on a rail segment 53 kilometres long, ÖBB-Infrastruktur will be working until 2027 to bring eight stations and train stops up-to-date. They are exchanging rails and overhead lines, considering future right hand running and rebuilding or creating the buildings. With the display boards, ticket machines and directions system, the stations will be light and clearly arranged. They have to be prepared for what is predicted for the considerably ‘faster’ southern line: a lot more passengers.

LINE RENOVATIONS

2013 – 2016	PEGGAU – GRATWEIN
2015	STÜBING AREA
2016 – 2018	FROHNLEITEN – PEGGAU
2018 – 2020	MIXNITZ – FROHNLEITEN
2020 – 2022	PERNEGG – MIXNITZ

Track-free platform access

Modernisation is especially important in the area around Graz, where more trains and especially express trains will be running. Fully automatic interlocking systems have been installed for a quicker and safer combination of switches, gates and signals and another safety factor, rail-free train access, is also being brought in. Staircases and exits are thus made more suitable for wheelchair and pram access, which can now be achieved without barriers.



01/ THE NEW RAILWAY STATION FROHNLEITEN
 02 RAILWAY STATION AND BUS TERMINAL PUNTINGAM
 03/ MODERNISATION OF THE RAILWAY STATION BRUCK A. D. MUR FROM 2010 TO 2013

“With the main station’s modern, waved roof, we have created a completely new landmark.”

Klaus Schneider
 Project Manager Graz Main Station,
 Overall Coordinator Koralm Line



08 GRAZ MAIN STATION

One railway station for over 40,000 people
 Graz will serve as a 2nd international transport hub after Vienna

Railway station reconstruction from A to Z

Day after day, 41,000 people enter Graz Main Station. They arrive or depart, wait for travellers or accompany them. With the completion of the Koralm Line in 2025, the Graz station will be more significant, for international travel too, because it is on one of the most important north-south transversals of Europe.

This required a modernisation from A to Z. All of the railway systems had to be renovated and expanded. The entire project “Graz Main Station” got started in 2009 and in autumn 2015 it was completed - but it involved more than an expansion of a railway station. It involved several infrastructure projects from the ÖBB, the city of Graz, the Graz Holding and the state of Styria, as well as numerous new buildings, that were built.

New interlocking system and numerous service halls

While the Graz station was gradually transforming, a new

passenger tunnel was built, which extended track systems with platforms and roofing, as well as a new motorail train facility with a new group of park and ride stops. In the station area, all of the facilities are now gathered together: the service hall for technical services, a service building with training workshops, a new location for Rail Cargo Austria AG, a modern electronic interlocking system and offices and car care halls. At the Graz shunting yard, ÖBB-Infrastruktur updated the rail technology and braking technology. The operation of all of this had to be modernised and accelerated to be prepared for the future.

Graz’s Lend district grows closer

With the continuous passenger tunnel in the north of the platform, Graz Main Station merges the Lend district, which was divided into an east and west section. The Graz Main Station is thus a new hub for local traffic with urban development aspects, a community project by city, state and ÖBB.



09 KORALM LINE

Off to the south ...
 ... on 130 kilometres of
 new railway lines past 23
 stations and through
 many new tunnels

Faster Connections to Southern Austria

Since 1999, the ÖBB has been building the Koralm Line in Styria and in Carinthia since 2001, there has been a new stretch of railway 130 kilometres long. This line makes southern Austria easier to reach. South Carinthia and West Styria are easier to access now too - both regions are getting closer to the state capital, Graz and Klagenfurt.

Graz – Klagenfurt in 45 minutes

This is an advantage for commuters and companies too. The Koralm Line transports people and goods more quickly, with short journey times and at short intervals. With its completion in 2025, a journey from Graz to Klagenfurt will take only 45 minutes, instead of the two hour bus journey that was previously required. People who travel from Graz to Venice can be very pleased with a time saving of up to four hours. In future, people will be able to glide through the countryside along the whole Koralm line at up to 230 km/h.

The sixth-longest railway tunnel in the world

For a quarter of the section, the trains will travel through tunnels, the longest is the Koralm tunnel, at 33 kilometres long. It is the sixth longest railway tunnel in the world and connects Styria with Carinthia and the Deutschlandsberg area with the middle of the Lavant valley. At a maximum depth of 1.2 kilometres, two tunnel tubes running in parallel, each with a ten-metre outer diameter, break through the Koralpe massif.

23 new and modernised stations and train stops

Along the line, eleven stations have been or are being completely modernised and twelve newly built: in Styria, the stations Kalsdorf, Werndorf and Wettmannstätten, as well as the Hengsberg stop; in the local transport hubs Don Bosco and Puntigam; in Klagenfurt, the station Klagenfurt Ebenthal. These stations are very significant, they are a guarantee for the regional use of the

Koralm line: thousands of people will get on and off here and this will be to their advantage.

