OLD BRIDGE, NEW VISION

Fourteen years of research supported by data collection have helped save the 90-year-old River Lea Crossing in London

The River Lea Crossing, sandwiched between two slip road bridges, was historically known as London's "Iron Bridge" and has been modified several times over it's lifetime.

Work has recently started on the River Lea Crossing in East London, following 14 years of investigation and data collection by Hewson Consulting Engineers. This ground-breaking work by Hewson concluded that refurbishment of the structure was a feasible alternative to replacement, which had been scheduled to happen by 2030.

EVIDENCE-BASED SUSTAINABILITY

Constructed in 1934, the River Lea Crossing is a 60m single-span steel arch bridge that remains vital to the A13 corridor.

Hewson's team adopted evidence-based decision-making to overcome the technical challenges associated with the bridge's age and construction, through comprehensive inspections, monitoring and material testing. Assessment of the existing structure and foundations confirmed the structure's integrity, allowing the team to confidently recommend refurbishment over replacement.

A detailed laser scan survey provided insights into structural changes, such as arch flattening and slight spreading of the abutments, which were incorporated into the refurbishment design. The survey also revealed that the deck build up and surfacing varied significantly, a fact supported by several trial holes.

Pin bearings, submerged twice daily by tides, were a critical focus. Monitoring in 2004 and 2019 demonstrated their continued functionality and performance over time, which was a determining factor for retaining the remainder of the structure.

Material testing of the steel and concrete supported by good historic records further allowed engineers to use worst credible strength parameters to minimise conservatism in the assessment. Sampling also allowed for a qualitative assessment of the concrete, as engineers could see good compaction and well graded aggregate.

INNOVATIVE FATIGUE LOAD MODEL

Hewson took an innovative approach to fatigue assessment of the retained structure and assessment of the foundations, which comprise a mass concrete abutment supported on precast piles.

The team developed a project-specific fatigue load model to allow for the gradual increase in the weight and volume of traffic, meaning that only the spandrel posts were found to have an inadequate fatigue life.

For the substructure, it was impossible to verify the condition of the piles, so the abutment was assessed for its capability to function as a raft and it was shown that the soil had sufficient bearing capacity. Therefore, if the piles are no longer effective, the structure is still safe.

ENVIRONMENTAL, ECONOMIC AND SOCIAL BENEFITS

When comparing refurbishment to the replacement scheme, Hewson found several benefits:

- **Lower carbon emissions:** Refurbishment achieved a 50% reduction in embodied carbon compared to replacement, by avoiding the removal of 810t of steel and installing 375t of new steel.
- **Lower whole-life cost:** As much of the existing structure is retained, the costs associated with demolition and sourcing new materials were greatly reduced, offsetting marginally greater maintenance costs.
- **Shorter programme:** There will be an overall reduction of 30 weeks and an even greater reduction in the time during which the A13 would be under traffic management. This reduces workers' exposure to site risks and brings benefits to the local community in terms of disruption and noise.

A MODEL FOR NET ZERO INFRASTRUCTURE

Aligning with the UK's Net Zero goals, which prioritise reuse rather than replacement, the project demonstrates how a data-driven approach can dramatically reduce carbon emissions while also delivering long-term benefits to stakeholders and communities.