Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke

Band: 4 (1980)

Heft: C-12: Structures in Austria

Artikel: Temporary bridges across the Danube, Vienna

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DOI: https://doi.org/10.5169/seals-16530

14. Temporary Bridges across the Danube, Vienna

Tram bridge:

Owner: Wiener Stadtwerke Verkehrsbetriebe – Vienna Transport

Engineer: A. Pauser

Contractor:

Structural steel engineering:

Stahlbauarge Wiener Donaubrücken:
Waagner-Biro AG, VOEST-Alpine AG, and Wiener Brückenbau und Eisenkonstruktions AG

Civil engineering:

Arge Donau Behelfsbrücken:
Allgemeine Baugesellschaft A. Porr AG, Universale Hoch- und Tiefbau AG, and Wiener Betriebs- und Baugesellschaft mbH

Works duration: 48 days

Commissioned: October 16, 1976.

Road Bridge:

Customer: Vienna Regional Government Office, Bridge Departement

Engineer: as above

Contraction: as above

Works duration: 10½ weeks

Commissioned: December 21, 1976.

Introduction

The Vienna Reichsbrücke collapsed on August 1, 1976 due to a failure of one river pier. Given a traffic density of 80,000 passenger cars daily, it appears extremely lucký that only one human life was lost. However, the consequences of this catastrophe were disastrous. The collapsed bridge blocked international shipping along the Danube entirely, traffic on the major arteries along the river banks was stopped, tram traffic across the river was reduced by half, the number of road traffic bridges across the Danube was decreased from four to three along a stretch of 70 km.

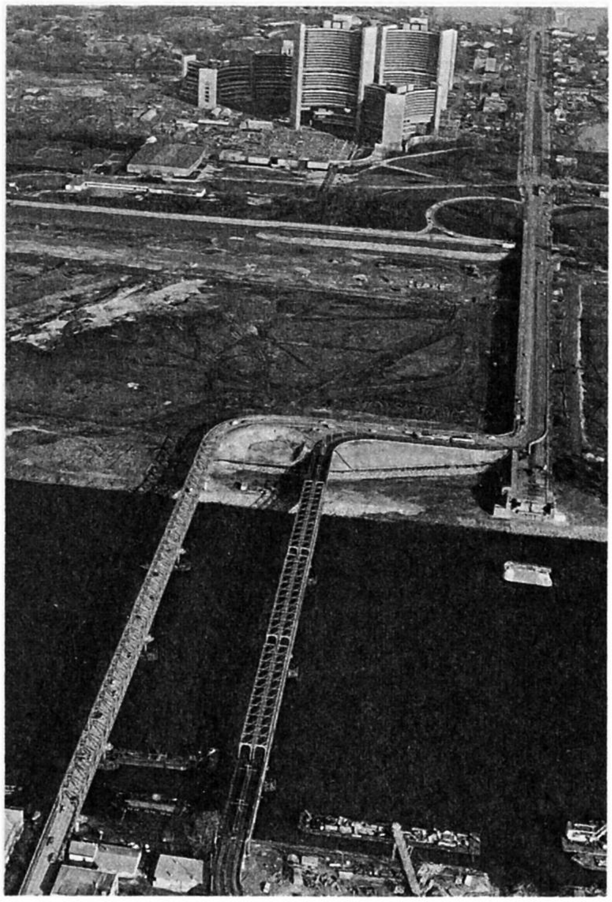
Something had to happen fast, yet initially no one was able to think of a rapid solution other than making use of military emergency bridges. However, even if bridge piers suitable for public traffic had been provided, this solution would have required a construction period of at least 50 days.

