

Site report

Concrete placement in the Hornberg Tunnel

Putzmeister



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The M 24-4 with its multi-Z boom fold is ideally suited for placing concrete beneath low hall ceilings and tunnels. Placing concrete on the vault formwork in the Hornberg Tunnel.

The most important section of the Hornberg by-pass was under construction in the form of a dual-lane highway tunnel almost two kilometers in length. The relocation of the B 33 main road was part of the project and as a traffic calming measure made a considerable contribution to the Black Forest community. Two PM truck-mounted concrete pumps equipped with 24 meter booms that can be operated in tunnels were in use almost every day, after the tunnel excavation had been secured using a Putzmeister wet shotcrete machine.

The project was executed by the construction companies STRABAG and KIRCHNER who had formed a joint venture under the name of Arbeitsgemeinschaft Tunnel Hornberg (ATH). The work was commissioned by the Federal Republic of Germany.

ARGE began blasting the approximately 1,850 m long highway tunnel in March 2002. After creating the first crowns and benches, the rest of the tunnel was driven as a full face with a typical cross section of about 85 m². The first 400 meters were secured with dry shotcrete but after that, the ARGE thought it necessary to change over to wet shotcrete because of the ir-

regular rock formation and the presence of open seams. These jobs were carried out using a Putzmeister shotcrete manipulator of the type WETKRET WKM 103. This spray gun handled about 6,500 m³ of concrete over a distance of almost 1.5 kilometers in just ten months to form a 10 – 15 cm thick exterior shell.

The real interior shell was divided up into 191 sections, the length of each block being typically 10 m. The wall thickness varied – depending on the geological conditions – between 30 and 60 cm. The project management calculated approximately 100 to 120 m³ of concrete for one block and a placement time of about four

hours in one go. In all, around 21,000 m³ concrete were required for the interior shell of the Hornberg Tunnel. This concrete was of type B 25 to which had been added a wetting agent and a flowing agent. Particle size at the connection to the banquette was 0/16 mm, otherwise 0/32 mm.

First, the dry shotcrete, and some of the wet shotcrete, was stored in large silos on site. As work progressed, all of the concrete required for the construction was delivered as ready-mix by UHL Transportbeton GmbH.

UHL is a medium-sized company situated just a few kilometres away in Hausach. The company operates several quarries as well as concrete and gravel works and has its own pump service, using seven truck-mounted pumps in the 20, 30 and 40 meter class. So on the tunnel construction site, two machines from the UHL fleet were often seen placing concrete for the interior shell in parallel over the ten concrete supports for each block.

The BSF 24.11 H truck-mounted concrete pump is equipped with a four-sectioned, Z-roll folding placement boom with a large boom angle which requires a mere 4.9 meter height for unfolding. This means that placement booms of this type are more or less pre-destined for concreting in underpasses, halls or, as here, in tunnels.

All the latest safety standards had been observed during the construction work on the Hornberg Tunnel. For example, there are five emergency exits as well as



A WETKRET WKM 103 was used for wet shotcreting of the approx. 10 – 15 cm thick exterior shell.

two lay-bys for vehicles which have broken down. The total length of the escape tunnels alone is 850 meters. Additionally, along two thirds of the length of the tubes in the roof, a concrete intermediate ceiling had been built which functions as an independent means of ventilation or as a fumes outlet in the event of fire. The

intermediate ceiling was concreted after the vault formwork had been placed using a M 24 truck-mounted concrete pump and special-purpose manoeuvrable formwork wagon in 10 meter long sections. The official opening of the Hornberg Tunnel took place in summer 2006.

The Putzmeister Group

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Putzmeister Concrete Pumps GmbH
Max-Eyth-Str. 10 · 72631 Aichtal/Germany
P.O.Box 2152 · 72629 Aichtal/Germany
Tel. +49 (7127) 599-0 · Fax +49 (7127) 599-520
E-Mail: pmw@pmw.de · www.putzmeister.com

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