39th IABSE Symposium – *Engineering the Future*
September 21-23 2017, Vancouver, Canada

Designing the River Irwell Crossing – the UK's first network arch bridge

Rusi Rusev, Rufus Foster, Tim Abbott, Athanasios Bistolas

Mott MacDonald, Altrincham and Croydon, UK

Contact: rusi.rusev@mottmac.com

Abstract

The first railway network arch bridge in the UK is due for completion in the summer of 2017 and will support a new railway line that connects the Piccadilly and Victoria Stations in the heart of Manchester. Set alongside heritage structures of huge significance, aesthetics is paramount and has led to an asymmetric network arch form to satisfy the aspiration for a landmark bridge. The highly constrained site necessitated an unconventional piecemeal erection sequence over the river on asymmetric temporary towers. This required a detailed erection analysis of a complex methodology and special measures had to be taken to facilitate erection within acceptable construction tolerances. The paper provides an outline description of the design challenges that the project posed and how they were addressed.

Keywords: Network arch; erection engineering; advanced analysis; landmark bridge.

1 Introduction

Network Rail's Northern Programme is a major infrastructure programme in the North of England improving the capacity of the railway network. Amongst its improvements to the existing infrastructure, the programme includes the construction of a new railway link in the heart of Manchester, the Ordsall Chord.

The Ordsall Chord viaduct is approximately 300m long, carries two ballasted tracks and connects two existing masonry arch viaducts. It crosses a site with significant historic value and traverses the Grade II listed Stephenson's Viaduct, the River Irwell and Trinity Way which is part of the Manchester and Salford Inner Relief Road. This paper concentrates on the River Irwell Crossing pictured in Figure 1, a steel network arch structure, the first of its kind in the UK, spanning 89m over the River Irwell.

Presented herein is a brief description of the requirements and constraints that significantly affected both the design and construction of the superstructure and the substructures. Particular focus is given to the somewhat unconventional "piecemeal" erection approach on asymmetric temporary river towers which necessitated a complex erection analysis and required special measures to facilitate assembly within acceptable construction tolerances.

Figure 1. Visualisation of the network arch

2 Requirements and constraints

Following public consultations, the aesthetic requirement for a slim and elegant but emblematic bridge led to the choice of a network arch. This structural form in combination with the

https://doi.org/10.2749/vancouver.2017.0655
Distributed by structurae