

Transverse Acceleration causing damage in a masonry arch bridge

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Abstract

A change in the form and type of traffic utilizing masonry arch bridges has been reported in the literature to cause an unexplained level of transverse damage in the bridges, even when the vehicle loading is within the accepted limits. Of the three most probable causes for this problem, the issue of transverse acceleration on the bridge is investigated here. Acceleration response on the bridge can be measured using standard 3 axis accelerometers with ambient vibration providing the minor test loads and vehicle loads providing the major test loads. A method is developed for testing the masonry arch bridges for detecting damage caused by transverse acceleration specific in the bridge and an example from measurements of masonry arch bridges in the UK is used to demonstrate the problem and solution.

Keywords: masonry arch bridges, accelerometer.

1 Introduction

Masonry arch bridges form an integral element of the European transportation system and have done so for at least a millennium. An example of a simple masonry arch bridge is shown in Figure 1.



Figure 1. Test Bridge near Bristol and Avon River

The bridge is adjacent to the River Avon. The small watercourse which it crosses has the original Roman boat harbour at its mouth. The bridge is a

skewed arch bridge incorporated in the 20th century into the A4 Project, then the most expensive road project in the UK. Monitoring of the bridge occurred on the fourth arch on the eastern footpath as shown in Figure 2.

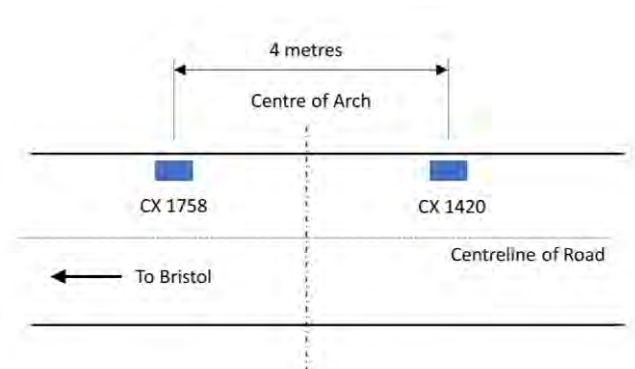


Figure 2. CX1 location details