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Artikel: Illinois River Bridge, Illinois (USA)
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1. Illinois River Bridge, Illinois (USA)

Owner:	*State of Illinois, DOT*
Engineer:	*Original Design: Howard Needles Tammen & Bergendoff, Kansas City, MO* *Redesign: Engineering Computer Co., Sacramento, CA*
General Contractor:	*Shappert Engineering, Rockford, IL*
Subcontractor (Superstructure):	*Moseman Construction Co., Denver, CO*
Post-tensioning, Heavy Lifting and Travellers:	*VSL Western, Campbell, CA*
Construction time:	*1987 – 1989*

Introduction

The bridge, located approx. 240 km north of St. Louis, Missouri, comprises two nearly parallel, but somewhat separated concrete structures over the Illinois River and its adjacent flood plains and marshes. Each structure is 12.80 m wide and approx. 1 km long.

The project was originally advertised in 1980, but the contract was not awarded due to protests from environmentalists anxious to protect a breeding zone for eagles. In 1986, when tenders were submitted for the identical project, VSL's redesign, which replaced the precast segmental structure by cast-in-place approach spans and segmental cast-in-place main spans, was retained by the lowest bidder as well as by the second and third bidders, since it proved to be more economical. The precast original design would have required the handling of heavy segments on ground with low bearing capacity.

Construction procedure

VSL proposed to build the thirteen 70.10 m long approach spans of both structures on the ground and to lift them into place from cast-in-place pier caps. The end spans were cast on falsework, to allow for the sloping ground. The two 382.22 m long main span units employ segmental cantilever using two formwork travellers leased from VSL.

VSL proposed that the lift spans be cast on a 152 mm unreinforced ratslab, but the contractor preferred low falsework, consisting of longitudinal wide flange beams supported on rock pads. These spread the load of the span uniformly on the underlying soil. After the segment has been cast, the ends are shimmed up to the column footing to transfer the dead load, after the 16 longitudinal tendons (stage 1 post-tensioning) of VSL type EC/EC 5-19 (breaking force 3.491 kN each) and the transverse deck tendons type SO/S 6-4 have been stressed.

