Railway bridges / fly-over "Sporen in Den Bosch"

Gerrit Jan HOLTLAND
Civil Engineer
Movares BV
Utrecht, The Netherlands
gerritjan.holtland@movares.nl

Bert HESSELINK
Civil Engineer
Movares BV
Utrecht, The Netherlands
bert.hesselink@movares.nl

Marc KRELING
Civil Engineer
Breijn.
Rosmalen, The Netherlands
m.kreling@breijn.nl

Jan Willem de VOS
Civil Engineer
Wagemaker
Rosmalen, Netherlands
j.devos@wagemaker.nl

Wim van den BERG
Civil Engineer
Wagemaker
Rosmalen, Netherlands
w.vandenberg@wagemaker.nl

Summary

The project "Sporen in Den Bosch" in it's total is meant for the modernization and refurbishment of the railway area of Den Bosch. It is designed to solve several bottlenecks in the railway transport around Den Bosch. All the railway traffic around "Den Bosch" Station which is crossing the Dieze river, now has to pass on one double track steel bridge. During the process two new concrete trough bridges are to be built and the steel bridge is to be replaced while the railway traffic more or less has to continue. For these bridges a new concept of prefabricated concrete trough structures is used. The construction works started at the end of 2011 and will be finished in the spring of 2014. The client for the project is ProRail, the managing organisation of railway-infrastructure in the Netherlands.

Keywords: building in restricted areas, building within restricted time-periods, pre-tensioning post-tensioning, prefabrication, concrete railway bridges.

1. Introduction

The construction works of the project "Sporen in Den Bosch" consist of two concrete bridges and a concrete viaduct (fly-over) to cross the river "Dieze" and cross the railway, all to be built in a restricted area, full of railway tracks, switches and equipment, directly to the north of the railway station "Den Bosch".
The building process should hinder the existing railway transport process as little as possible. Completely stopping the train traffic is only allowed during the so called "Train Free Periods". They need to be planned long beforehand in consultation with "ProRail". These periods of time (weekends) are the most important milestones in the planning of the complete project. Apart from these periods there are also the regular, shorter, train free periods during night-hours. For the replacement of the existing double track steel bridge by the concrete double track trough-bridge a train free period of 11days is available. During that time the existing bridge has to be removed, parts of the foundation have to be built and the new bridge has to be shifted to its final position.

The bridges are concrete trough bridges crossing the river Dieze with 3 spans of approximately 50-55m. The fly-over also is a concrete trough crossing the Dieze and crossing the tracks over the bridges, with a total length of 350m, which consists of 7 spans of approximately 50m.
The span of the trough-bridges / fly-over is the largest span in concrete trough railway bridges ever built in The Netherlands.
The bridges and viaducts are complex composite structures of high-strength concrete with pre- and post-tensioning combined. They are partly prefabricated and partly concrete cast on site.

https://doi.org/10.2749/222137813806548532

2. Substructure

The substructure can be divided in the those for the two bridges and the ones for the fly-over. For the fly-over there are 2 abutments and 6 piers. One of the piers of the fly-over is made of a "portal-frame construction" which spans two tracks. This complete portal-frame, table 13m × 5.5m, about 6m high, is built next to the final location and has to be lifted in place as a complete unit over the overhead lines. The columns had to be connected to the foundation slab by pouring the concrete in the slab around the column after placing the portal-frame. Because of its dimensions and weight, 305 tons, enormous lifting equipment is needed.

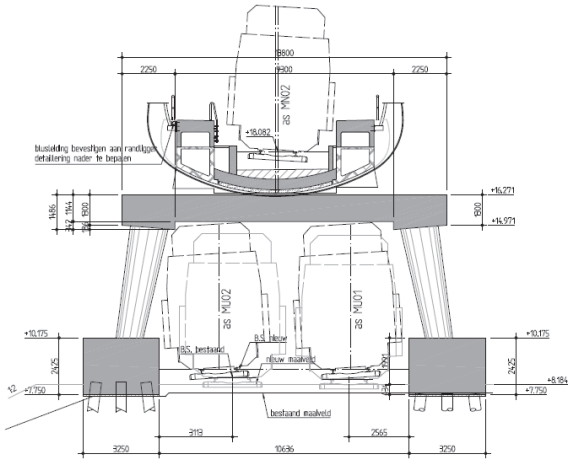
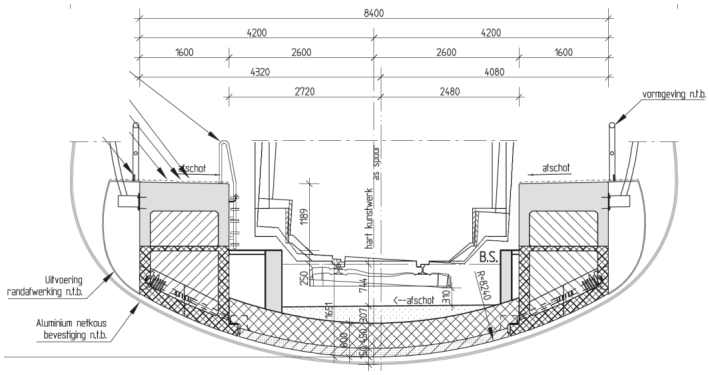


Fig. 1 Table pier over two tracks

The substructure of the two bridges consists of two abutments and two intermediate piers. Partly they are to be built below the existing bridge.

3. Superstructure



The superstructure of the bridges and the fly-over is a complex composite structure of high-strength concrete with pre- and post-tensioning combined. They are partly prefabricated and partly cast with concrete on site. The double track bridge additional has an enormous concrete truss girder for the central beam.

Fig. 2 Basic cross section of the fly-over and the single track bridge

4. Execution

The main theme in the execution of this railway related project is that the building process should hinder the existing railway transport process as little as possible. In order to accomplish this, first of all the superstructure was partly prefabricated. Besides this, also many parts of the substructure were prefabricated on site.

As a conclusion the project demonstrates that the choice of prefabricated parts and their composition as structure to a large extent has contributed to the progress of the project as scheduled.