

Conveyor System at Brenner Base Tunnel, Lot Mules 2-3, Italy



66 km Conveyor Belt System at Brenner Base Tunnel (BBT), Italy

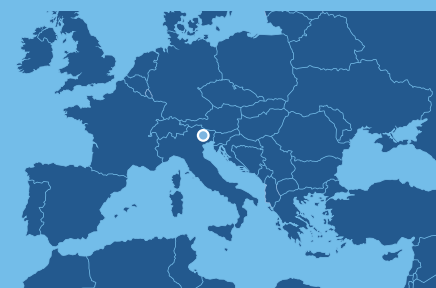


Design and engineering start: 2017

First delivery to job-site: March 2018

Last delivery to job-site: 2020

Average use of conveyor system:
5 years



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Overview of the construction lot "Mules 2-3"

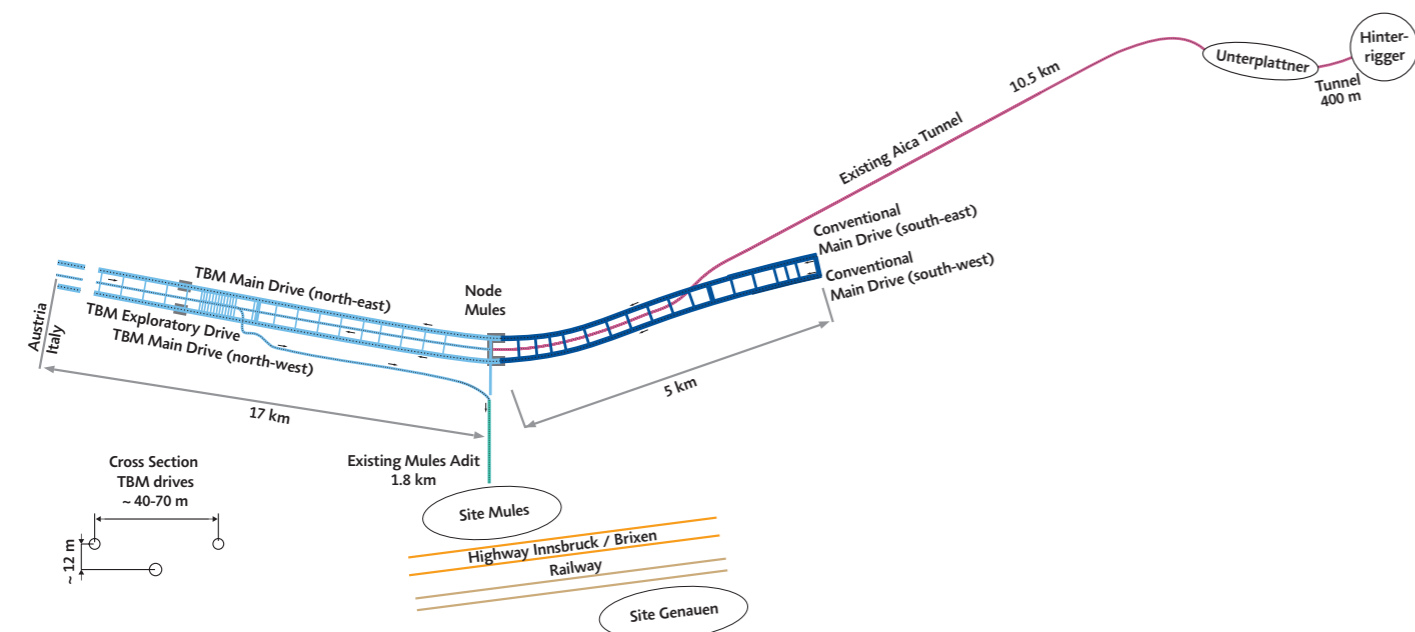
The Brenner Base Tunnel (BBT) is a straight, flat railway tunnel between Austria and Italy. It runs from Innsbruck to Fortezza (55 km). If the Innsbruck railway bypass will be added, which is the endpoint for the Brenner Base Tunnel, the entire tunnel system through the Alps is 64 km long. It is the longest underground rail link in the world.

The BBT is a complex tunnel system. Besides the two main tubes (each diameter 8.1 m), there is an exploratory tunnel (diameter 5 m)