The Koralm Line connects Köflach with Bleiburg

The Koralm Line fits into a local railway network. It connects to the future station West Styria, in the greater St. Florian area with the Graz-Köflacher railway. The regional line Zeltweg - Wolfsberg merges into the new Lavant valley station. Other new stations: Aich/Wiederndorf, Mittlern, Kühnsdorf/Klopeiner See, Grafenstein. To open up the surrounding countryside, two more lines were modernised on the Carinthian side: the Lavant railway and what is known as the Bleiburg loop; it connects the town community of Bleiburg and the market community of Feistritz on Bleiburg to the southern line.

CONSTRUCTION SITE INSIGHTS: SEMMERING BASE TUNNEL



01

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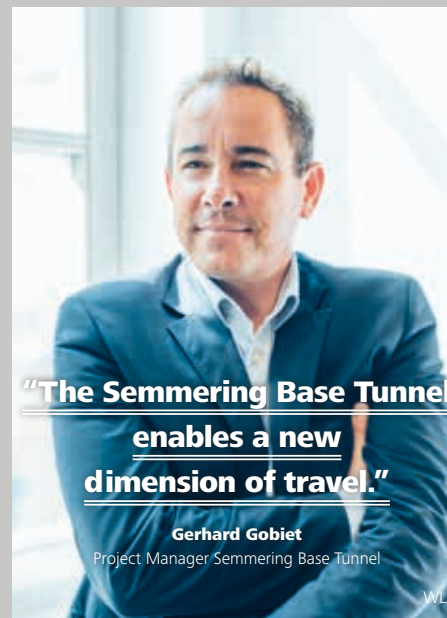
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06

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"The Semmering Base Tunnel enables a new dimension of travel."

Gerhard Gobiet
Project Manager Semmering Base Tunnel

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Fellowship first.
The men underground: miners have always had a special sense of fellowship. You have to rely on your workmate.



07

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01 FORMWORK CARRIAGES CONSTRUCT THE CONCRETE INNER-SHELL
02 INNER-SHELL SECTION FROESCHNITZGRABEN
03 WORK PROCEEDING AT SOME 400 METRES BELOW GROUND
04 SURVEYING THE SEMMERING BASE TUNNEL
05 GLOGGNITZ TUNNEL ENTRANCE

06 GROUP PHOTO OF THE MINERS
07 NEW STEEL BRIDGE OVER THE SCHWARZA
08 BREAKTROUGH SEMMERING BASE TUNNEL, GOESTRITZ MEETS FROESCHNITZGRABEN
09 LONGSGRABEN LANDFILL SITE

CONSTRUCTION-SITE INSIGHTS: KORALM LINE



01

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Thousands of workers in action

Although technology is moving forward all the time, in the end it is the people who put together, operate, steer, maintain and control the machines who define construction progress.



