Award

Beaulieu Parkway Bridge, Chelmsford

PROJECT TEAM

Architect: **AECOM**
Structural Engineer: **AECOM**
Steelwork Contractor: **Briton Fabricators Ltd**
Main Contractor: **GRAHAM**
Client: **Countryside Zest LLP**

The 161m long, three-span superstructure marks the final phase of a £35 million infrastructure program aimed at reducing congestion for Chelmsford residents and road users. It is the longest curved multi-span bridge over land in England.

Initially constructed onsite in a temporary location between February 2022 and September 2022, the superstructure underwent a complex and meticulous process to reach its final position. It was first manoeuvred and cantilevered over the Great Eastern railway line and the A12 north bound slip road in September 2022. In October 2022, the superstructure was prepared to be moved to its permanent position and lowered onto the substructure, spanning the Great Eastern railway line and the A12 northbound slip road.

One of the standout features of this project is the use of composite weathering steel fabricated girders. The design and installation of this structure were particularly complex due to its unique geometry. Curved on plan with a pronounced camber profile, the steel elements consisted of four lines of 2.7m deep plate girders. These girders were 'spiral' in construction and had 'offset' flanges to webs, designed to twist into shape under load. Accuracy of the fabrication was controlled in the workshop using laser levels and purpose made jigs, with information derived from an advanced 3D model prepared in-house by an experienced modeller.

Tight site access posed additional challenges, necessitating the delivery of plate girder beams in smaller sections. These sections were then welded together at ground level. Temporary trestles were designed and deployed, encapsulated to allow welding, blasting, and weld testing. Once the paired beams were assembled into 40m lengths, these sections were lifted to a height above the adjacent overhead line structures and settled onto another temporary works set up. This 'at height' set up mimicked the final abutment and central supports, plus two rows of purpose-built trestles at weld locations. Once at height, the whole structure, at its corresponding connections, was welded.

The final installation scheme for the superstructure was particularly intricate due to its location. A complex chorography involving multiple Specialist Propelled Moveable Transport (SPMT) was employed. The bridge superstructure weighed a total of 2,400 tonnes during installation. It was manoeuvred by adding and removing SPMTs at different stages, rotating in a carousel motion until the bridge was positioned over and lowered onto temporary trestles. The bridge was then lifted from the temporary trestles using SPMTs and MJS300 jacking systems located on top of the SPMTs. It was transported and positioned on either side of the railway boundary and driven into place over the permanent abutments and piers. This project is the longest bridge installed using SPMTs in the UK.

Lasers were used to align the bridge with 16 permanent bearing positions to an accuracy of +/- 10mm. Temperature control was crucial to maintain these tolerances.

The design, fabrication, and installation of the complex geometry curved steel set of weathering grade steel plate girders for the road bridge, is a testament to the skill base in the civil engineering sector. The high level of skill, quality, and rigorous testing regime ensured the bridge was delivered well within tolerance. Additionally, the complex SPMT choreography employed during the installation made this a standout structure.

The opening of the new Beaulieu Parkway bridge and relief road is a significant development for the traffic management in the area. It provides a crucial strategic link for commuters traveling from the A130 to the A12, helping to alleviate congestion around Springfield for those journeying to and from Braintree, Stansted, and the M11. Additionally, it will facilitate easy access to the new Beaulieu Park Station in 2025.

The local council has reportedly implemented several transport developments in this part of Chelmsford. Alongside the relief road, the new bypass and train station are all vitally important for ensuring the transport network is fit for the future. These developments aim to provide local people safer, greener and healthier travel options.

Overall, the successful completion of the Beaulieu Parkway bridge is a milestone achievement that underscores the importance of strategic infrastructure investments. It reflects the commitment to enhancing the quality of life for residents by reducing congestion, improving safety, and promoting sustainable transportation solutions.

Judges' comment

This 161m long, three-span highways bridge has an extraordinary construction story. The structure, which spans a road and live railway, is curved in plan and section. Built on the ground, complete with much of its deck, the structure was then driven into position on multiple specialist propelled moveable transporters.