

Preliminary Planning Study

New Railway Line Dresden – Prague

Task 2 Route Optimization

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Definition of Goals

The further qualification of the corridor of the new railway line Dresden – Prague between the connecting points of Heidenau (south of Dresden) – the State Border D/CZ – and Ústi nad Labem (Station) was performed along the preferred route 2012 and under consideration of the following special aspects:

- settlement areas,
- spatial development plans,
- projects planned by third parties,
- nature and environment (environmentally designated issues),
- geophysics (fault zones), mining areas
- geology und hydrogeology

See the additional information in task 2.1 and 2.2 with environmental issues.

as well as the railway guidelines of Deutsche Bahn:

- Guideline 413 Infrastructure design, Standards of routes
- Guideline 800.0110 Network Infrastructure Technology Design: Line Routing

and for the design of a railway line with mixed traffic

- Passenger traffic $v_{\max} = 200 / 230$ km/h
- Freight traffic $v_{\max} = 120$ km/h.

See additional information in task 1.2 railway regulations.

Basic Planning Assumptions

- Optimization of the preferred variant 1.1 from the study of 2012
- Within the planning corridor of 2012 the preferred variant 1.1 and the alternative variant suggested by KuK in 2014 along the preferred route will be optimized.
- Therefore the route corridor (corridor of investigation) can be derived from these variants.
- The corridor for environmental investigation will be 500 to 1000 m larger than the route corridor.
- At the German side the allowable longitudinal slope for railway lines with mixed traffic is restricted to a value 12.5 ‰ (freight traffic) according to TSI and DB regulations, at the Czech side this value will be considered.
- The maximum length of the tunnel is not restricted to 20 km, but the economic issues have to be considered.
- The connecting point in the Czech Republic is fixed for this preliminary planning study, the results of the study performed by the Czech railway organization (SŽDC) and the planning team of SUDOP / MOTT MD are to be considered.
- The cross section of the cross border tunnel with its equipment has to be defined in accordance with the Czech railway organization (SŽDC)
- The placement of connecting switches from one tunnel tube to the next tube in the cross border tunnel due to the operational concept needs to be proved (compare to publication in ETR 09/14 Brenner Base Tunnel)

1. Step First optimization of the preferred variant 1.1 leads to the preferred variant 2014

Because to the difficult topographic and spatial planning circumstances at the junction point in Heidenau, the crossing of the Seidewitz Valley and the consideration of the environmental basic data of the Bahre Valley a first optimization was made, based on the present preferred variant No. 1.1 in the Study 2012 (variant 1a Tunnel with lower gradient) and the findings on the visit to the route corridor at the 03th and the 04th of October 2014.

Route Alignment

The planned route starts in Heidenau South as it did before as a double track railway line on the existing railway route No. 6240, then it crosses the state route 172 and after that merges into a tunnel with 2 single track tubes (Length app. 2.600 m). It is specified by the EBA Guideline for "Fire and catastrophe protection requirements for the construction and operation of railway tunnels", that for tunnel above 1.000 m length on mixed traffic lines the tunnel shall be divided into single track tunnel tubes.

This tunnel called “Heidenau–Großsedlitz” with 2 single track tubes at a distance of > 29 m ends at km station 3.3 and merges into a dam structure (length app. 800m) on which the track center distance is changed back to 4.50 m (double track).

After that follows a double track bridge (length app. 700 m, height above ground app. 37 m) with a track center distance of 4.50 m which crosses the Seidewitz valley and the town of Pirna-Zehista southwest of the planned road bypass Pirna B172n.

After the bridge follows a 1.800 m long dam section up to the route K8753 (near Goes) at km station 6.6. Up to this station the route was designed analogue to the preferred route 2012.

After this section a 2.700m long deep open cut at the Lohmgrund Rücken follows parallel to the route S 173. In this section the tracks are spaced again to a distance of 29 m until the beginning of the cross border tunnel at km station 9.2 with 2 single track tunnel tubes (about 200 m north of the S 170 road bypass Ottendorf-Friedrichswalde).

The longitudinal slope is 12 ‰ in the open cut at the Lohmgrund Rücken up to the north portal of the tunnel; it changes to 4 ‰ at the tunnel portal which is a requirement in the DB Guideline 800.0110 that limits the max. longitudinal slope in tunnels. The slope of 4 ‰ continues about 8.900 m up to the tunnel crest near Börnersdorf at km station 18.1. After that the slope changes downward to 4 ‰ into the direction of the Czech Republic at a length of 15.100 m. On the German side the max. distance between the tunnel and the surface is about 310 m, on the Czech side it will be about 550 m.

The optimized route bypasses the formerly crossed Bahre Valley and the community Gersdorf (Study 2012) with high spatial resistances now further south-east. The initially planned tunnel Ottendorf (length appx. 3.000 m) and the valley bridge in the Bahre valley (length approx. 200 m) are cancelled in this environmentally optimized route. The new cross border tunnel is now 24.150 m long and therefore longer as it was planned in 2012 which was 20.330 m in length.

