Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 64 (1991)

Artikel: Veitshöcheim-viaduct: a concrete arch bridge with 162 m main span
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DOI: https://doi.org/10.5169/seals-49359

Veitshöchheim-Viaduct: a Concrete Arch Bridge with 162 m Main Span

Viaduc de Veitshöchheim: un pont en arc de 162 m d'ouverture

Talbrücke Veitshöchheim: eine 162 m weit gespannte Bogenbrücke in Beton

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DESIGN

The New Railroad Line from Hannover to Würzburg crosses the valley of the river Main about 10 km north of Würzburg. The main span (arch) is 162 m. This is the longest span of all concrete railroad bridges in Germany. Over the arch and the piers, a 1262 m long prestressed concrete box girder has been incrementally launched. This has been the longest launch from one end ever done. After launching the continuous girder was made discontinuous at piers 5, 10, 14 and 17, thus dividing the girder into five parts. The reason for this separation is to provide the possibility to replace the superstructure in short pieces of 237.0; 369.5; 214.0; 160.5 or 299.0 m, should this ever be necessary. It is assumed that the not prestressed piers and the solid arch never has to be replaced.

Over piers No.5, 10 and 17 is a so called "longitudinal force coupler" and over pier 14 is an expansion joint. The bridge has two fixed points where longitudinal forces (e.g. braking forces) may be transmitted to ground. This is

a) at the crest of the arch, where all longitudinal forces acting onto the superstructure from axis 0 to 14 and
b) at piers 16, 17, 18, where all longitudinal forces acting onto the superstructure from axis 14 to 23

are transmitted to the soil. Rail expansion joints are in the axes 0, 14 and 23. The span between axes 22 and 23 consists of a solid slab 1.40 m deep and built on a scaffolding after the main bridge was launched.

CONSTRUCTION

The arch was built by free cantilevering with the aid of auxiliary cables, which are anchored in auxiliary towers, built of precast concrete segments. The arch is solid and 1.80 to 1.50 m (at crest) thick. Its fresh concrete was chilled from 28° to 10°C by liquified nitrogen. In consequence of the chilling the strength of the concrete could be increased from 55 to 65 N/mm^2. The reinforcement of the arch consisted of not prestressed Dywidag bars with a rolled thread. When these bars met in the closure joint in the crest of the arch, the ribs of the thread did not fit together. The free ends of the bars had to be elasticly twisted in order to be able to turn the coupler nut from one end of a bar onto the other bar. There was not sufficient space to join the two ends of bars by overlapping.

The incremental launching of the heavy concrete superstructure over the slender arch has been an engineering challenge. An arch of 162 m span and a rise of 25 m only, is sensitive, if a beam, three times as deep as the arch, is launched from one side over the arch. The arch was supported by additional cables on the heavily loaded side and it was ballasted by hanged up concrete blocks on the other side.

ACKNOWLEDGEMENT

The preliminary design, the tender documents, the checking of the detailed design and the permanent site inspection has been done by Leonhardt, Andrä und Partner, Consulting Engineers Ltd., Stuttgart, in close collaboration with the client, the German Federal Railway Administration, Nürnberg Division. The detailed design has been made by Obermeyer, Munich. Concrete specialist advisor was Prof. R.Springenschmid, Technical University, Munich. The bridge has been built by the joint venture of the contractors Strabag (Cologne/Würzburg) and WTB (Walter, Thosti, Boswau; Augsburg/Aschaffenburg).

The bridge is a milestone in the development of railroad bridge design and construction and it is a landmark in the beautiful Main valley. The viaduct was opened for traffic on May 29, 1989.

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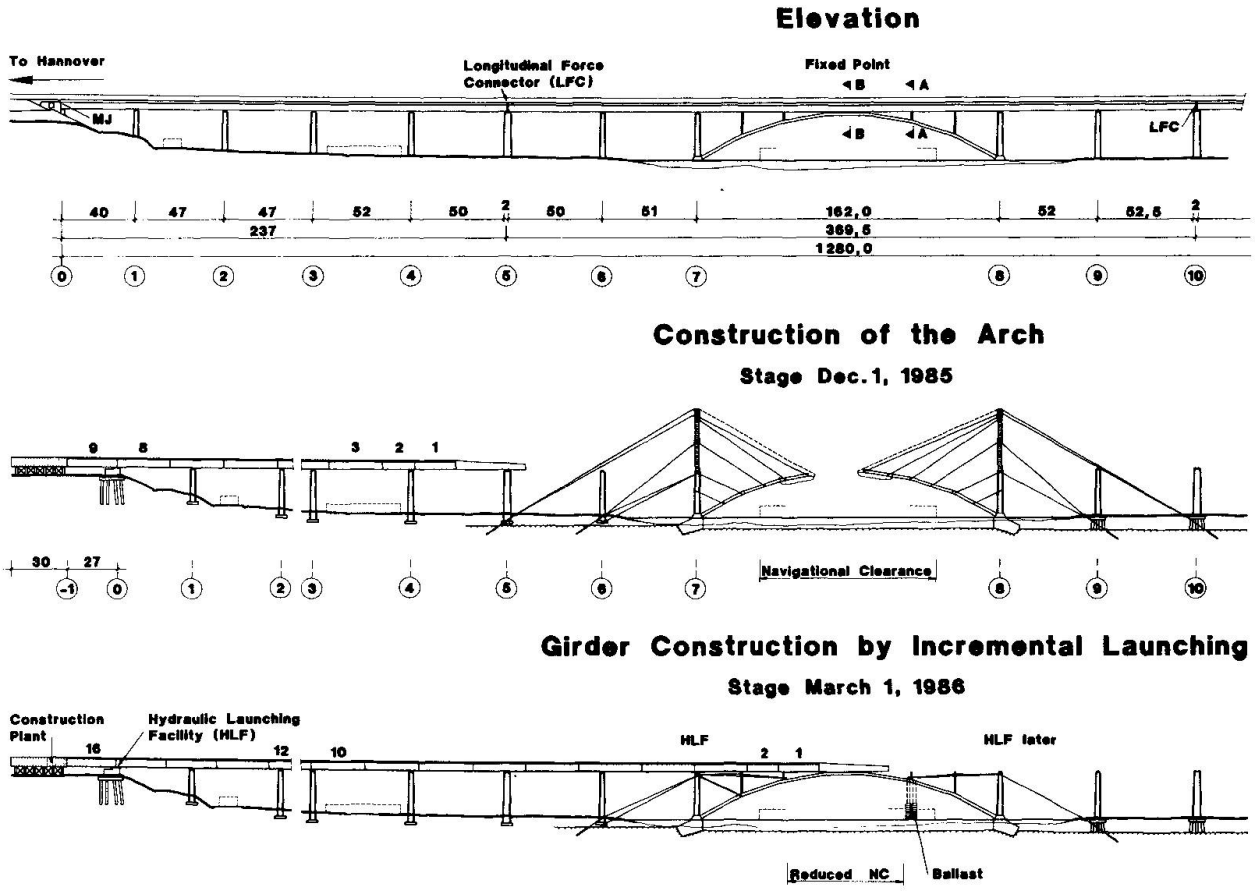

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