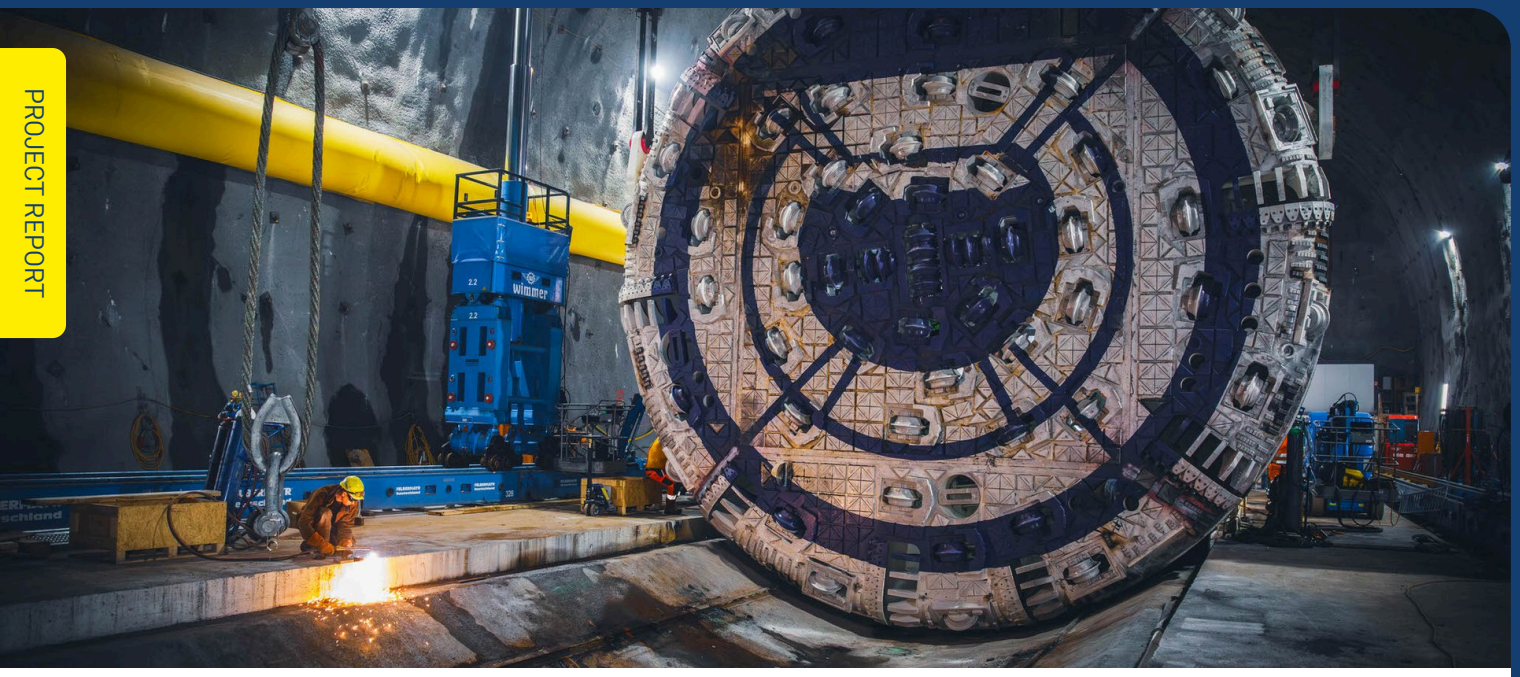
PROJECT REPORT



BBT H53

Data and facts

Company	ARGE H53 Brenner Base Tunnel – PORR, Marti
Type	Tunneling
Runtime	05.2023 - 03.2029
Principal	BBT SE

Project report online

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Brenner Base Tunnel H53 – a major project with particular technical challenges

The BBT consists of two single-track main tunnel tubes 70 metres apart, connected by cross-passages at regular intervals of 333 metres. Between the two main tunnel tubes lies a lower-lying exploration and service tunnel. Three emergency stopping points, each with a cross-cavern for technical installations, are planned at intervals of no more than 20 km. Each emergency stopping point is accessed via the cross-cavern through an access tunnel with a maximum gradient of approximately 10 per cent and is accessible by road vehicles.

The scope of work required for the H53 construction project is so varied that it demands the full range of engineering expertise from the tunnel construction specialists:

- Two tunnel boring machines
- Conveyor belt formwork from the neighbouring contract section H41, through the contract section to the Padastertal landfill site
- up to five simultaneous cyclic tunnelling operations
- 38 cross-passages
- Construction of the inner linings in the three tunnel tubes and cross-passages, in the emergency stop, in the transfer point and in the access tunnel

Each of these tasks could be a project in its own right and keep a construction site team fully occupied. In the H53 project, they were combined with an enormous degree of simultaneous execution. All supply and disposal operations take place via a 4 km-long access tunnel, which descends to a depth of more than 400 m.

Continuous tunnelling

The two TBMs are each approximately 7.5 km long. The internal diameter of the tunnel tubes is 9.04 m. They are constructed using a 40 cm thick, 1.95 m wide, single-sealed universal ring system (ring configuration 6+0 with precast base elements).

The logistics were systematically designed to minimise the number of trips to the tunnel boring machine and to keep traffic in the tunnel to a minimum for other trades. Bulk building materials such as tunnel segments, base stones, expanded clay aggregate and dry mortar were transported underground using specialised lorries fitted with hydraulic braking systems and with a payload of around 60 tonnes.

