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ST. PHILIPS PEDESTRIAN AND CYCLIST BRIDGE IN BRISTOL. A HOLISTIC AESTHETIC, STRUCTURAL AND FUNCTIONAL DESIGN

Héctor BEADE-PEREDA

Associate | Bridge Designer
Knight Architects
High Wycombe, United Kingdom

h.beade@knightarchitects.co.uk

John McELHINNEY

Principal Bridge Engineer
CH2M
Bristol, United Kingdom

john.mcelhinney@ch2m.com

Rocío ROMO-TORRES

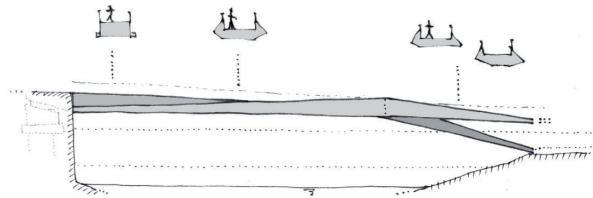
Bridge Designer
Knight Architects
High Wycombe, United Kingdom

r.romo@knightarchitects.co.uk

Bogdan BARBULESCU

Senior Bridge Engineer
CH2M
Swindon, United Kingdom

bogdan.barbulescu@ch2m.com



Summary

This article describes the story of the design of St. Philips footbridge in Bristol (UK), detailing the progression from early concepts into a fully realised solution to the particular challenges of the scheme. The number of functional, structural, and aesthetical constraints of this complex urban crossing of the River Avon are simultaneously addressed thanks to a holistic architectural and structural approach.

The bridge, a Y-shaped 50m-span and 4-m wide variable depth beam, will connect two river banks of very different elevation and appearance (one being a Victorian masonry wall and the other a green slope), just one of them will be developed to high architectural standards on the short term. Close to the site are two bridges with a strong visual character, and a proposed multipurpose entertainment venue.

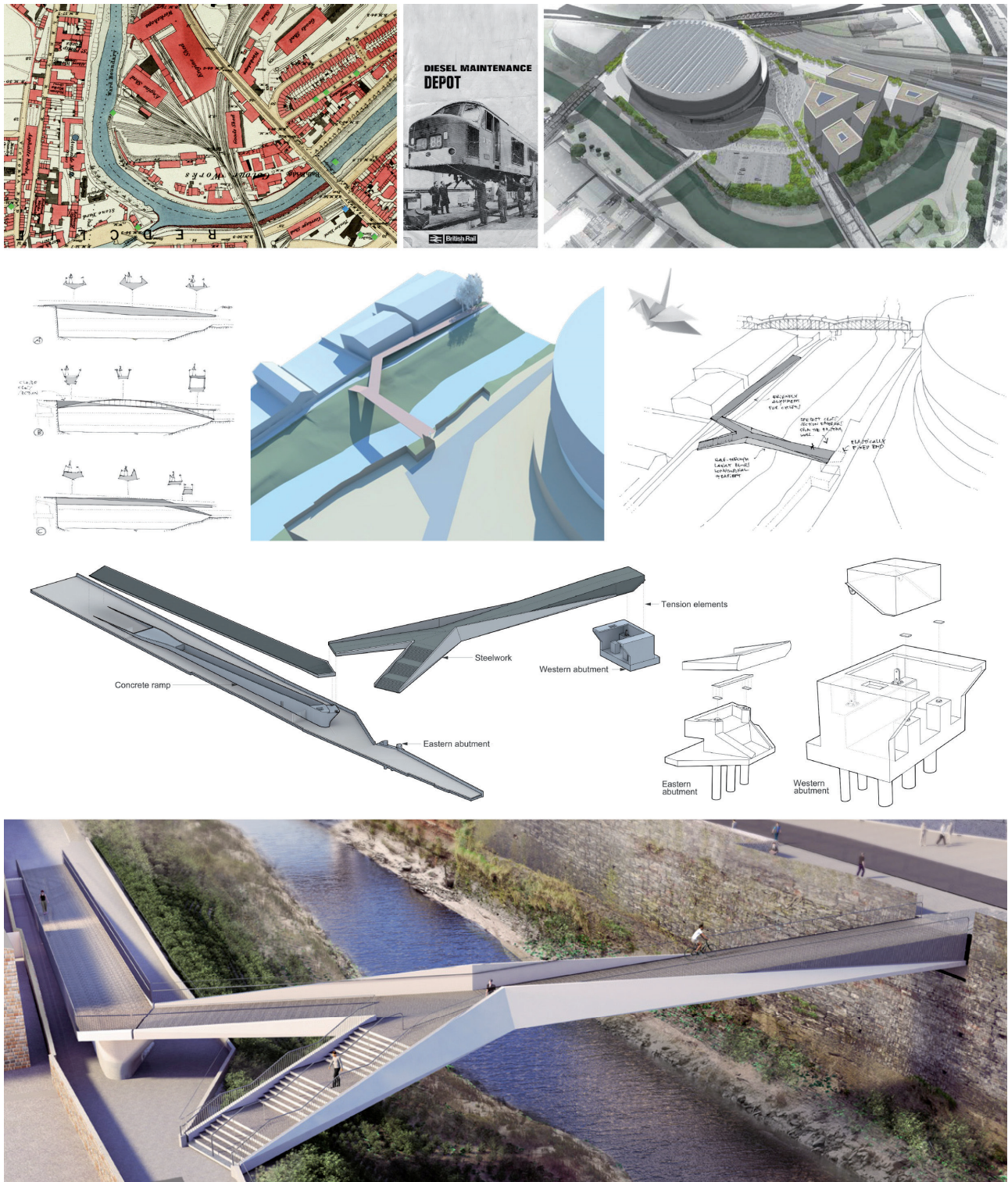
Keywords: urban footbridge; aesthetics; holistic design; origami; elastically fixed beam; functionality

1. Introduction

The transformation of a central unused site (originally railway-maintenance related) adjacent to Temple Meads station is an important urban development project being carried out in Bristol. The new area (Arena Island) will host a multipurpose entertainment venue, a public plaza and mixed used development in a second stage. The new St Philips footbridge, designed by Knight Architects and Ch2m for Bristol City Council, spans the River Avon connecting the Bristol Arena and a pedestrian and cyclist route.

The bridge is a 50m-span and 4-m wide steel beam with a forked geometry, hosting a ramp for disabled and cyclists and a staircase as part of its own structure to maximise functionality. It is simply supported at one end and elastically fixed at the other two. The design approach to generate its shape was at the same time structural (shape conditioned by bending moment envelope diagram), aesthetical (geometry sculpted in detail and maximum depth at massive masonry wall), and functional (geometry follows desire lines + headroom requirements and hydraulic constraints). The inevitable longitudinal gradient is partially obscured using the geometry of the top and bottom structural envelopes, so the design isn't perceived as a continuous ramp.

Thanks to this holistic aesthetical and structural approach, the design is compact, simple, elegant, innovative, and clearly legible for both footbridge and river path users.



Figs. 1 to 8. Assessment and design (from left to right and from top to bottom) 1 and 2. Original plot arrangement and use (images: © National Rail) 3. Future plot arrangement (image: © Populous) 4 and 5. Preliminary studies of possible structural schemes and basic geometric arrangements 6. Some key points of the design 7. Exploded isometric view of the bridge and access ramp + isometric views of two of the abutments 8. Aerial virtual image of the pedestrian and cyclist bridge (images 4 to 8: © Knight Architects)