



## The drive and potential for innovation in existing structures

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### Abstract

Constraints drive innovation and our ageing and heavily used existing infrastructure should be a breeding ground for innovative ideas. The strong drivers for innovation can realise substantial value if the programme and cost barriers associated with traditional procurement, by lowest design cost and compressed programmes, can be overcome. Case studies show that with designers and contractors open to collaboration and novel approaches, and clients focussed on long-term benefits, innovation can lead to substantial savings. This paper includes two case studies.

**Keywords:** Bridges, Fatigue, Assessment, Repair, Instrumentation, Monitoring.

### 1 Introduction

The potential value of innovation in existing structure projects is substantial due to the high cost of work on structures in-service and the cost of disruption. The paper explores the drivers for new applications or developments, the challenges posed, many of which relate to funding and programme, and how these can be overcome. Case studies are drawn from our work on high profile existing structures forming part of the M25 network around London.

### 2 Opportunities and Drivers

We have an aging infrastructure with many major highway structures built in the 1960s, 70s and 80s. New problems are developing or coming to light in these structures which now form key parts of our infrastructure. Demand also continues to increase which drives the expansion of capacity on the network. New solutions are required to deal with these new challenges.

The costs of reduced availability of our infrastructure must drive new ways of working to carry out the maintenance, repairs and strengthening required while minimising disruption to road users. Disruption extends not only to closure but also reduced speed and capacity.

We have a great opportunity as the existing structure can be considered a full-scale model! Scanning and monitoring gives the option to use as-built geometry in analyses or even to determine in-service stress changes directly. This is particularly useful in assessing the effect of as-built distortion or in assessing vulnerability to fatigue.

### 3 Challenges

Construction can be a conservative field and innovation requires us to step outside existing guidance. We must not shrink from using departures from standard where these can be justified and bring value.

Work on existing structures may require the development of project-specific procedures to optimise their effectiveness. Testing of contemporary material may be required to confirm the applicability of the procedure. This requires a funding and programme commitment from the client early in the project.

Accurate assessments can require accounting for past loading history as well as predicting future loading. Codes are not set up to provide this information.