But in total the route variant 2014 is about 780 m shorter than the preferred route variant 1.1 in 2012.

2. Step Optimizations due to spatial resistances and requirements of the DB Netz are leading to the “optimized route variant 2015”

Connection area in Heidenau

According to the local inspection at the 4th of November in 2014 the connection area in Heidenau the location of the route variant 2014 needs to be changed due to newly built commercial buildings. Furthermore the initial beginning of the tunnel needs to be shifted out of the Flora-Fauna-Habitat of the Elbe Valley and out of the area with the underground cavity „Pechhütte“ and furthermore out of the development area located nearby in the eastern direction because of the evaluation of actual environmental basic data.

The route rises in this section with a ramp and bridge construction having a longitudinal slope of 12 ‰.

Roadbypass Pirna B172n

According to the local inspection at the 4th of November in 2014 and the evaluation of actual environmental data the planned viaduct crossing the Seidewitz valley should be shifted closer to the road bypass Pirna B172n with the goal to minimize the interventions in the existing settlement structure in the district Zehista and to pass by the waste disposal site east of Zehista.

Because of the narrow route alignment with small curve radii and with a maximum allowable cant of the tracks (170 mm for slab track with a cant deficiency of 147 mm) the maximum design speed will be 180 km/h at this route section. After the Seidewitz viaduct the design speed can be raised to $v_e \geq 200$ km/h and up to maximum $v_e = 230$ km/h (crossbordertunnel).

Börnersdorf Structure

A first intermediate result of the research subject „Geophysikalische Untersuchungen an der Struktur Börnersdorf“ was presented at 10th of November 2014 during an intermediate presentation of the geophysical investigations.

The boundary sections of the Börnersdorf Structure have been investigated deeply by geophysical measurements. The results of the measurements of the Bouguer Gravity, the Gravimetry, the Geomagnetism, the Geoelectricity and the Seismicity have been shown in Bachelor / Master Studies. The existence of the geophysical anomaly called “Börnersdorf Structure” has been approved.

Because of the density measurements it was concluded that the structure will consist of a loose rock zone with a diameter of about 600m at the surface and a depth of about 100 m / up to 300 m, which will be probably containing flowing water according to the electrical measurements. The relatively strong geomagnetic disturbance in the section of the structure cannot be definitely explained (e.g. deep Basalt body).

The optimized route shall pass by the Börnersdorf Structure about 400 m towards the west as initially planned in 2012.

Adjustments of the route alignment in accordance to DB Netz

- Connecting point Heidenau South

The new railway line deviates directly from the existing line 6240 Dresden-Pirna at km station 49,360 with a design speed $v_e = 160$ km/h on a ramp like structure. The regional connection Dresden – Pirna needs to be retained in the future for local goods traffic. A separate investigation shall be carried out by DB Netz for the need of this connection. The new railway line Dresden – Prague will take over the long distance traffic completely.

The regional passenger traffic to and from Pirna and the Czech border can use the parallel track of the DB line 6239 in the Elbe valley. The existing section with 4 tracks ends in Pirna.

The regional freight traffic to and from Pirna (actually 6 trains / day) and the Czech border (future backup line) through the Elbe valley can use a single track deviation at the existing line 6240 short before the new railway line begins.

A traffic table study performed by the DB Netz verified the capacity of the new double track line Dresden – Prague with its actual route characteristic.

The crossbordertunnel with the minimum cross section according to DB Guideline 853 and the dam and open sections north of the tunnel portal with the minimum spacing of the tracks according to the DB Guideline 413 are allowing a maximum design speed of $v_e = 230$ km/h which shall be utilized due to the traffic study.

- **Placement of passing tracks**

According to DB Guideline 413 a passing station or passing tracks have to be placed at a minimum distance of 20 km (e.g. after connection point Heidenau south).

The length of the route from Heidenau to the southern portal of the crossbordertunnel on the Czech side is 33.8 km, the length of the crossbordertunnel will be 24.650 m.

Because of the estimated traffic on the new railway line there shall be bypassing tracks placed for the slower freight trains on each side of the crossbordertunnel. Before and after the passing tracks there shall be connecting switches placed for the main track (for traffic alteration).

The placement of passing tracks with a useable length of 750 m and deviation switches ($v_e = 80$ km/h) as well as the arrangement of connecting switches ($v_e = 100$ km/h) before and behind the deviation switches have been investigated. The tracks within this section shall have a maximum slope of 2.5 ‰.

From a route alignment point of view and because of the topography there is only one open track section between the Seidewitz viaduct at km station 5.710 and the northern portal of the tunnel at km station 6.741 that is long enough for the placement of the above mentioned arrangement of passing tracks and switches (total required design length about 1.000 m).

The DB Netz has approved this placement of the passing station in front of the crossbordertunnel because of operational reasons (e.g. emergency halt of freight trains)

Crossing connections and passing tracks within the crossbordertunnel shall not be planned because of technical and economic reasons (e.g. Study on Brenner Base Tunnel).