07

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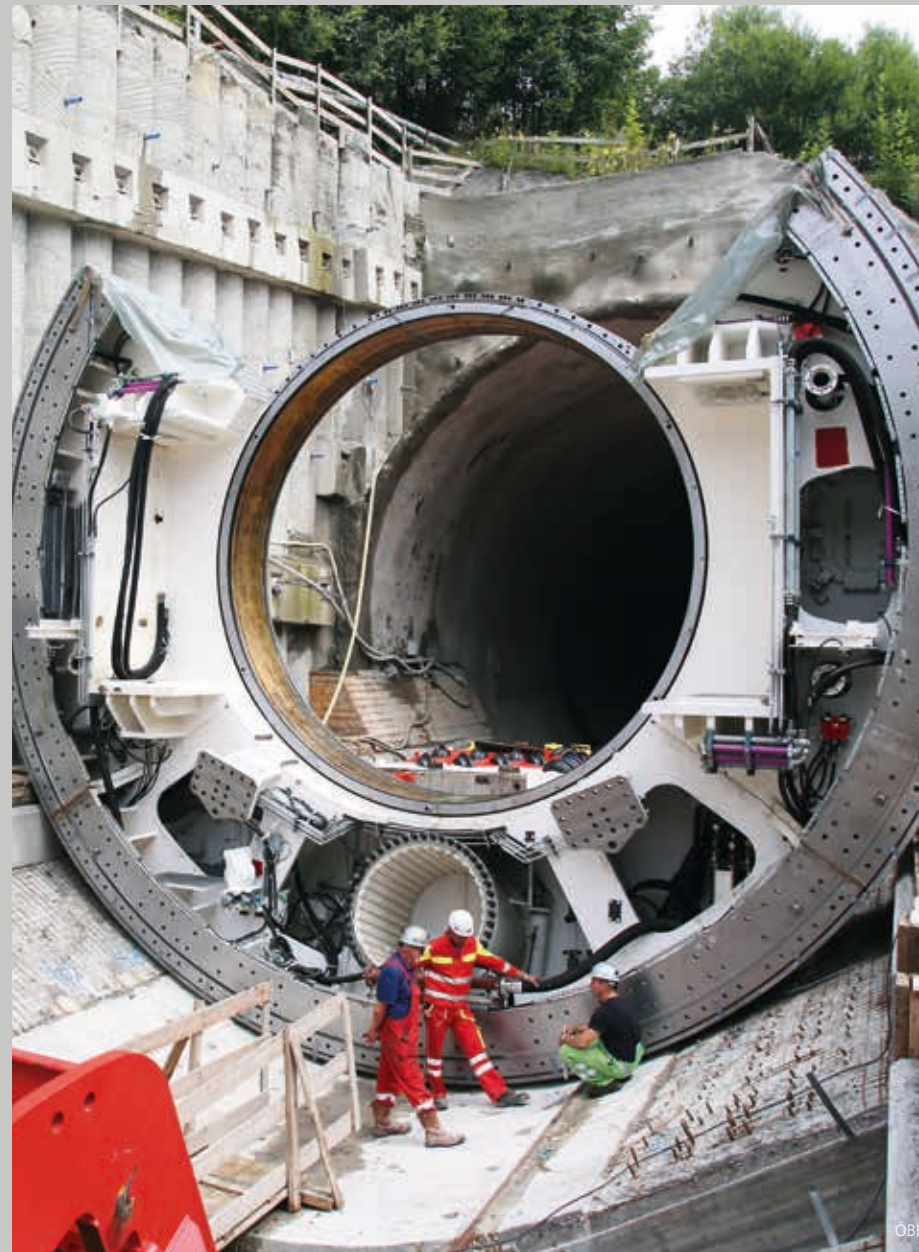
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ÖBB



ÖBB



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ÖBB



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The tunnel drilling machine's long journey (Photo No. 06)

Every tunnel construction project needs a very specific tunnel drilling machine, which corresponds to the requirements of the mountain and the project. Several months in advance, it is built in the manufacturer's production plant, tested and taken apart again. Then, once the giant components of the tunnel drilling machine have been delivered to the construction site using special transport on sea, road and rail routes, it is put together again and put into operation after what is known as the switching on process.



09

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10

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- 01 FINAL BREAKTHROUGH KORALM TUNNEL 2020
- 02 VIEW OUT OF A SUPPLY SHAFT
- 03 INNER-SHELL IN THE TUNNEL
- 04 TUNNELING BORING MACHINE IN THE KORALM TUNNEL
- 05 MINERS AT WORK

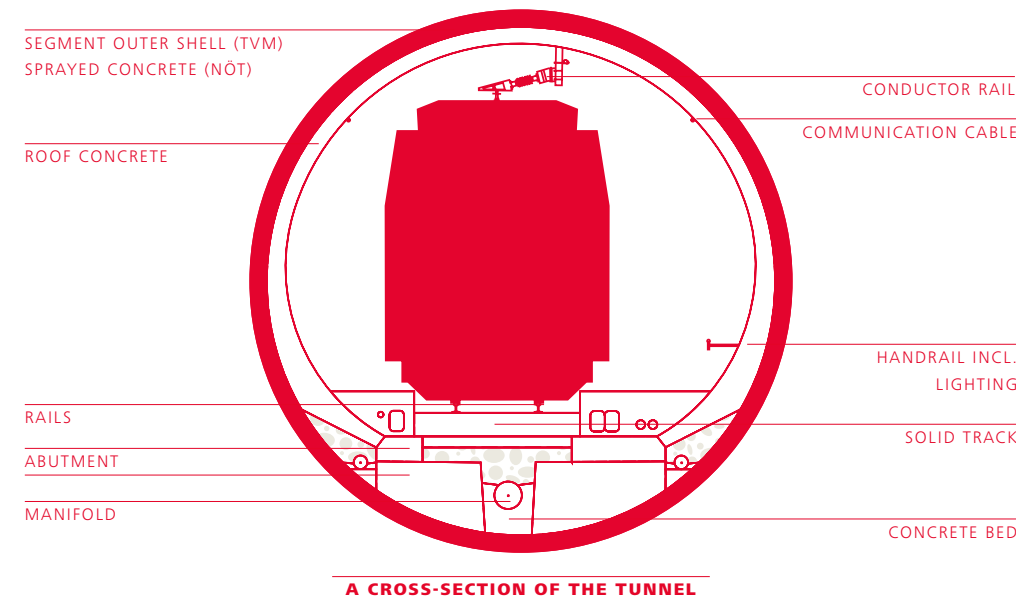
- 06 ASSEMBLING THE TUNNELING BORING MACHINE
- 07 WORK IN THE INTERMEDIATE HEADING
- 08 IMPORTANT MILESTONE: RENOVATION JAUNTALBRIDGE
- 09 INSPECTION ROUND IN TUNNEL BORE
- 10 WORKING IN THE TUNNEL

CONSTRUCTION & TECHNOLOGY

Onwards, ever deeper into the mountain!