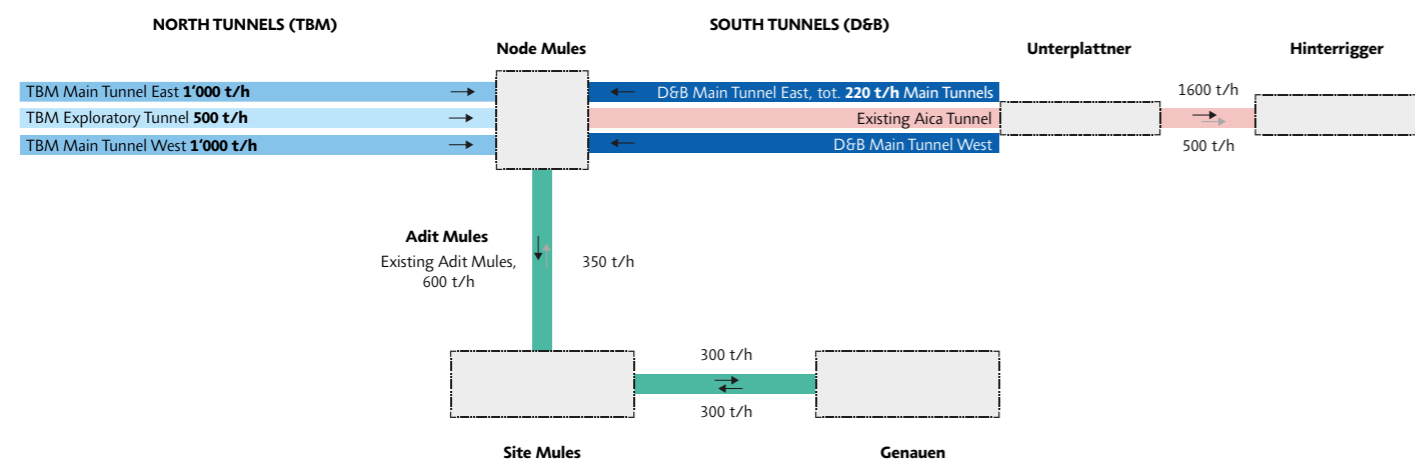
which lies between the two – about 12 m below and is running from one end to the other.

There are four access tunnels – one of it is Mules. The biggest construction lot of the Brenner Base Tunnel project is "Mules 2-3". Marti Technik AG delivers a complex conveyor system with a complete length of approx. 66 km for that lot. This lot reaches from the construction lot "Isarco river underpass" (at Fortezza) up to the border to Austria.

The Tunnel System with its Job-Site:



Simplified Material Flows:



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Aica Tunnel

In the year 2009 the 12 km long Aica Tunnel had been completed by a TBM. Already at this stage Marti Technik AG had delivered the complete conveyor system that allowed to transport the excavation material to Unterplattner or up to Hinterrigger. The Client had decided to reuse this system and using it for a first step

to muck out material from drilling and blast and later on as well for muck from the exploratory TBM, which runs northwards. In order being able to transport as well the muck from the two main-TBMs, an additional larger conveyor had been installed.



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System Data Tunnel Conveyors

	Existing Conveyor	New Conveyors
Axis distance:	10'825 m	9'430 m / 1'337 m
Belt width:	800 mm	1'000 mm / 1'200 mm
Number of boosters:	2	2 / 0
Conveying capacity:	500 t/h	1'600 t/h
Power:	860 kW	1'990 kW / 445 kW
Speed:	3.0 m/s	3.3 m/s / 3.0 m/s
Smallest horiz. radius:	400 m	1'200 m / 400 m



2

1 Tunnel Conveyors in Aica Tunnel in narrow horizontal curve
2 Booster station existing conveyor

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Unterplattner – Hinterrigger

Continuation of the two conveyor lines from Aica tunnel direction to Hinterrigger. The conveyors are mounted on the ground and where traffic under passing is required are the conveyors installed on pillars.

The two conveyor lines are reaching Hinterrigger where the excavated material will be transferred onto the dump conveyors. The existing conveyor line drops its excavated material on a fixed point. The new conveyor line transports its material to a stacker, which will be able to distribute the material in a large angle of horizontal rotation.

The excavated material will be classified in A and B + C products. Good material will be reused for segment production. Not suitable material will be directly used for landfilling at Hinterrigger.

System Data Overland Conveyors

	Existing Conveyor	New Conveyor
Axis distance:	1'175 m	1'187 m
Belt width:	800 mm	1'200 mm
Conveying capacity:	500 t/h	1'600 t/h
Power:	132 kW	400 kW
Speed:	3.0 m/s	3.0 m/s



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System Data Dump Conveyors

	Ex. Dump Conveyor	New Dump Conveyors
Axis distance:	118 m	262 m / 48 m
Belt width:	800 mm	1'200 mm
Conveying capacity:	500 t/h	1'600 t/h
Power:	90 kW	90 kW / 90 kW
Speed:	3.0 m/s	3.0 m/s

- 1 Overland Conveyors at Unterplattner
- 2 Conveyor installed on pillars
- 3 Overland Conveyor transfers to dump conveyors at Hinterrigger
- 4 Dump Conveyors at Hinterrigger
- 5 Side view New Dump Conveyors

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Site Mules

Primarily A-class material will be transported from the caverns to the Site Mules or over the Highway and Railway to Genauen 2. Installed under deposit piles – charging at Site Mules (5 pcs vibrating feeders) for back transport of aggregates 0...63 mm to the batching plant at Node Mules.