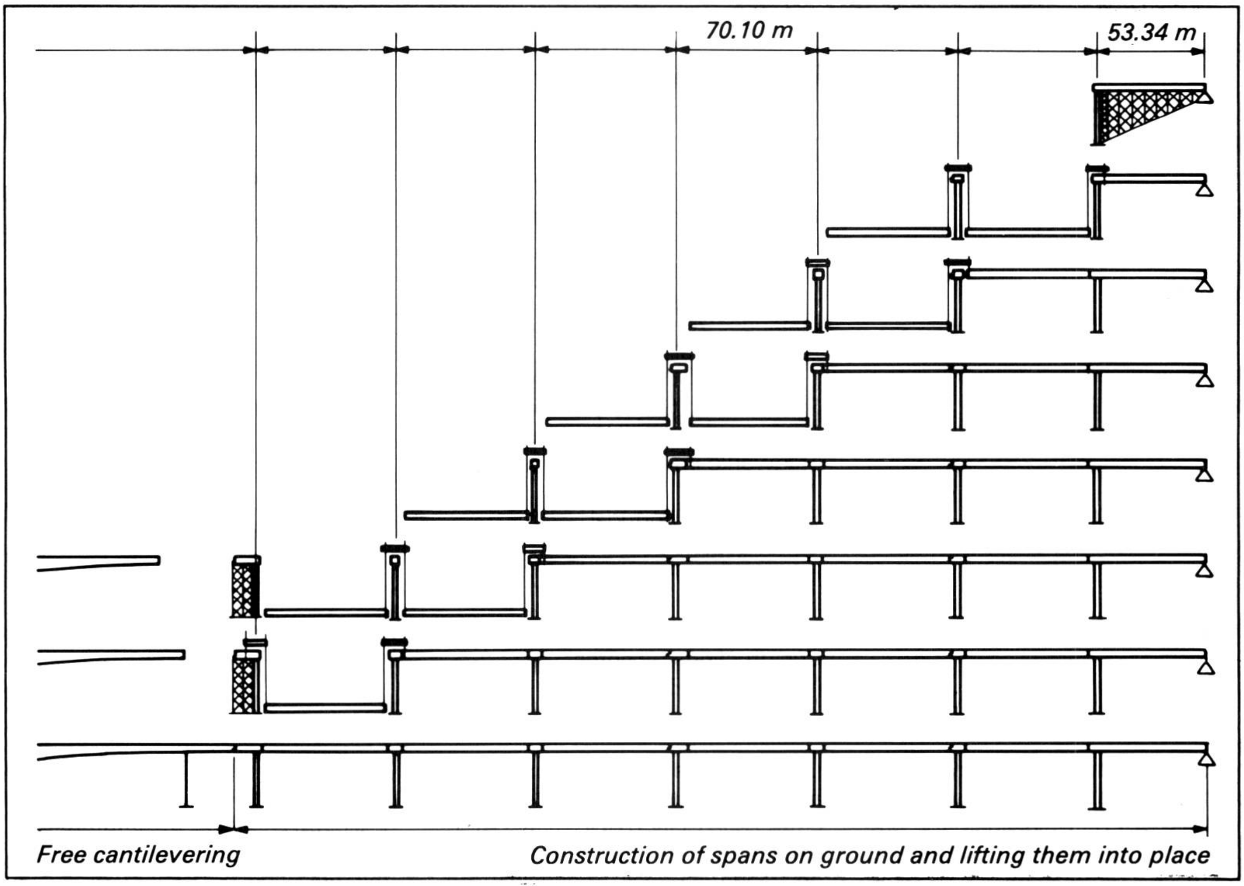

Fig. 1: Construction sequence in the approach spans

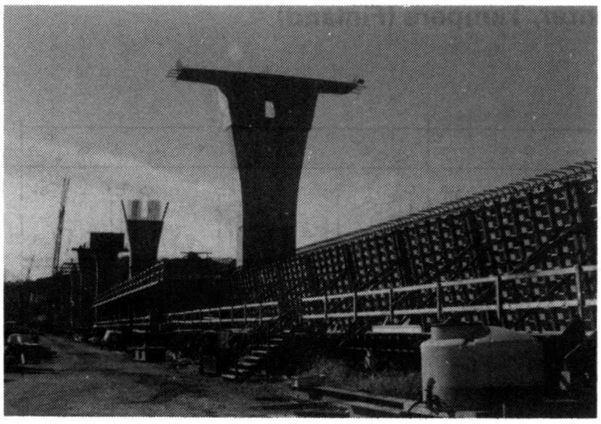

Fig. 2: Formwork for the approach spans

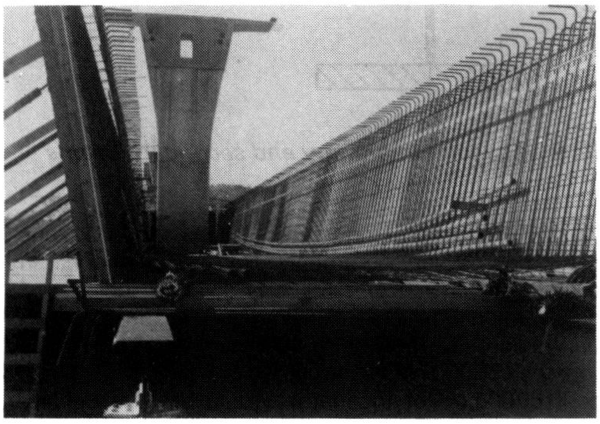

Fig. 3: During installation of cable ducts

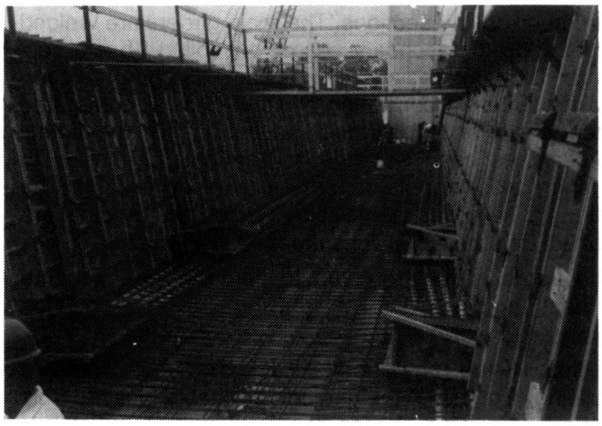

Fig. 4: After placing of inner web formwork

Fig. 5: Free cantilevering construction in progress

Lifting of approach spans

A typical lifting cycle can be broken down into four stages:

1. Moving of the lifting equipment from the trailing pier of the previous lift to the leading pier of the next lift.
2. Lowering of the lifting and tie-down tendons at the leading pier.
3. Lifting the span.
4. Forming and casting of 152 mm closures, installation of stage 2 post-tensioning (continuity tendons).

Two types of lifting frame are used: a short frame and a long frame. Each lifting frame consists of two longitudinal steel beams supported by two legs each and a bracing frame connecting the two beams. Four hydraulic pumps and the power controls are mounted on the latter. Each lifting beam carries two VSL motive units SLU-330, strand guide frames and tendon coilers.

After the lifting and tie-down tendons at the trailing pier have been detensioned, the frame is dismantled into its three units and each of these is moved 140.20 m ahead to the next leading pier. After the re-assembly of the frame, the four lifting and tie-down tendons are lowered by the tendon coilers. Once the threaded anchor head has passed through a pipe / bearing plate assembly embedded in the concrete, a ringnut is engaged.

The spans, each weighing 1200 tonnes, are lifted up to 26 m above the ground in approximately six hours. Four jacks are used for the lifting operation, while the outer four stress the tie-down tendons. The span ahead of the current lift span is used as a counter-weight at the leading pier. At the trailing pier, the tie-down tendon is the lifting tendon of the previous span.

When all the fine adjustments of the lifted span have been made, the two 152 mm unreinforced closures are shimmed up and two continuity tendons are partially stressed, providing lateral restraint. Four VSL tendons type EC/EC 5-31 (stage 2 post-tensioning) are fully stressed after the closure has reached its required strength. At this time, a new lifting cycle begins.

(A. Micklus/H. U. Aeberhard)