Here, tunnel drilling machines work their way from several sides through the stone. There, they drill, blast, secure and clear the stone. Conveyor belts several kilometres long hum loudly. Tunnel construction is a highly precise clockwork mechanism in the mountain.

CONNECTING TUNNEL BETWEEN THE TWO MAIN TUNNELS, SEMMERING BASE TUNNEL



Dust, fuss, roaring in the half light. The Koralm Tunnel is being built. Two tubes of around ten metres in diameter are drilled into the mountain. Two sets of 33 kilometres - through a piece of the Lavant valley Alps. With 10,000 PS or a good 7,000 kilowatts, the machines fight their way through rock and debris. They dig and drill further and further inwards. They have been doing this almost constantly since the first tunnelling work in 2009. 18 years after the first test drillings, both both tubes were completed.

Tunnel drilling machines – Loud giants in the mountain

The tunnel diggers call these whining wonder works tunnel propulsion machines, or “Maui 1” and “Maui 2” (after the beloved character Maui the mole). These are their Styrian nicknames. The Carinthians have lovingly christened their giant “Kora”. With a weight of 2,000 tonnes and around 200 metres long, these tunnel drilling machines work like underground factories. Leading the machine operation is the drilling head of the heavy cutting wheel, which rotates at the front. It has a diameter of approximately ten metres and it digs through several metres of stone every day. Not unlike glass cutting, the 30 to 40-centimetre large, sharp chisels on the cutting wheel break off rock chips from the mountain. Behind the drilling head, the follower rolls on the rails with vans and platforms with drill units, cement sacks, pumps, wires and power units.

Excavated material is partly reused

The tunnel drilling machines have to be supplied with power, compressed air and cooling water and conveyor belts and wagons take what they remove from the mountain away afterwards: gneiss and mica slate, marble, quartz and feldspar. In the tubes that have already been drilled out on the Styrian



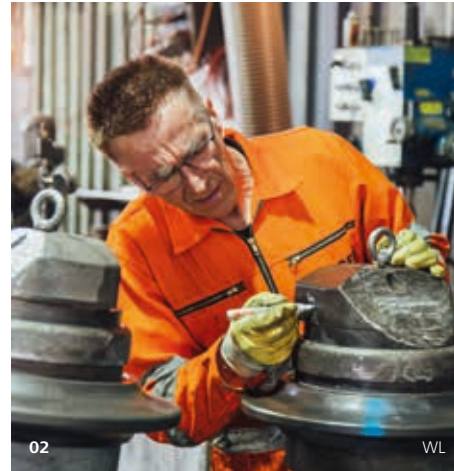
side, the conveyor belts are 16 and 17 kilometres long. Part of the rock formations can be used for building the routes. A better quality part can be used for the lining of the tunnel itself. Above ground, in a gravel plant, it is ground down and processed with water and cement to make concrete. This concrete is later reintegrated on the inside of the mountain in the form of concrete inner shells and segments.

160,000 ring segments made from reinforced concrete – the segments

Another service that the colossal machine provides besides the thunderous propulsion: it supports and lines the raw stellar vault as soon as it has been created. It drills and builds at the same time - with the help of segments, precast curved steel concrete parts, which provide a protective outer ring when hefted and jointed. Thousands of these ring segments are brought into the mountain with the tunnel railway. Just one segment weighs over seven tonnes. The remaining hollow space



01



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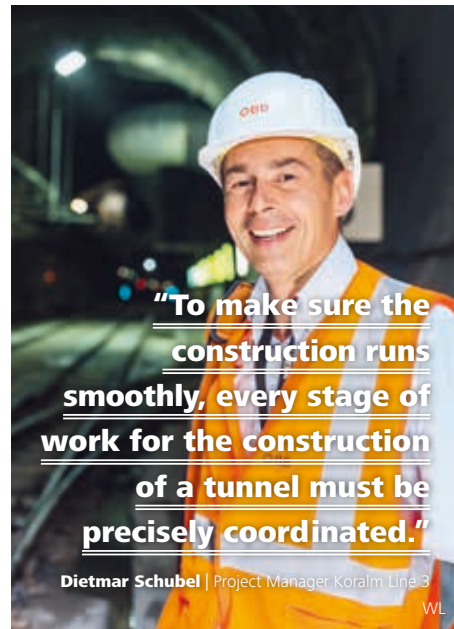
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“To make sure the construction runs smoothly, every stage of work for the construction of a tunnel must be precisely coordinated.”

