

DEVELOPMENT OF CONCRETE BRIDGES IN THE CZECH REPUBLIC

J. L. Vitek¹

¹Czech Technical University, Faculty of Civil Engineering and Metrostav a.s., Prague, Czech Republic.

e-mail: vitek@metrostav.cz

SUMMARY

Reinforced concrete bridges, the arch bridges in particular, which were built even in the first half of the 20th century exhibited a reasonably good safety and durability provided good quality materials were used. Fast development of the technology of prestressed concrete suffered from some deficiencies due to a limited knowledge and experience with the material behaviour and with the technology itself. However, the contemporary prestressed structures may be considered as safe and durable, since mainly the protection of prestressing units improved significantly. Design criteria also changed and requirements on robustness should avoid severe damages in case of failure of a single element.

Keywords: *Arch, Bridge, Concrete, Durability, Prestressing, Safety.*

1. INTRODUCTION

Concrete bridges replaced especially the stone bridges. Excellent experience was achieved with arch stone bridges because of their load carrying capacity and durability. Character of the stone masonry allowed for minor deformations, which resulted in minimum problems with expansion joints. Their service-life sometimes exceeded thousand years.

Concrete bridges were based on the concept of stone bridges in initial stages of development. The stone arch was replaced by a concrete one and also earth filling above the arch was maintained. Already in 1896, the first small arch concrete bridge was built in Prague. The single arch made of plain concrete has the span 13.3 m long and the rise of 2.75 m. However, in a short time the heavy earth filling was replaced by slender supports. The arch bridges with upper bridge deck became elegant and their span was growing up to several hundred meters as we see today. Also arches with a lower bridge deck were built; the deck used to be suspended on reinforced concrete ties. Compactness of reinforced concrete required dividing of the structure by expansion joints. Beside arches, also beam bridges were built, however, reinforced concrete did not allow for a design of large spans. Only arch structural system made it possible to build reinforced concrete bridges of large spans before the prestressed concrete was used.

Prestressed concrete was developed in France and in Germany already before World War II, but in Czechoslovakia, the first bridges were built in 50th. The development of the prestressing technology in the socialist system was not easy. The contact with developed countries was very limited and any experience was not available. In spite of that, the technologies for bridge construction were developed similarly as those used in western countries. The quality of design was certainly comparable with that in developed countries. Today it is known that some at that time new technologies were not perfect and did not avoid some stages, which are now considered as not suitable, and which led to lower durability of prestressed structures. Now we know that the quality of work was not always sufficiently good which resulted also in a lower service life of at that time erected structures. The situation changed after 1990, when the direct co-operation with foreign partners started and the highly developed prestressing systems were used also in the Czech Republic. Mainly important clients like a highway authority or Czech railways increased their requirements on quality of execution of all works. At the same time the development in concrete technology accelerated due to application of chemical admixtures like superplasticizers and other products, and new high-performance