



Press Release

HERRENKNECHT

Mixshield Bärlinde closes east-west gap in Berlin Mitte

November 02, 2015

Berlin / Schwanau

Upon reaching its final position at the Brandenburg Gate on 10/14/2015 the Mixshield >>Bärlinde<< has successfully completed its mission in Berlin. Behind the tunnel boring machine (TBM) are two 1,620 meter long parallel tubes, built through the historic center of the capital. The undercutting of the river Spree and the Spree Canal with overburdens of sometimes only five meters was a challenge. With a high density suspension, as little pressure as possible and as much supporting effect as necessary, Bärlinde bored her way safely beneath the river bed. Thanks to modifications to the machine, elaborate ballasting of the river and canal beds with steel plates was not required. Shipping remained unimpaired, a success of modern tunnelling technology from Herrenknecht.

_____ With the closing of the gap by the Berlin metro line U5, 25 years after reunification the Berlin subway network is also growing together. After completion, 22 kilometers of subway lines will run uninterrupted into the center of the capital. The 2.2 kilometer long extension of the subway line U5 from Alexanderplatz to the Brandenburg Gate is being carried out by the municipal transport company Berliner Verkehrsbetriebe (BVG) and its subsidiary Projektrealisierungs GmbH U5 on behalf of the German Federal Government and the State of Berlin. The Swiss construction company Implenia Construction GmbH is handling the construction work. 1.6 kilometers of the 2.2 kilometer long new line were built by mechanized tunnelling using the Herrenknecht Mixshield S-788, christened "Bärlinde".

After the start on June 20, 2013 the 74 meter long, 700 tonne Bärlinde tunnelled her way from the launch shaft on Marx-Engels Forum to the Brandenburg Gate. With overburdens of 5 to 17 meters, the machine with a shield diameter of 6.67 meters worked its way under the river Spree, the Spree Canal and Schlossplatz through the two future stations Museumsinsel (Museum Island) and Unter den Linden along the boulevard Unter den Linden. At the same time it built the tunnel shell out of high-quality concrete segments. Currently Bärlinde is awaiting disassembly and transport

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of the back-up and the shield components back to Marx-Engels Forum. The connection to the subway station Brandenburger Tor planned for 2016 is being created manually.

Designed especially for heterogeneous soils and high water pressures, on the shield drive through the center of Berlin the slurry-supported TBM Bärinde mastered complex geological challenges: groundwater at a depth of only two to three meters below the surface, sandy and in the Spree area sludge laced soils as well as large granite boulders.

For safe undercutting of the Spree and the Spree Canal the awarding authority originally planned elaborate ballasting of the river and canal beds with 40 centimeter thick steel plates. Working together in a spirit of innovation, however, client, construction company, a research institute and the machine manufacturer developed a smarter solution, which has led to a significant improvement in the ability to use Mixshields for tunnel sections with small overburdens: in some stages the machine was driven using a higher density bentonite suspension (HDSM = High Density Support Medium). This meant that in comparison to conventional suspensions, with considerably higher transferable support pressure the penetration depth into the soil ahead of the machine was significantly reduced. Thanks to the HDSM used (up to $1.4 \text{ t} / \text{m}^3$), Bärinde was able to safely cross under the Spree with very low overburden beneath the riverbed. Big Bags (large sandbags) lowered into the water near the banks provided sufficient weight. Shipping remained unimpaired. The modification of the machine for the HDSM drive was already taken into consideration during design, factory assembly and jobsite assembly. During the advance no further alterations were necessary.

With the new section of the U5, in future passengers between Alexanderplatz, the Brandenburg Gate and the main railway station will save travel time. Exhaust fumes and noise will be reduced – according to BVG, after the scheduled completion in 2020 on Unter den Linden alone there will be at least 3,000 fewer cars driving on weekdays. BVG expects up to 150,000 passengers per day on the new line.

The entire 2.2 kilometer long new line runs from the future subway station Berliner Rathaus past the Rotes Rathaus (Red City Hall), then crosses under the Marx-Engels Forum and the Humboldt Forum as well as the river Spree and the Spree Canal. It then passes under the boulevard Unter den Linden to the metro station Brandenburger Tor at the Brandenburg Gate. Once the new line has been connected with the existing 1.5 kilometer long section of the U55 and the 18.3 kilometer long current U5, from Hönow to the main railway station the new U5 will have a total length of 22 kilometers.

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Herrenknecht looks back on a successful history in Berlin. In the late 90s the tunnel for the U55 was also driven with a Mixshield from Herrenknecht, the S-126. Two small AVN machines from Herrenknecht were used in the construction of the subway station Brandenburger Tor with the pipe arch method. There have also been numerous smaller machines, mainly to build waste water pipes and sewers.

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MACHINE DATA

Machine type: Mixshield

- › Shield diameter: 6,670 mm
- › Drive power: 450 kW
- › Torque: 1,958 kNm
- › Total machine length: 74 m
- › Total weight: 700 t

PROJECT DATA BERLIN METRO LINE 5

Client: Berliner Verkehrsbetriebe (BVG)

Contractor: Implenia Construction GmbH

Application: Metro

Advance length: 2 x 1,620 meters

Geology: Heterogeneous soil conditions (fine sands, stones and blocks of granite, boulder clay, groundwater)

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Picture 1

A Herrenknecht Mixshield bored through the center of Berlin and closed the U5 gap with two 1,620 meter parallel tunnels. Thanks to special adaptations the tunnel boring machine christened Bärlinde mastered the undercutting of the Spree just below the riverbed. Elaborate ballasting was not necessary, shipping remained unimpaired.

Source: BVG



Picture 2

In April 2015 Bärlinde gets ready for excavation of the second tube. Set against the backdrop of the Rotes Rathaus (Red City Hall), the cutting wheel of the tunnel boring machine is heaved into the launch shaft on Marx-Engels Forum.

Source: Antonio Reetz-Graudenz



Picture 3

View of the TBM launch shaft on Marx-Engels Forum, from where Bärlinde began both drives and was supplied during the advances to the Brandenburg Gate.

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Herrenknecht AG

Herrenknecht is the only company worldwide to deliver tunnel boring machines for all geologies and in all diameters – ranging from 0.10 to 19 meters. The product range comprises tailor-made machines for traffic, supply and disposal tunnels as well as additional equipment and service packages. Herrenknecht also manufactures drilling rigs for vertical and inclined shafts as well as deep drilling rigs.

In 2014 the Herrenknecht Group achieved total revenue of 1.082 billion euros. The Herrenknecht Group employs around 5,000 people worldwide, including nearly 200 trainees (as of September 2015). With 80 domestic and overseas subsidiaries and associated companies working in related fields, Herrenknecht provides comprehensive services close to each project and customer.

› <http://www.herrenknecht.com/en/references>

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