

This is rather a momentous occasion. The end of the 5th year of Bridges and still no sign of things drying up. It has also been a momentous few days in the bridge world with a number of venerable bridges lost or badly damaged. Some of those that look beyond repair may not be and I hope to offer help in the rescues as the engineers concerned begin to lift their heads from the initial frenzy of inspection and assessment.

As usual, there is a pdf copy available [here](#), and a full archive [here](#).

There are a number of reasons for returning to Cheltenham, beginning with the fact that Hamish and I went back specifically to get some more photography and to do at least a rudimentary measure. One outcome of that is a [3D model of last month's bridge](#). That should open in Sketchfab and allow you to move around it using the mouse. If it doesn't work, it might be worth trying another browser, I use Chrome and it doesn't seem to work there but does in IE.

Having returned to the scene, I wondered whether there would be another similar bridge on the line. Google Earth doesn't help a lot because street-view doesn't extend to cycle tracks and disused railways. However, [the next bridge East at Malvern Road](#) proved to be very interesting. It is also a flying arch but is skew and has been widened with two concrete rib arches.



The ribs were all I could see from a distance so I thought perhaps the whole arch was gone. As you can see from here, though, there is a similarly distorted brick arch behind.

As you get underneath, the concave face of the spandrel wall is emphasised by the straight plan of the concrete rib.



Notice also, the regular pattern of mortar dots marking places that have been pinned through the ring.

Striking in the view below are the cracks marked with chalk. They seem more or less parallel to the edge. There are more than can be seen here.



The wide angle lens (16mm on an APC frame) distorts the picture below a little, but it does serve to show off the bevel on the acute edge of the arch. One day I will find out how that was done.



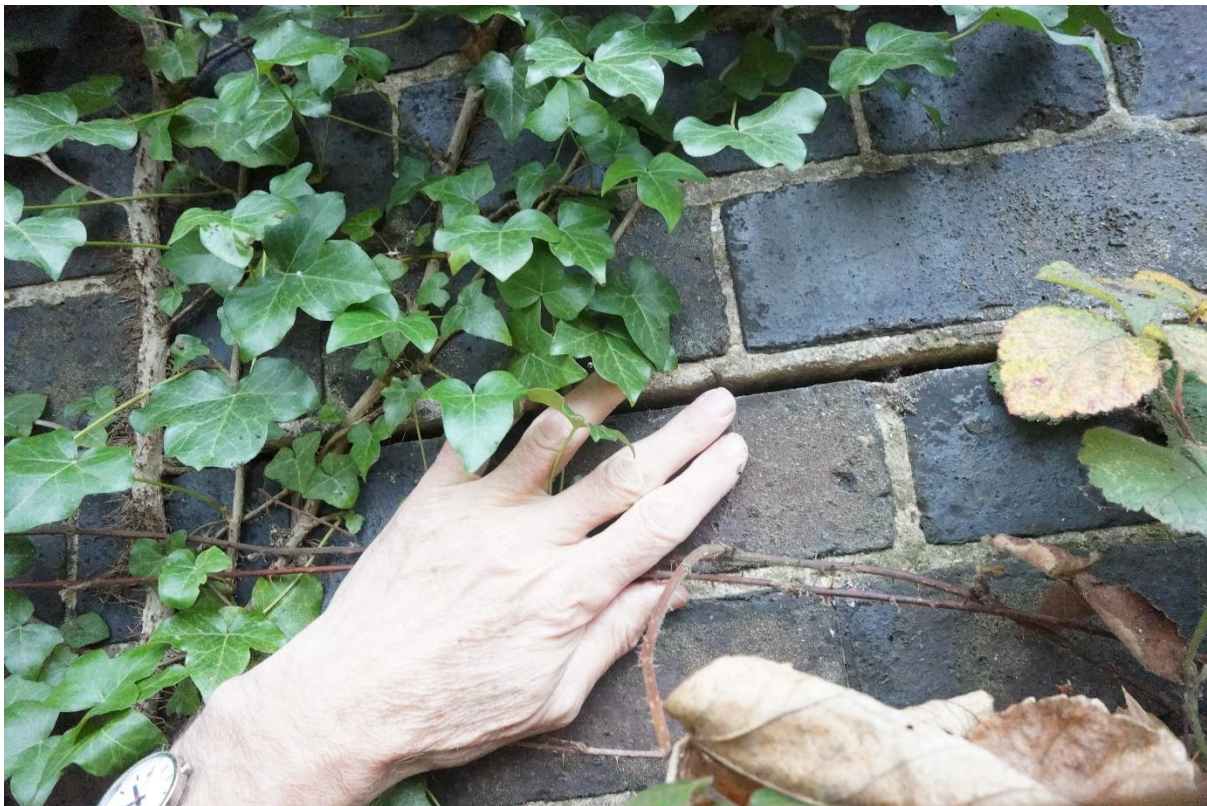
Notice how it twists from being in line with the arch at the crown to quite a steep angle at the springing.



The pic above shows areas of considerable mortar loss and some consecutive perpendicular joints that come very close to alignment, creating a line of weakness on which a crack might form.



As at last month's bridge, there is a horizontal crack in the spandrel and some degree of ring separation near the end of it. Note the drain, which must come from the top of the backing, though the crack is below. The crack is quite substantial.



There has certainly been some loss of continuity in the ring.



Under the concrete frame, some stonework has been exposed. I assume this was originally below ground.



[And here is a 3D model of this one.](#) But please read on.

2016 and all that

Masonry bridges generally

As a result of the monitoring work we have been doing, my ideas on viaduct behaviour are in a state of flux. A paper for the ICE Bridges journal is nearing completion. In the medium term this might explain some unexpected damage that we have been witnessing.

We have also come across a number of skew arches (like this one) that have systematic cracking in the skew direction at a number of places through the width. The number of these cracks is particularly perplexing and we are working on understanding them. The first ones we found were carrying railways but.....

Archie-M

I think we really are getting close to a fresh release with some substantial new functions, including carrying the thrust down the abutment.

Archie Mobile

At the same time, using a different team, we are working on an Archie App for android devices. It may turn out that some of the functions I am wanting to add will fit more easily into the new build. If it does, we will try to migrate the App into the main stream windows program.

Bill Harvey Associates

For many years, I practiced alone, using various part time helpers to keep things moving along. My son Hamish joined the firm nearly 5 years ago. His main interest has been computing and data acquisition. He built and installed the monitoring equipment we put on the Cleddau bridge and was appalled at the difficulty of getting loggers and computers to communicate effectively. The need for something more portable has led him to design and build a combined system which has battery power, 8 channel simultaneous logger, a computer to drive it and various forms of communication. The units can be linked with a single wire after which they synchronise together. They have WiFi, networking and 3G connections and a web based interface. For our own field work, one of the most useful benefits is the sending of a graph by email within seconds of a completed run. The system can sustain high data rates over long periods, so it can be set to record and stopped soon after an event (eg a train crossing a bridge) so the risk of missing such an event is greatly reduced.

It is his intention to offer these units on the market shortly, though not before we have given them a substantial workout ourselves.

At the end of the year, we are heavily involved with Freyssinet in a project to lift a railway arch which should reach completion in April.

Moiré Tell Tales

[Our Moiré Tell-Tales](#) have recently been used in measuring the behaviour of the Forth Road Bridge Bearings after a partial failure. This follows on from their use on Humber which is referenced on our web site. At Forth, the issue of access was obviously serious. We are now able to make measurements from video of a tell-tale and record displacement to 0.1mm accuracy.