Inquiry into the circumstances surrounding the closure of the Forth Road Bridge

Written submission to the Infrastructure and Capital investment Committee

Bob Hopewell, MICE, C.Eng, former Supervisory Engineer, Flooding and Structural Design, North Ayrshire Council (retired)

I am a retired professional civil engineer with over 35 years’ experience of road and bridge design and construction, flood management, coast protection and quality management in local government in Scotland. I retired in 2011 and my role with North Ayrshire Council included the function of bridge manager for the council's road bridges and I was also project manager for the replacement of the largest road bridge within North Ayrshire. During that time I was also a member of the SCOTS Bridges Group.

Although there are no road bridges of the scale and complexity of the Forth Road Bridge within North Ayrshire, there are a number which require to be managed in a similar fashion. I will provide some comments on the issues surrounding the closure of the Forth Road Bridge but I consider that it would be of benefit to the Committee to begin by briefly outlining two such projects for which I was responsible and which had similarities to the issues with the Forth Road Bridge.

The first is the replacement of an ageing steel Bailey bridge over the River Irvine in Irvine. The bridge was a 3 span truss type structure with articulation similar to the Forth Road Bridge in terms of pinned joints and the possibility of steps forming in the decks if failure occurred. A decision was taken in the late nineties to strengthen the bridge to current standards to allow a weight restriction to be removed and to extend the life of the bridge by some 10 years or so until funding was available for its replacement. During the design process for the new structure, the existing bridge started to deteriorate more rapidly and decisions had to be made as to how much funding should be allocated to maintenance works given that the bridge was shortly to be replaced. Civil Engineering is about management of risk and therefore risk assessments were carried out and any non-essential work was deferred. The frequency of inspections was increased, annual maintenance works became 6 monthly then 3 monthly. In the months before the start of construction of the replacement, the bridge was being inspected weekly and a weight restriction had to be re-imposed. Finally, the decision was taken to close the bridge some weeks in advance of the start of construction due to serious faults emerging in other elements which had not been foreseen. Management of risk and dealing with unforeseen circumstances is the very nature of all civil engineering and is a sign of good management.

The second is also a major bridge over the River Irvine. This bridge is a 1970's composite steel and concrete 3 span structure with steel parapets and demonstrates a similar type of fault to that with the Forth Road Bridge albeit with a completely different element. The steel vehicle containment parapets had never given any cause for concern and regular inspections had found them to be in sound condition and they were only about half way through their design life. A routine annual inspection unexpectedly found that the bases of the parapet posts were displaying
significant signs of rust and the inspector called for a detailed inspection by an experienced engineer. Destructive testing (with a screwdriver in this instance) showed that most of the hollow steel posts were rusting from the inside and as a result the parapet had lost a substantial degree of its vehicle containment value. Steps were taken immediately for temporary full containment barriers to be put in place until funding for replacement barriers was available. The likely cause was the corrosive nature of the air and how it travelled within the bridge environs which had not been considered significant at the design stage.

Both of these examples show that despite a good inspection and maintenance regime, unforeseen problems can occur which result in significant costs and disruption to the travelling public.

With regard to the Forth Road Bridge, although I am now retired, I have taken a keen interest in the current issues with the bridge and I have familiarised as much as possible with the coverage in the civil engineering media and the available information on the old FETA website and the current Forth Road Bridge website.

Having read all the information on the FETA website, I would concur with the view that the planned maintenance work had nothing to do with the current fault (which was certainly not predictable and occurred without warning) and was primarily to address a specific issue with the expansion joints. It is clear that the work would have necessitated replacement of the steelwork where the faults occurred but it is equally clear that it was not being carried out to address these faults as they did not exist at that time.

The key information on the FETA website is the section on the replacement of the expansion joints which is comprehensive and understandable and I have no doubt that the Committee will have taken the time to have familiarised themselves with it.

The main recommendation is the regime of inspections and monitoring and, as would be expected, these were set out and followed by FETA’s engineers and then passed to Transport Scotland’s engineers to be included in the Scottish Ministers Requirements which govern the current contract. The current bridge operator, Amey, would have reviewed this regime and carried out the bridge inspections as laid out in the contract otherwise they would not have been able to identify the fault and act as fast and appropriately as they have.

With regard to funding, this has always been and always will be an issue that has to be taken into account in every decision that engineers have to make. Having undertaken the necessary risk assessments in terms of public safety and integrity of the structure, any professional bridge engineer would have made the same recommendation to the Scottish Ministers that the works could safely be delayed in order to achieve the savings brought about by the construction of the new bridge and which were necessitated by Westminster cuts to the Scottish budget. It is the duty of professional engineers to use public money wisely providing that public safety is uppermost at all times. No professional bridge manager or in the case of major bridges, bridge master would have recommended delaying the work if the bridge was expected to become unsafe.
The Scottish public and its elected officials put a lot of trust and faith in the civil engineering profession. With respect to the management of bridges there are three main points which I hope the inquiry will consider during its deliberations:

- If there was an immediate risk to the safety of the travelling public any professional bridge manager would be duty bound to take appropriate measures to mitigate that risk otherwise the only alternative would be to close the bridge.

- No public bridge authority would refuse to fund essential maintenance that was considered to present an unacceptable risk to the travelling public.

- In my opinion, the integrity of a bridge manager would mean that it would be a resigning matter if funds were refused and the bridge were allowed to remain open against his/her recommendation.

These are my personal opinions and views and I trust they may be of some assistance to the committee.

Bob Hopewell, MICE, C.Eng
former Supervisory Engineer, Flooding and Structural Design
North Ayrshire Council (retired)
28 January 2016