Case Study: Reliability-based Assessments for South Wales Trunk Road Agent

The Neath River Bridge (constructed in 1955) is a 17-span viaduct, approximately 580m in length, carrying the A48 Trunk Road. The dominant feature of the structure is the 91.4m river span which is 27.4m above mean high-water level. The superstructure comprises riveted steel plate girders supporting a 200mm thick reinforced concrete deck slab. The steel plate girders are supported on reinforced concrete crossheads which are in turn supported on concrete columns.

The Briton Ferry Dock Viaduct (constructed in 1955) is an 11-span viaduct, approximately 320m in length carrying the A48 Trunk Road. It is an 11-span riveted steel plate girder bridge with an in-situ reinforced concrete deck slab.

Burrows Road Bridge is a three-span structure comprised of longitudinal and transverse plate girders and a reinforced concrete deck carrying the M4 carriageway at Llandarcy (Junction 43). The original structure was constructed in 1959 to carry the A48.

Structural assessment was initially undertaken on all bridges in accordance with the DMRB standard for the assessment of highway bridges (CS 454) with results suggesting that Burrows Road Bridge was unable to carry 40 tonne (Normal Traffic) live loading.

A decision was therefore made to undertake a reliability-based assessment of Burrows Road Bridge (and at the bridge owner’s request for the other two bridges) in accordance with Appendix B of CS 454, reducing the partial factors on actions and resistance in line with achieving an acceptable safety-based reliability level. This allowed Burrows Road Bridge to achieve a 40-tonne assessment live load rating, mitigating the need to restrict the use of the structure (and associated carbon emissions).

Through the application of these assessments, and through collaborative working between Atkins, SWTRA and Welsh Government on these structures, this negated the need for an estimated £4m of strengthening works and the associated working programme of 45 weeks, together with mitigating the carbon emissions arising from the construction phase and associated delays to road users.

Contributor(s): South Wales Trunk Road Agent; Welsh Government; Atkins.

Tags: Build Nothing, Existing Bridges.