Dietmar Schubel | Project Manager Koralm Line 3

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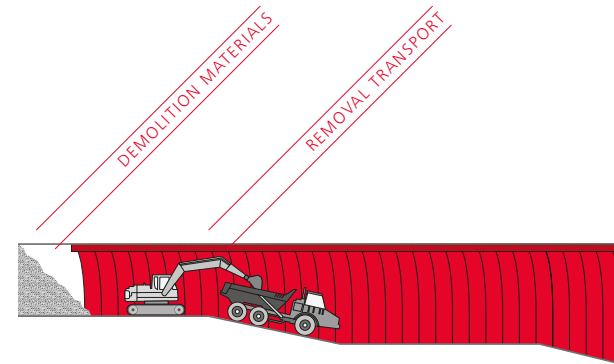
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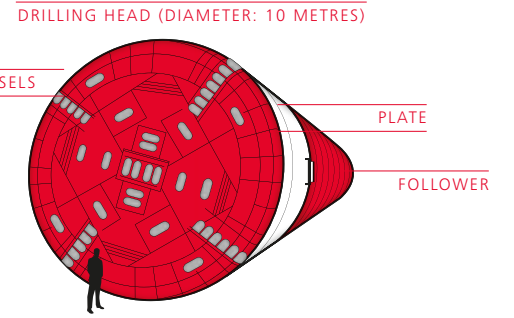
ÖBB

- 01 TRAMWAY FOR TRANSPORTING THE WORKFORCE
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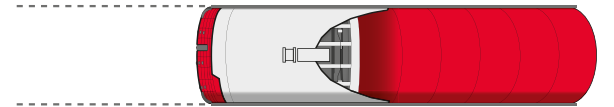


CYCLIC TUNNELLING

NEW AUSTRIAN TUNNELL DRILLING METHOD: DRILLING, BLASTING AND DREDGING FOR HETEROGENOUS ROCK MATERIAL



TUNNEL DRILLING MACHINE (LENGTH APPROX: 200 METRES)



CONTINUOUS TUNNELLING

BREAKING DOWN ROCK, LOADING AND FITTING OF PRE-MANUFACTURED SUPPORT ELEMENTS (SEGMENTS) USING THE TUNNEL DRILLING MACHINE FOR HOMOGENOUS ROCK MATERIAL

between the mountain and the segments is filled with special pea gravel. With the ring segments, mostly seven per ring, the tunnel is secured against falling rocks and mountain water. For the two Koralm tubes, in the end, 160,000 segments were installed.

Will water flow from the rock?

“You can never talk about day-to-day business,” say the tunnel construction experts. Despite refined logic, despite precise test drilling and preliminary geological explorations, every step forward is also a step into the unknown: the mountain has a life of its own. Will water flow from the rock? Will it seep from the ground? Is the machine stalling? Do the chisels need to be replaced? Every task is its own challenge. The geologists keep a constant eye on the stone that is primarily changed in this way. One minute you could come across loose mountain rock and the next hard “Koralm crystal”.

“Continuous” and “cyclic” tunnelling

The tunnel drilling machines, which power the “continuous” tunnelling into the mountain cannot work alone. For the vastly changing rock formations and suspected problem areas of the mountain, another method is used. The tunnel diggers then talk about “cyclic” tunnelling. Austria has made a name for itself with the “New Austrian Tunnelling Method”, for which engineers and workers drill and blast the uncovered hollow space immediately with construction steel grids, secure them with sprayable concrete and anchors and finally remove the loosened stone with diggers. And they keep doing it, thousands of times, in cycles. While about a quarter of the Koralm tunnel is produced cyclically, around three quarters of the shorter, 27-kilometre long, Semmering base tunnel is dug this way.

Semmering: a complicated tube system

With its two tunnels, it crosses the dark, crystalline Greywacke zone, which also contains a lot of water. They are built in three large sections and from several sides at the same time. To build a railway tunnel, lots of small tunnels need to be built around it: vertical supply and air shafts; drainage so that the water can all flow away; cross cuts every 500 metres to connect the two main tunnels. You need escape routes and emergency stations, large rock caves, so-called caverns, where machines can be repaired and maintained. Constructing several work shafts or so-called intermediate points is a unique and huge task, which requires a lot of time. The material logistics for the middle section of the Semmering Base Tunnel, for example, has an approximately 400-metre-deep supply shaft in Fröschnitzgraben in the middle of the Semmering countryside.