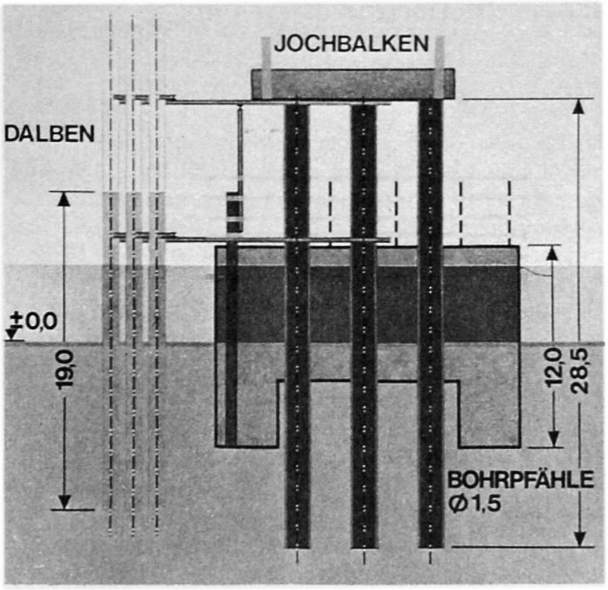
In this situation Stahlbau Arge Wiener Donaubrücken –a joint venture of the major Austrian bridge construction companies–showed enough confidence to accept the challenge posed by the extremely close deadlines. With a special bridge design the companies involved proposed a solution involving the same amount of time as would have been required for setting up military bridges, and at a much lower price.

Three temporary bridges–two for trams and one for road traffic–were built across the river, and within a few weeks after the collapse traffic was moving across the bridges, eliminating the consequences of the disaster almost entirely.

Bridge piers

A total of six river piers and numerous land-based piers had to be set up. Their quality had to meet the requirements not only of a long-term provisional situation but also of the legal and building authorities. The designer had to consider the severe conditions imposed by the water flow of the Danube, i.e. annual floods, high flow velocities, strong sediment transport and the hazards of pit formation, as well as the demands of navigation and road traffic, all of which had to be met in all cases. Drilled pile groupings comprising three or four piles with a diameter each of 1.50 m were arranged in series. The piles, which were provided with a permanent steel shell shuttering, were driven to a depth of 13 m below the river bed and joined at the top end by a concrete crossbeam serving as bridge abutment. They were secured against pit formation by a steel cage shaped like the customary river piers, a sheet pile wall apron being rammed into the external surface of the cage down to a depth of 6 m. The inside of the cage was filled with a reinforced concrete slab and backfilled with gravel and loose rocks. To save time, floating equipment was used exclusively.





Bridge superstructures

Any temporary solution of the problems posed by the intended early resumption of traffic allowed–for time-saving reasons–only one alternative: public and individual traffic had to be separated. The location of the temporary bridges was almost inevitably determined by the given landscape, i.e. about 100 m upstream from the collapsed bridge for the tram bridge, and about 170 m upstream for the road bridge. The system of the superstructures had to be a simple one based mainly on the use of rolled sections. A span of 80 m–which (for navigational reasons) had also served for the old Danube bridges–seemed preferable in order to allow for a possible re-use as a temporary structure in the future.

The temporary tram bridges comprise 6 girder bridges, each with a span of 80 m, a usable height of 6.5 m and a bridge width of 4.8 m. The truss system consists of braced sloping members without verticals.

A stringer bracing is provided between the longitudinal beams in addition to diagonal bracings and portal bracings. All truss members are HSFG-bolted. One girder bridge weighs 130 t, totalling 780 t in all.

The temporary road bridge comprises 3 girder bridges each 80 m long, and 2 end girders, length 40 and 44 m, the usable height being 8 m and the bridge width–for two traffic lanes–8 m. The bridge deck consists of orthotropic slabs 3.5 m wide and 4 m long. A walkway (width 1.5 m) is provided on one side of the superstructure. The technical details are similar to those of the tram bridge. The road bridge has a total weight of 1400 t.

Construction work at the site

After the 35th working day the first bridge piers were given over to the structural steel engineering team for the mounting of the girder bridges. It is obvious, of course, that this performance was made possible only by a 24-hour round-the-clock effort with seven workdays a week. The achieved precision was excellent in spite of the fact that the piles were mounted from a floating drilling platform. The biggest deviation–with a pier to pier distance of 80 m–was less than 10 cm.

Obviously, the structural steel engineers had to adapt themselves to the working rhythm of civil engineering.

Structures involving a delivery weight of 780 t had to be designed, fabricated and mounted and the required material had to be procured. Assembly operations were realized by way of preliminary land-based assembly, by transverse transport on the water on prepared roller tracks, and by floating-in by means of a 200 t floating crane.

After the tram bridge had been completed, the road bridge was constructed on the site. Due to the fact that the capacity of the floating crane was limited, the bridge girders of the road bridge had to be floated in by barges.

The superstructure was lifted onto the supports by means of special hydraulic presses.

(F. Pfohl)