

New modular construction method for multi-span concrete bridges with reduced material consumption

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Abstract

A new construction method for post-tensioned bridges with a double-T cross-section was developed at the Institute of Structural Engineering (TU Wien). That method enables a swift production of the longitudinal girders and the deck slab. Precast deck slab elements stiffened by cross-beams are placed on top of the installed post-tensioned precast girders. The precast hollow box girders and the deck slab elements can be installed along the whole length of the bridge with cranes or a launching gantry. The combination of precast hollow box bridge girders and precast deck slab elements allows for the fast production of post-tensioned concrete bridges with a double-T cross-section in the span range from 30 m to 60 m. This method will make the erection of one span per week possible, thus achieving the same construction speed as segmental bridge construction. Compared with segmental box girder bridges, the new construction method permits a reduction of construction materials and avoids transverse joints that extend over the entire height of the finished cross-section.

Keywords: Precast deck slab element, precast hollow box girder, post-tensioned bridge, segments, sustainable, thin-walled.

1 Introduction

Several building techniques for multi-span concrete bridges have been developed in the last decades. The state of the art is described in “Bridge Deck Erection Equipment” [1]. In total, ten construction methods are outlined:

- 1) Precast balanced cantilever erection by launching gantry
- 2) Precast segmental span-by-span erection by launching gantry
- 3) Precast girder erection by launching gantry
- 4) Precast full span erection by launching gantry
- 5) Cantilever erection by lifting frames
- 6) Progressive cantilever method using stay cables
- 7) In-situ form travellers
- 8) Movable scaffolding systems
- 9) Incremental launching method
- 10) Prefinished bridge installation methods

More than half of the listed construction methods can be assigned to the construction method with precast elements. This shows the current importance of these bridge-building techniques. In contrast to the construction methods with in-situ concrete, swift construction progress can be achieved using techniques with precast elements.

An extraordinary building technique for multi-span prestressed concrete bridges with a plate-girder