Coordinate peak performances

All of the processes have to be precisely coordinated with one another. The tunnel drilling machine is the master clock for the preparation of the tunnel breakout material, the segment production and the dam fillings on free stretches and it influences the project progress. In 2025, the company hopes that the Koralm tunnel, one of the longest railway tunnels in the world, will be complete. In 2028, the last touches will be put to the tunnel through Semmering. At the end of 2028, train passengers will then be able to race from Vienna to Graz in 1 hour and 50 minutes and beyond through the Koralm tunnel from Graz to Klagenfurt in 45 minutes. Freight transport will then be able to travel with high power on what is known as the flat track with a maximum slope of just eight per mille - in comparison to this, the existing mounting stretch to Semmering has a maximum slope of 25 per mille.

From mountain water and riverscapes

Ecologists and engineers have a lot to do to protect nature in the building phase and to develop new meadows, forests and creeks - with frog ponds and grey heron colonies, maple trees and trembling poplars.



ÖBB



TOAD



SANDPIPER



GRAYLING

The motors are still roaring, people are welding and hammering and the lorries are driving around. Cranes heave stones into the air, turn and lower the weight again. But they are careful not to tunnel into the tree roots. The sodium vapour lamps, which have been installed on the construction site are glare-free and have a pale orange light. In the womb of the Deutschlandberg, the "Schilcher city", where vineyards, meadows and forests stretch out over the countryside and the Laßnitz river flows, nests one of the largest grey heron colonies south of the Alps. The birds crouch, family beside family, in their high brushwood nests and stalk around the shallow water in search of food. Not far from them is the northern portal of the Koralm tunnel. Ornithologists had studied the colony long before the tunnel drilling machines began to howl - in the planning phase for the environmental impact test. A range of protective measures were worked out. The trees must not be cleared in the breeding season but instead between August and January. At the annual nest counting it was determined that the grey heron colony is intact.

How to move a piece of Lavant

The environmental experts, agricultural planners and hydraulic construction technicians, among others, have planned a renaturalisation measure with an enormous amount of effort in the other side of the Koralm tunnel in the Carinthian Lavant valley: they have transferred a part of the river by 1.4 kilometres. We need space for the high performance route of the railway line and the Lavant valley station but also for the stone and debris, which is carted day after day away from the growing tunnel. But this means that the retained volume that protects the community of St. Paul downriver with its 21 villages against possible flooding is lost.

So, similarly to the Schwarza area for the Lower Austrian portal of the Semmering Base Tunnel, we must clear away terrain and set new retention areas in addition to the Lavant, for a section, digging out a new river bed. 20 hectares of compensation area was gained as well as a significantly healthy river environment. The Lavant itself was for a long time separated from its backwaters, wedged into a bone straight trench. Now it can wind and snake around again in any section, according to its natural dynamic in a wide bed with so-called expanded, sometimes steep and sometimes flat banks with bars and sand banks, hollows and shallows. It can be seen from the cycle path.

Yellow-bellied toad and crested newt

The 'old' Lavant remains as a weak flowing tributary. Between it and the new river, an island is formed with an alluvial forest, wetlands and all kinds of still waters, in which deadwood, root stocks and stones are being introduced. A natural calm zone with no access by people is being established - so that they can flap around here and peck for food: the fast sandpiper and the whistling oriole. In 2011 the restructuring was completed and the first monitoring results showed: the barbels and graylings bustle about in the river, yellow-bellied toads and crested newts glimmer in the ponds and in the meadows and the precious Lavant valley terrestrial orchids gleam in red and violet.

4,300 water measurement points in the Semmering area

Conservationists and scientists also have a constant eye on the mountain water of the Koralmpe and the Semmering. Years before the tunnel construction was started, they began to record data - in the Semmering area, believe it not there are 4,300 measurement points; in the Koralm there are around 350. The smallest changes are recorded. Maps are



created, hundreds of sources, springs and streams are created and samples are taken and brought to the lab. The most important principle: the quality and quantity of drinking water must remain protected. The Koralm sources - as discovered by this research - are not negatively affected by the tunnel construction: they feed from the near-surface mountain water, in the loose stone and the weathering zone. The tunnel runs much deeper. On the Semmering, geologists and hydrologists take drillings up to 850 metres deep to research the stone, the water and its streams. In actual fact the water-containing layers of chalk and dolomite must be avoided as well as possible or crossed using the shortest possible route with the route of the base tunnel. Where this isn't possible, particular mountain sections are sealed and drainages are dug to divert the rivulets. In the Grassberg and the Large Otter, where the stone contains lots of water, the engineers have constructed water pipes.

