Re-use of a 300 m steel arch bridge

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Abstract

The Van Brienenoordbrug consists of two steel tied arch bridges of 300m span, the east was built in 1965 and the west arch was built in 1990. They carry the A16 highway, a crucial part of the Dutch infrastructure network near the port of Rotterdam. The west arch has been suffering from fatigue in the orthotropic deck and Arup was assigned by Rijkswaterstaat (Dutch highway authority), to design a renovation for the west arch. The renovation required a solution for the orthotropic deck and strengthening of the main load carrying structure. After extensive investigation of the renovation under traffic it was concluded the total execution time of 1.5 years and the accompanying safety risks made it not the best solution. Instead Arup proposed an alternative solution in which the wish for less hindrance aligned with the sustainable goals of both Arup and Rijkswaterstaat. Arup and RHDHV work in a joint venture, the Managing Contractor, on the renovation of steel bridges for RWS.

Keywords: arch bridge; renovation; refurbishment; assessment; re-use;

1 Introduction

The van Brienenoordbrug forms a vital part of the Dutch highway network around Rotterdam, carrying the A16 over the 'Nieuwe Maas'. It consists of two large steel tied arch bridges of which the west arch is the longest spanning bridge in the Netherlands. Directly after the steel fixed bridges there is a bascule section facilitating a movable crossing of 50m wide, allowing high ships on 'The Nieuwe Maas' to pass the A16. The van Brienenoordbrug currently carries 12 lanes of A16 traffic in between the junctions Ridderkerk and Terbregseplein. The easterly 6 lanes of traffic travelling to the North use the east bridge, built in 1965 and the western 6 lanes use the west bridge build in 1990. This paper will focus on the planned renovation of the superstructure of the steel arch bridges of the van Brienenoordbrug.

1.1 East arch (OBB)

The 1st Van Brienenoordbrug was opened to traffic in 1965. The length of the original Van Brienenoordbrug is 306,6m, spanning 287m between support centrelines. The total width of the bridge is 33,5m including cycle path. The structure consists of two steel box arches, connected with inclined hangers to two box girders, connected by crossbeams that carry an orthotropic bulb deck. The bulb stiffeners are continuous and spaced every 300mm, the deck plate is 10mm thick. The cross girders are spaced every 2,05m. The two arches are connected by a bracing system. The span is 287m and the arch rises

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