

Design and construction staging of a 300m steel bridge renovation

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Abstract

Two steel tied arch bridges are a part of the Van Brienenoord Bridge (VBB). They carry the A16 highway, a vital part infrastructure near the port of Rotterdam. The west arch has been suffering from fatigue in the orthotropic deck and the main load carrying structure required strengthening.

A renovation outside traffic on a yard was proposed, benefiting achievable quality, H&S and hindrance. The main objectives where: maximizing remaining service life while re-using the maximum amount of existing steel. This was achieved by a combination of extensive analysis on describing locked-in stress, advanced FE analysis (GMNIA) and testing of existing material. After renovation the western VBB is able to withstand all design loads for another 100 years, while re-using 3200 ton of steel in the highest form. Arup and RHDHV work in a joint venture, the Managing Contractor, on the renovation of steel bridges for Rijkswaterstaat (Dutch highway authority).

Keywords: steel bridge; arch bridge; renovation; assessment; re-use; construction staging;

1 Introduction

The Van Brienenoord Bridge (VBB) is a crucial part of the Dutch highway network surrounding Rotterdam, as it carries the A16 over the Nieuwe Maas river. The bridge is made up of two steel tied arch bridges, with the western arch being the longest span (295m) in the Netherlands. Currently,

the VBB carries 12 lanes of traffic between the Ridderkerk and Terbregseplein junctions. The east bridge, built in 1965, is used by the eastern 6 lanes of traffic traveling north, while the west bridge, built in 1990, is used by the western 6 lanes.

The west arch (2nd VBB) has been experiencing fatigue issues in its orthotropic deck. The Dutch highway authority, Rijkswaterstaat, enlisted Arup



Figure 1: Side view of Van Brienenoord Bridge (standing on East side). Source: Rijkswaterstaat