- 1 Two conveyor lines at Site Mules, one in and one out
- 2 Discharge switch
- 3 Transport over highway and railway
- 4 Charging by vibrating feeders
- 5 Collection conveyor out of pit
- 6 Charging onto back transport line



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System Data Site Mules Conveyors

	Excavation Conveyors (out)	Aggregates Conveyors (in)
Axis distance:	405 m / 40 m	103 m / 45 m / 264 m
Belt width:	800 mm	650 mm
Conveying capacity:	600 t/h	350 t/h
Power:	90 kW / 45 kW	45 kW / 45 kW / 45 kW
Speed:	3.0 m/s	3.0 m/s



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Adit Mules

The 1.8 km long access tunnel with a gradient of 9% had been completed in the year 2009 by drilling and blasting. The consolidation took place with reinforced shotcrete. In order having a free tunnel section for job-site traffic, the tunnel conveyor is suspended by specific cantilever arms all 4 m.

The installed conveyor has a double function. On the upper belt it

transports the excavated material from Node Mules to Site Mules portal. On the lower belt there is the possibility to transport back aggregates to the batching plant in the cavern.

In order to reduce the forces on the upper belt and therefore being able to handle the horizontal curves, a booster is installed in the tunnel.



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System Data Tunnel Conveyors	
	Tunnel Conveyor (bi-directional)
Axis distance:	1'826 m
Belt width:	1'000 mm
Conveying capacity:	600 t/h out on upper belt, 350 t/h on lower belt
Number booster:	1 pc
Power:	616 kW
Speed:	3.0 m/s
Altitude difference:	141 m
Smallest horiz. radius:	500 m

- 1 Tunnel conveyor main drive station (discharging / charging)
- 2 Charging batching plant
- 3 Booster station in tunnel
- 4 Tunnel conveyor aggregates discharge

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Node Mules

Node Mules represents the heart of the conveyor system; its function is the distribution of material from the classes A and B + C to its defined destination.

The excavated material from the TBM main tunnel conveyor lines (north) and D&B (south) can be dropped onto three different positions.

- 2 dropping points with destination Hinterrigger (new or existing line)
- 1 dropping point with destination Site Mules / Genauen 2

The TBM exploratory tunnel conveyor line (north) can transfer its excavated material onto two different dropping positions.

- 1 dropping point with destination Hinterrigger on existing line
- 1 dropping point with destination Hinterrigger on new line



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System Data Node Mules Conveyors				
	Main Drive Level		Exploratory Drive Level	
	Distribution Conveyors	Hopper Charging Conveyors	Hopper Discharging Conveyors	Reversible Conveyor
Axis distance:	37 m / 32 m / 35 m / 34 m	32 m / 34 m	2.6 m / 2.6 m	5 m
Belt width:	1'000 mm	800 mm / 1'200 mm	1'000 mm / 1'200 mm	1'200 mm
Conveying capacity:	1'000 t/h	500 t/h / 1'600 t/h	500 t/h / 1'600 t/h	500 t/h
Power:	45 kW / 45 kW / 45 kW / 45 kW	22 kW / 45 kW	5.5 kW / 7.5 kW	22 kW
Speed:	1.5 m/s / 2.0 m/s	3.0 m/s	0.2 m/s / 0.2 m/s	1.5 m/s

- 1 Heart of conveyor system (main drive level)
- 2 Movable dropping point
- 3 Heart of conveyor system at Node Mules exploratory drive level / Aica
- 4 Two conveyor lines in Aica Tunnel

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Main and Exploratory Tunnels

Total three tunnel boring machines are used for the north tunnels – each tunnel conveyor line almost 17 km long up to the Austrian border. Due to the fact that approx. 2.5 km distance of each north main tunnel had been realized conventionally, fix conveyors are installed

beside the extendible tunnel conveyors.

Each extendible conveyor consists of a return drive station, extension station, main drive station and a horizontal belt storage. All the three extendible conveyor systems will be tensioned by a winch.



System TBM Tunnel Conveyors

	Main Tunnel East	Main Tunnel West	Exploratory Tunnel
Axis distance:	14'286 m / 2'440 m (fix)	14'289 m / 2'449 m (fix)	16'735 m
Belt width:	1'000 mm	1'000 mm	650 mm
Conveying capacity:	1'000 t/h	1'000 t/h	500 t/h
Power:	1'927 kW / 400 kW	1'927 kW / 400 kW	1'397 kW
Speed:	3.0 m/s	3.0 m/s	3.0 m/s
Number booster:	1 pc	1 pc	2 pcs
Belt storage capacity:	500 m	500 m	500 m

1 By TBM progress extensible tunnel conveyor with belt storage
2 Booster Station
3 On the way to Node Mules



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