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Editorial: Special issue on Railway Bridges

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Throughout the world, railways are experiencing a renaissance as efficient movers of people and freight. Nowhere is this more obvious than in the United Kingdom—some routes that were at risk of closure only a few years ago have again become vital transport arteries. A complete change of culture within the UK rail industry has been required to move from managing slow decline (as experienced up to the 1990s) to managing and enhancing the network for increased capacity.

Railway bridges present a challenge because they are long-lived assets, often built at the time of the line's construction and little modified since. Although robustly constructed for the loads of the past, material deterioration and deficiencies resulting from earlier and simpler design processes mean that some will require strengthening or redecking.

Due to the advent of modern computer models and analysis techniques, the assessment to identify and prioritise structures in need of strengthening or replacement has become a highly developed process. In addition, the increased sophistication of these techniques can often demonstrate that strengthening is not required and many rail structures continue to cope well with the increased weight and frequency of modern traffic.

Railway bridges, with few exceptions, fall into several distinct groups.

- (a) Small to medium-sized metallic railway bridges often seem deceptively simple with modern through-deck designs appearing to the lay person as little different to before. In reality they are sophisticated, robust designs with a much greater fatigue-life and an ability to carry a ballasted deck at shallow depth where headroom below is limited.
- (b) For larger metallic railway bridges deck replacement is not usually a viable option. The repair and strengthening of structures that are often complex and not structurally working as the original designer intended is a significant difficulty. However, experience has shown that engineers find this type of work challenging and rewarding—especially when the structure is well known and of historic value.
- (c) In the past, arches were the favoured structural form for the greater proportion of rail-under bridges, where the construction depth was adequate. Arches were well

understood and easily constructed, often using local materials. These bridges have served the railways well and have continued to give good performance. However, they can be load sensitive and accelerated deterioration can be caused by the advent of regular high axle load freight traffic resulting in strengthening works being required. There has been a knowledge gap with regard to the understanding of masonry-arch behaviour and this has had to be re-learned by engineers who in modern times have not been taught the principal structural actions of arch bridges or come into contact with artisans building or repairing them. It is important that this knowledge gap is rectified as arch bridges will continue to be an important part of the rail network.

- (d) Concrete under-bridges are fewer in number and generally reliable structures for the railway. Chloride attack can be a problem where salt spray is present from highways or a coastal location but it is still a much less significant issue than others experienced by highway authorities. Most concrete rail bridges are robust, reinforced or pretensioned beam constructions, and, with the exception of a small number of post-tensioned structures, they have performed well.

As the rail network is developing and modernising, bridges are being viewed less as individual structures but more in asset management terms as components of the route capability. Structures and other assets are maintained to minimise whole-life cost with respect to the required capability and reliability of the route. The improved asset-knowledge and systems that are being put into place will allow bridge managers to plan for the future, maintaining reliability and targeting capacity enhancements where there is a need to upgrade routes for a heavier and increased volume of traffic.

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There was a good response to the call for papers for this special edition focusing on railway bridges. Unfortunately, not all papers were ready in time for inclusion; and, indeed, there is a limit to the extent of one issue. The editorial advisory panel for *Proceedings of the Institution of Civil Engineers—Bridge Engineering* have taken the decision to ensure publication of all such papers, by including them in the September issue.*

*Barry Mawson, Chairman and Honorary Editor