70,000 trees and shrubs

The renaturalisation on the southern line will not be completed for a long time. There is a lot that we won't see in full for years yet, including the 7,000 plum trees, walnut trees and maple trees, willows, ashes and oaks that have been planted in the shifted Lavant. At Gussendorf on the Styrian Laßnitz river, of which a section has been moved, 11,000 trees and bushes have been planted. At the Semmering Base Tunnel the dump Longsgraben in Styria is completely filled up. All in all, over 70,000 new plants are already flourishing and there will be even more. Everything is happy and healthy.



01 SCHOOLCHILDREN PLANTING A FOREST
02 MORE THAN 20 HECTARES GO GREEN



A paradise for greylag goose and kingfisher: Brenndorfer Bucht, 18 hectares of ecological compensation area for a diverse flora and fauna.



01 NEW RAILWAY BRIDGE OVER THE DRAU RIVER
02 DRAINAGE OF THE CONSTRUCTION SITE
03 NEW CREEK, LONGSGRABEN
04 ENVIRONMENTALLY-FRIENDLY RAILWAY

TIMELINE

Mobility of the future

A quarter of a century of work and full application so that commuters can get to work and back again more quickly and goods can reach their destination more cheaply.



09 KORALM LINE 1999 - 2025



08 GRAZ MAIN STATION 2009 - 2015



06 SEMMERING BASE TUNNEL 2012 - 2030



05 POTTENDORFER LINE 2016 - 2024



04 FREIGHT CENTRE VIENNA SOUTH 2013 - 2016



02 MARCHEGGER OSTBAHN 2015 - 2025



03 VIENNA MAIN STATION 2010 - 2015



01 NORTHERN LINE 2022 - 2026

FRIENDS OF THE SOUTHERN LINE

And what kind of noise protection do you have?

When tunnels are dug, routes are raised and stations and freight terminals are built, locals and neighbours want to be informed.

SOUTHERN LINE INFORAIL DISPLAY



01

WL

01 EXHIBITION DISPLAY FRÖSCHNITZGRABEN

02 INFO BOX SEMMERING BASE TUNNEL GLOGGNITZ



01

ÖBB



02

WL

Will the terrain be lowered or raised? How many trees will be cleared? What's happening to Rosiwal street? At the round table for the Freight Centre Vienna South project on the outskirts of Vienna, for which the first tracks have been laid, 15, 20 people kept meeting: men and women from the neighbourhood, representatives of the city, district leaders from Favoriten and Liesing, speakers from allotment clubs and the citizen's initiative 'Stop Mega City Rothneusiedl' met the ÖBB planners. From May 2010 to February 2011 the group met almost every month.

All parties were heard

Wishes were laid on the table, concerns were discussed and ideas were gathered. Twice, excursions were taken to other freight terminals, to the Freudenu Danube port and the Vienna central marshalling yard and to the ÖBB Logistics Centre in Linz. A freight centre with halls, workshops, office buildings, accesses and tracks is a big project, a meeting point of agriculture and living space. ÖBB-Infrastruktur presents this dimension in their construction plans in a dialogue with the people. All parties must be heard - this is demanded by the legal railway requirements and the requirements of the environmental compatibility test. Lots of suggestions were made for the project.

List of requirements: fences, walls, green

After 'hard but businesslike' discussions, some measures were taken to adapt the new goods transfer point between Petersbach, Liesingbach and Schrebergärten between the

green Favoriten district of Rothneusied and the expanding Vienna farmers' fields. Walls were built up - against noise, especially against wind and also for visual protection. Hills and meadows were laid out, trees and hedges on the east side of the freight centre, for example, and also inside the system or on access roads. The locals also spoke up for lower lampposts than originally planned and they were able to carry through in terms of site exits; these were not created on Rosiwal street. They even reduced the terminal's distribution list in the construction plan and had it moved a little further south. This dialogue around the table made it possible.

A 170-person work forum

The discussions in the planning phases of the Semmering Base Tunnel led to similar compromises. A work forum was created, which met every three months. Up to 170 people took part - representatives from the country, state and communities, from interest groups and citizen's initiatives, experts and ÖBB delegates. Things that seemed unmanageable to begin with were gradually brought down to a common denominator. Route variations were debated and assessed by experts. But when the selected route was announced in 2008, everyone was together: now it was all about the construction process, what could be made easier, how and when, which protective measures were good. And it was decided that the wider public should be informed step by step - using 'info boxes' on the tunnel portals, 'info glimpses' at the Styrian Fröschnitzgraben and in the Lower Austrian Göstritz and on the 'construction site open day'.

BREAKTHROUGH

Creating an opening connection between the two sides of the tunnel construction



BALLAST LAYING

Stabilising the rails with track ballast.

SINKING

Creating a shaft from the top surface to down below.



WORKING FACE

Wall or face at the end of the tunnel construction where driving the tunnel occurs.

DRIVING

Cutting the tunnel underground. Driving the tunnel can be cyclical or continuous.