The tunnel boring machines were supplied via an efficient rail system with an underground loading station. General cargo was transferred from lorries to trains via lorry-lift stations, whilst bulk materials were temporarily stored using silo and conveyor belt systems before being loaded onto wagons. To increase efficiency, the decision was taken not to build a further station; instead, a dual-ring supply system was set up. Each supply train transported the material required for the installation of two tubbing rings.

The use of a twin-shield machine largely prevented deformation caused by the constant tension on the segmented tube due to overlying rock loads. The result was precisely installed segment rings with virtually no misalignment or spalling. Thanks to additional safety measures, the tunnel boring machines could also be safely steered through fault zones.

During the approximately 15.5 km of cyclic tunnelling in the main tunnel, cross-passages and railway service galleries, the method was successfully switched from conventional crown/sidewall and floor tunnelling to full-face excavation using steel-fibre-reinforced shotcrete. This allowed the advantages of conveyor belt shoring with crusher feed and the favourable geological conditions to be utilised to the full.

Inner lining construction

With the completion of construction lot H53, the installation of railway equipment in the Brenner Base Tunnel can be finalised. Furthermore, cavities already created in preliminary projects are being fitted with an inner lining. A total of around 56 km of inner lining work is to be carried out.

The wide variety of different tunnel cross-sections requires specially developed formwork systems. One example is the transfer point, which enables trains to switch between the two main tubes, thereby creating a traffic-free section for maintenance work. The widening profile gradually reaches a width of up to 22 m. The modular formwork concept consists of an eastern and western parament, as well as a cap formwork that can be adapted to the different profiles. Equally unusual is the lifting platform at the emergency stop. There, a formwork unit for a ventilation tunnel is raised by around 5 m to its working level.

Construction site facilities

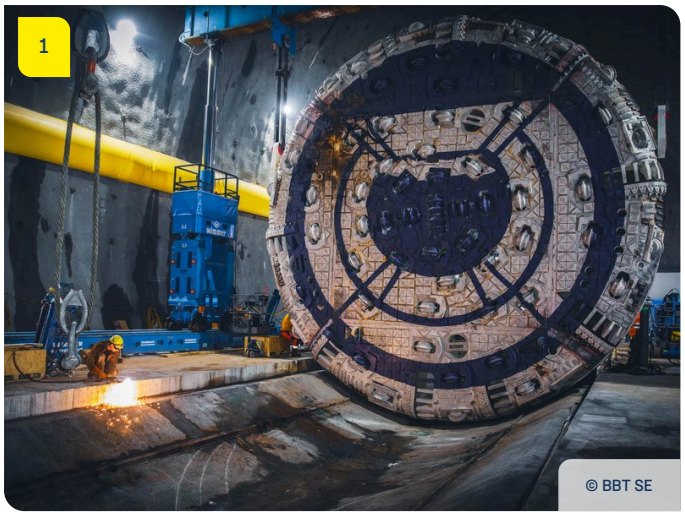
A comprehensive on-site facility was established above ground to supply and remove materials from the various underground work areas. It comprises:

- Two mixing plants
- A processing plant for raw materials from a nearby quarry and from the access tunnel
- An open-air storage area for tunnel segments
- A railway connection
- Silo facilities for expanded clay and dry mortar
- A high-bay warehouse and an open-air storage area with a crane
- Water protection facilities
- Workshops for the maintenance of plant and equipment, as well as
- a site office and a dormitory with 688 beds for staff and subcontractors, some of which are occupied by two people.

The challenging Brenner Base Tunnel project demonstrates not only PORR's concentrated expertise in tunnel construction, but also the efficient and precise teamwork and collaboration between various trades and companies.

You can find more insights into this major project in the video

Impressions



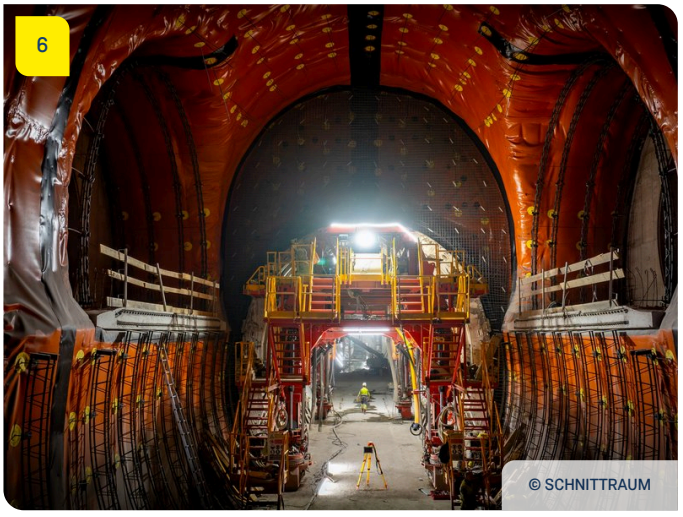


Image notes

1

TBM ‘Olga’ awaits deployment

Final preparations are being carried out before the TBM ‘Olga’ begins work.

© BBT SE

2

Preparation for tunnelling

Setting out drilling and anchoring points

© BBT SE

3

Car lift station, Main Tunnel West

The tunnel segments are stored in the immediate vicinity of the construction site to save time and money.

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4

“Olga” twin-shield TBM

Assembly of the ‘Olga’ double-shield TBM in the East assembly cavern.

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5

Formwork for widening

Specially developed formwork systems are used for the various tunnel cross-sections.

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6

Lifting platform at emergency stop

Concrete works on the exhaust air tunnels are being carried out using a lifting platform at the emergency stop.

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7

Padastertal construction site facilities

BE Padastertal with the site mixing and material processing plant, looking towards the Padastertal landfill site.

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PROJECT REPORT

Do you have questions about the project or would you like to learn more? Feel free to contact us for further information.

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