

Bridge-specific Assessment Techniques for the Strengthening and Refurbishment of the West Gate Bridge, Melbourne

Ian FIRTH
Director
Flint & Neill
London, UK



Ian Firth is a Director of Flint & Neill and a Fellow of the Royal Academy of Engineering, the Institution of Civil Engineers and the Institution of Structural Engineers. He is well known as a bridge designer and for his work on the assessment and refurbishment of several major steel box girder bridges worldwide.

Summary

This paper describes the approach taken in the structural assessment of the West Gate Bridge and the design of strengthening, and describes the challenge of upgrading a bridge such as this while it continues to carry extremely busy traffic on one of Melbourne's most important transport arteries.

The bridge specific assessment approach adopted has led to considerable savings in strengthening requirements when compared to what would be required by the application of standard bridge design criteria. Certain economies and efficiencies have been achieved by optimising the strengthening details through the application of sophisticated non-linear analysis techniques.

Keywords: Steel box girder, bridge assessment, strengthening, refurbishment, rehabilitation.

1. Introduction

The West Gate Bridge carries the 8-lane M1 highway over the Yarra River in Melbourne, Australia. The bridge is 2.6 km long, with a central 848 metre cable stayed steel box girder section, and the 336 metre main span crosses the shipping channel used by large ships going in and out of the Port of Melbourne. The crossing carries approximately 170,000 vehicles a day and serves the Port which is the busiest in Australia, and the bridge is considered to be one of the most important pieces of transport infrastructure in Australia. (Figure 1)



Figure 1 *The West Gate Bridge*

Constructed in the 1970's, the bridge is now in need of strengthening and upgrading to meet future demands, along with the whole M1 corridor, which is the main east-west highway artery running immediately south of Melbourne's city centre.

The work is being carried out by the West Gate Bridge Strengthening Alliance, which comprises owner VicRoads, contractor John Holland and consultants Flint & Neill and SKM. The consultants were appointed in 2007 to carry out a structural assessment, with the contractor joining in 2008 for the implementation phase. Work is due to be completed by the end of 2010.

The concrete approach viaducts are also being strengthened, and the work includes perhaps the most extensive use of carbon fibre reinforcement on an existing bridge to date, but that is not the subject of this paper which only addresses the steel bridge.

2. Background and history

The West Gate Bridge had a tragic start to life. One of the western spans of the steel bridge