

The Gade Valley Viaduct project is the perfect example of collaboration and innovation. Great ideas and new technologies were both trialled and implemented in order to solve challenging problems, while keeping the bridge and the M25 open to traffic.”

Kyriakos Antoniou,
Design Project Manager,
COWI



Case Study

Gade Valley Viaduct Strengthening— How offline ‘Mock ups’ benefit customer outcomes

PROJECT	Gade Valley Viaduct Strengthening
CUSTOMER	Connect Plus M25
LOCATION	Kings Langley
CONTRACT	Lifecycle Renewals Framework
COMPLETION	2022





Need

With vehicle numbers increasing at 7% per annum, and the estimated cost of motorway lane closures at £50,000, undertaking essential improvements to the Strategic Road Network requires agile thinking for safe and predictable scheme delivery.

On the M25 at Gade Valley Viaduct, a 400m long, 11 span box girder bridge carrying 8 lanes of traffic over road, rail and a canal, had to be strengthened. The challenge was developing a repeatable technical solution that could be safely implemented while maintaining journey time reliability.



Figure 1 - Gade Valley Viaduct

Solution

One answer was to test and refine the design ‘offline’ before applying it to the ‘live’ motorway environment. We did this by taking learning from 2 similar schemes on the M4 at Boston Manor and at Chiswick. There we had used off-line prototyping in the form of trials on a replica ‘mock up’ section of the bridge in advance of construction. In both cases it had been extremely successful in verifying the design but also in proving methods and training specialist trades.

Applying this successful approach at Gade, we fabricated a full-scale section of the box girder beneath the existing bridge.

Working with Connect Plus, Highways England and designer COWI we optimised the bolt installation and tested the design offline in the mockup. Over the 5 year project we would install 9,000 bolted plates, 2570m new welds and 273 plasma dressed welds. It was critical to be efficient, safe and most importantly guarantee confidence in the solution before work commenced on the actual structure.

The ‘mockup’ also became an invaluable asset during construction. We verified the welding technique and the specialist’s competencies.

Alongside this, incremental improvements in design and techniques were regularly tested prior to implementation. Safety training and even a full emergency rescue simulation were also undertaken in the mockup.



Figure 2 Off-line mock up

Outcome

On road/rail infrastructure works where it is mission critical to keep the public moving an offline prototype ‘mock up’ can play a vital role prior to undertaking work in the ‘live’ environment.

This upfront investment can be returned to customers through safe execution of the works, accurate cost and programme predictability, and journey time reliability.

Importantly, assurance in the performance of the solution enhances certainty for planning future network maintenance interventions.