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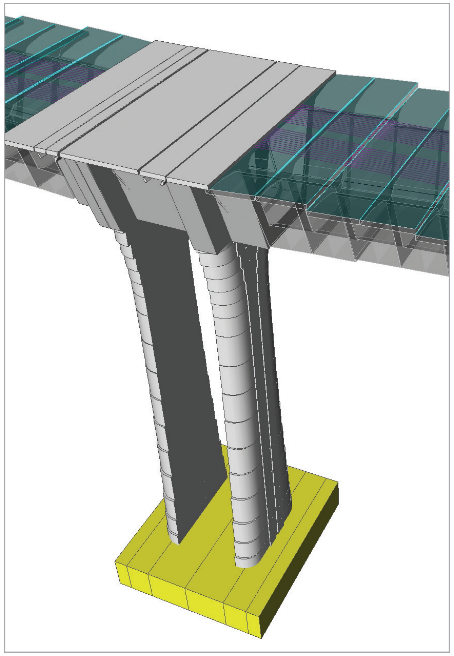
Novák&Partner ltd. was founded in July 1992 and initially dealt with bridge design only. Later the company expanded its engineering activities with general and special structural analysis, design of road structures and environmental studies. The company provides full design and engineering services from concept preparation up to the provision of implementing documentation, author's supervision, engineering activities, negotiation with public authorities, expert, consulting and bridge inspection services. We also provide services to customers from the Czech Republic, Slovakia, Germany, Denmark, the Netherlands, Austria, the U.S.A. and Russia. Since 2003 the company operates as a part of the VALBEK Design Group.

At present more than 30 employees work in the company as well as a number of permanent external specialists and students of the Czech Technical University (Prague), including those specialised in foundation engineering, general engineering activities and budgeting. The company won a lot of awards: e.g. "The Dancing House", Prague; The Tramway Bridge Hlubočepy - Barrandov, Prague.



Software: Scia Engineer

Bridge over the Berounka River Valley - Prague, Czech Republic

The bridge is a part of the Outer Prague Ring Road (SOKP) and is erected by means of the balanced cantilevers method.

The last part of the bridge structure consists of a structure with a length of 557 m passing over the city district of Radotín and the railway line Prague - Pilsen at a height of up to 40 m above the ground surface. The construction has 6 spans with lengths of up to 114 m, with a variable height of its boxed cross section (6.5 m above piers and 3 m in span centres). The load bearing structure is connected to the piers by a frame and supported on the end abutments using pot bearings. This structure has been erected by the balanced cantilever concreting method. Starter frames have a length of 12 m and all lamellas have a length of 5 m. The individual span lengths are: 72 m + 84 m + 101 m + 2 x 114 m + 72 m. The superstructure of the box girder cross section with inclined walls rests on the substructure formed by pairs of slim piers whose heights vary within the range of 26.5 to 35.6 m. The form of the piers vary in transversal direction to the bridge length; they get narrower along their height from the base to the top but get wider again before being fixed in the bearing structure. Their outer edges close tightly the side walls of the bearing structure and create unusual, but impressive saddles, which the supporting structure is seated in. This solution has brought, in addition to its architectonic effect, also static advantages of improved force transfer between the load bearing structure and pier blades. The superstructure is 3 m high in span centres and above end abutments. Above the piers a height increases through parabolic thickening up to the height of 5.2 m with smaller spans and to 6.5 m with wide spans.

On top of the piers starter frames of 12 m in length were designed, where symmetrical balance beams were concreted with 2 x 7 or 2 x 10.5 m long lamellas. The whole balance beams were 82 m or 112 m long, subject to the span width. The bridge ends were completed by concreting on a fixed centering.
All the prestressing reinforcement was designed of cables of 19 steel wires each of 1620/1860 MPa quality standard. The structure includes three cable groups. The first group comprises balance beam cables led only through the upper slab and anchored in the upper slab thickenings near the walls. The second group includes lifted cables passing along the walls always over one span length only and anchored in thickenings between the pier blades and section wall. The third group consists of cables led through the lower slab and anchored in pads close to the walls. Those cables were prestressed as the last ones at the time when crash barriers and plat bands had been already concreted. Before connecting individual balance beams rectification was always carried in the joint by pressing it. This operation eliminated shortening of the load bearing structure due to the effects of concrete shrinkage and creeping, elastic shortening due to the action of prestressing cables and temperature (in a part).
Bridge halves were erected from opposite ends, each subject to building site readiness and in view of the realisation of necessary relocation of buried services in the immediate vicinity of the bridge. In order to be able to keep the high speed of construction, the contractor had to employ, for a time, four pairs of concreting carriages. The carriages were obtained from two manufacturers, WITO and NRS, which, in spite of mutual similarity of the two carriage types, required different methods of anchoring in the load bearing structure, which made design works difficult, particularly as to optimisation of their application. The high speed of building works was kept also in bridge equipment installation. At the side of completed bridge structures the treatment of bridge decks, concretion of monolithic inner crash barriers and precast units of outer plat bands were carried out. It required the designs to be prepared for precamber of not quite completed load bearing structure that did not have all its prestress loads still established.

Software use
For static analysis a lot of computational models based on the different mathematical methods were used. Basic model was a 2D frame structure solved by the Scia Engineer TDA solution method. All construction stages and history of all loading cases were taken into account. For detailed analysis respecting real 3D behaviour a complex deck and slab model was used. It was also necessary to solve the stability of the structure during construction stages with respecting geometry and physical nonlinearities.

Bridge over the Berounka River Valley

Prague, Czech Republic

Project information

Owner	The Road and Motorway Directorate, Czech Republic
Architect	Patrik Kotas, Petr Šafránek
General Contractor	Bögl&Krýsl
Engineering Office	Novák&Partner, s.r.o.
Construction Period	From March 2008 to September 2010
Location	Prague, Czech Republic

Short project description

The bridge structures lead the motorway ring over the Berounka River valley and the adjacent inundation area with roads, railway sidings and a railway line. The last part of the bridge complex is a structure with a length of 557 m, passing the valley at a height of up to 40 m above the ground surface. The structure has 6 spans with lengths up to 114 m with a variable height of its boxed cross section.