OPENING UP

Extending and improving the railway network

GLÜCK AUF

(Luck be with you) is the traditional greeting amongst Austrian miners.



INTERMEDIATE HEADING

An additional access point, from which the tunnel is driven.

INFO WORLD SOUTHERN LINE

INFO BOX KORALM LINE GRAZ MAIN STATION

EUROPAPLATZ 4, 8020 GRAZ
DAILY 6:30 - 21:00

KORALM LINE INFO BOX FELDKIRCHEN

ROUNDAABOUT AIRPORT GRAZ, 8073 FELDKIRCHEN BEI GRAZ
DAILY 18:00 - 19:00

KORALM LINE INFO BOX LAVANT VALLEY

MITTERPICHLING 15, 9422 MARIA ROJACH
DAILY 8:00 - 19:00

KORALM LINE INFO BOX KÜHNSDORF

9125 KÜHNSDORF, ON THE B82
DAILY 9:00 - 18:00

INFOBOX KORALM LINE KLAGENFURT MAIN STATION

W.-V.-D.-VOGELWEIDEPLATZ 1, 9020 KLAGENFURT
DAILY 8:00 - 18:00

INFO BOX FREIGHT CENTRE VIENNA SOUTH

ROSIWALGASSE 91, 1230 VIENNA
BY TELEPHONE APPOINTMENT +43 664 967 493 2



BIKE INFO PATH KORALM LINE STYRIA

FROM WERNDORF VIA WETTMANNSTÄTTEN TO DEUTSCHLANDSBERG
12 INFO BOARDS AND VIEWS OF THE CONSTRUCTION SITES



APPLY FOR CONSTRUCTION
SITE VIEWINGS AND TOURS:
WWW.BAUSTELLESCHAUEN.OEBB.AT

SEMMERING BASE TUNNEL GLOGGNITZ INFO BOX

WOLFSSCHLUCHT 5, 2640 GLOGGNITZ
DAILY

SEMMERING BASE TUNNEL MÜRZZUSCHLAG INFO BOX

HEIZHAUSGASSE 1, 8680 MÜRZZUSCHLAG
DAILY

SEMMERING BASE TUNNEL GÖSTRITZ INFO GLIMPSE

GÖSTRITZ 109, 2641 GÖSTRITZ
DAILY

SEMM. BASE TUNNEL FRÖSCHNITZGRABEN INFO GLIMPSE

FRÖSCHNITZGRABEN 25A, 8685 SEMMERING
DAILY

SEMMERING BASE TUNNEL GRAUTSCHENHOF INFO GLIMPSE

GRAUTSCHENHOF 11, 8684 SPITAL AM SEMMERING
DAILY

INFO BOX POTTENDORFER LINE

BAHNSTRASSE 38, 2483 EBREICHSDORF
DAILY 9:00 - 19:00



BIKE INFO PATH KORALM LINE CARINTHIA

FROM ALTHOFEN VIA MITTLERN AND AICH TO ST. ANDRÄ
16 INFO BOARDS AND VIEWS OF THE CONSTRUCTION SITES

REQUEST INFORMATIVE
MATERIAL ON THE PROJECTS AT:
INFRA.KUNDENSERVICE@OEBB.AT

SOUTHERN LINE INFORAIL

SOUTHERN LINE INFORAIL CONSISTS OF NINE LARGE RED METAL TUBES, 50 METRES OF REAL TRACK, 12 ORIGINAL CITYJET SEATS, 5 DISPLAY MONITORS, ONE SOUTHERN LINE RELIEF MAP AND INFORMATIVE PHOTOS AND INFORMATION BOARDS.

THE MOBILE EXHIBITION WAS BUILT BY APPRENTICES FROM THE ÖBB FLORIDSDORF TRAINING WORKSHOPS.

ON ITS TOUR AROUND AUSTRIA, IT WILL GIVE AN INSIGHT INTO THE MANY PROJECTS ALONG THE SOUTHERN LINE AND TELL THE STORY OF THE PEOPLE THAT WORK ON IT.

FIND OUT MORE:

SUEDSTRECKE.OEBB.AT

- 01 OPENING THE SOUTHERN LINE INFORAIL AT VIENNA MAIN STATION
- 02 WELDING WORK AT THE ÖBB TRAINING WORKSHOPS AT FLORIDSDORF
- 03 TRIAL SET-UP IN THE GYM
- 04 ENTHUSIASTIC ÖBB APPRENTICES CONSTRUCTING THE EXHIBITION DISPLAY



Find out more.

Ride these info routes from north to south for the biggest projects on the southern line. They have an overview of the tunnel construction, the measures for the protection of nature and numerous discussion forums for the work.

SUEDSTRECKE.OEBB.AT

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