Pöcking bridge

SSF Ingenieure

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Since 1998 bridges are built in prefabricated composite element construction method (VFT®). The high quality of the bridge structures is guaranteed by producing the main bearing elements under protected circumstances at the workshop. As all compounds and support points are cast in concrete in place, welding and corrosion protection works at the building site are no longer necessary.

The VFT®-girders with rolled girder in concrete (VFT-WIB®) are a further development of this construction method. The innovation consists of halved rolled girders that are connected to the prefabricated flange by concrete dowels. These VFT-WIB®-girders were used for the first time on the replacement of the bridge over the railway line at Pöcking in the district of Starnberg.

Since 1900 the crossing represents the link between Pöcking and Possenhofen at the lake of Starnberg and crosses over the railway line Munich – Mittenwald. The cross-section of the bridge is a T-beam with rolled girders in concrete. The total height of the construction reaches approx. 0.60m, over 2 spans reaching 2x 16.70m. After sever damages on the superstructure and the abutments a replacement became inevitable.

Additionally to renewing the bridge structure, works are planned to render the station Possenhofen - part of the Munich urban and regional railway – accessible for handicapped people. Several variants with diverse platform arrangements and connections to the existing track network were examined. The variant to converse the middle platform and to connect it by an elevator to the bridge structure was preferred by the German railway company DB AG.

The large spans of the 2 span structure result in very small abutments once they are jacked up on the embankment. Because of the small width of the superstructure, this solution is deemed to be the most advantageous compared to the variants with short spans and rather high abutments. Compared to the old structure the gradient was scarcely increased because of the VFT-WIB® having a construction height of 0.80 m which inured to the benefit of the alignment under the given narrow conditions.

Over the highly used line from Munich to Mittenwald the construction of the superstructure with prefabricated elements took inevitably place during nightly line closures. The superstructure is made of 3.2 m wide prefabricated elements to which the 0.25 m thick cast-in-place concrete slab in B 35 is attached. The girders are made of two halved HEM 1000 of quality S460M and are retrofit with concrete of quality B55 to the VFT-girders. With a length of 32 m the girders span all prefabricated elements over the two spans. This allowed shorter assembling periods and complicated transversal girders for support were no longer necessary. Instead of bearings a rigid bonding of the superstructure on the abutments was chosen so as minimize future maintenance efforts as much as possible. On the pier a spring slate was arranged as bearing. The abutments are founded on bored piles that absorb deformations of the frame through their soft, horizontal embedment. For reason of the narrow conditions, the pier's web is founded between the rail tracks with four bored piles.

1+3 Rolled steel girder in the workshop for coating
2 Reinforcement of concrete flange in the pre-casting plant
4-6 Lifting of the VFT-WIB®-girder on the substructure
7 Soffit of the bridge

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Picture credits: **1** Arcelor Mittal / **2+3** SSF Ingenieure GmbH

Picture credits: **4-7** Florian Schreiber Fotografie for SSF Ingenieure GmbH

The steel girders were produced completely in the rolling mill including the corrosion protection. The approx. 32.5 m long girders were halved by a longitudinal cut of the web. This was carried out on a computerised machine, whereby three girders were machined simultaneously with three burner heads automatically in one cycle according to the stipulated recess geometry. The machining process guarantees a neat, low-distortion cut with excellent smoothness of the flamed surfaces.

The resulting T-profiles were then dressed and shaped according to the camber lines that result from the gradient progression and calculated deformation under constant load including subsidence over the post. This was carried out using a bending press, bringing the profiles to their final shape in cold state in several cycles with on-going controls of dimensional accuracy (largest depth gauge 199 mm). The T-profiles were then connected in pairs by welding on bulkhead plates. Pressure plates were welded to the flanges at the ends of the bars, while the 40 mm thick spring slats with the head bolt dowels were welded onto the middle of the girders (double level groove).

The complete corrosion protection was applied in the workshop belonging to the rolling mill. The coat structure complies with ZTV-KOR and consists of surface preparation by shot-blasting Sa 2½, a basic coating (EP zinc powder), two intermediate layers (EP) with supplementary protection of the borders as well a final coating (PUR). The total coat was introduced to a depth of 70 mm in the steel concrete contact surfaces, while the remaining contact surfaces only received a primer coat.
The coated girders were transported to the precasting plant. The precast flanges were lined with timber formwork, while a concrete-grey fibrous cement strip closed the gap between the steel girder flanges. The reinforcement of the composite dowels was aligned exactly (Fig. 2). Following a rest period of two weeks, the girders were brought to the building site.

On the site, a mobile 600 t crane was positioned at the west abutment. During the hours of track closure during the night from 10 p.m. to 4 a.m., the precast parts were lifted into position. In Fig. 4 the camber of the girder resulting from static deformation as well as the geometry of the structure can be clearly seen. At about 2 a.m., the three 32 m long precast parts were fastened to the structure.
This was followed by the finishing work with caps and road surface. The bridge is in use since 2004.

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