OBVIS

Bridge of the Month No26 February 2013
Polsloe Station

BILL HARVEY ASSOCIATES LTD

News and Events

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Follow Bill on Twitter @BillHarvey2

Sutherland History Lecture 2012 at http://bit.ly/J4gblz

Level 0 assessments

Bill and Hamish are developing tools to help with the Level 0 assessment process. If you know anyone who might be involved please ask them to email bill@obvis.com for more information.

Seminars and Lectures

26th March Belfast, Hosted By Doran Consulting
14th May, Motherwell, Hosted by Amey. Contact Philip@obvis.com

Please contact Philip@obvis.com if you are interested in attending a day seminar on Arches and Archie. The program for this year includes:
Bill's recent work (some interesting bridges!)
Skew Arches
Ring separation
Causes of live load damage
We charge £100 for the day but if you wish to host a session at your office we then wave the charge.

Recent Publications

Two papers in the ICE Bridge Engineering journal:
Stiffness and damage in masonry bridges. Proceedings of the Institution of Civil Engineers, Bridge Engineering 165 September 2012 Issue BE3 Paper 1100032 Pages 127–134 http://dx.doi.org/10.1680/bren.11.00032
A spatial view of the flow of force in masonry bridges, Proceedings of the Institution of Civil Engineers, Bridge Engineering 000 Month 2012 Issue BE000, Paper 1100026, Pages 1–8 http://dx.doi.org/10.1680/bren.11.00026

Forthcoming Lectures

28th Februrary, Plymouth, IStructE. "*The Devil is in the Detail*", on the responsibilities of an engineer, or what I did on my holidays.
4th April, Dorchester City Club ICE. "*Arch Bridges*" more detail later.
1st May, Swindon City Club. "*The Devil is in the Detail*"
18th July Poole City Club "*The Devil is in the Detail*"

Polsloe Junction Bridge

This bridge, over Pinhoe Road in Exeter carries the branch line from Exeter to Exmouth at http://goo.gl/maps/KtcI9. This screen grab shows that the single track is slightly more skewed than the bridge itself. It also illustrates the ability to measure such things as skew from publicly available data.

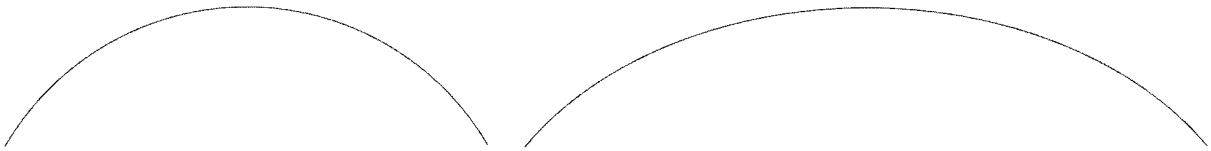
If you are not already familiar with it, the alternative “Birds Eye” view from Bing Maps has its own value.

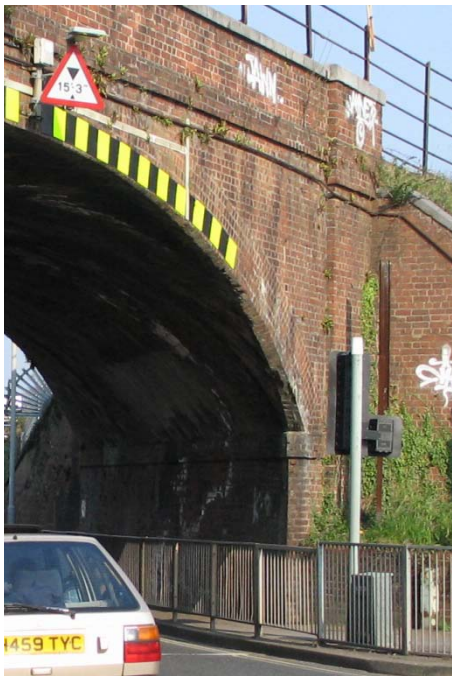
The bridge shows a number of the classic issues of skew bridges and one or two features I only noticed recently.

This is, as close as I can get, a view normal to the spandrel walls. The shape looks a little distorted, particularly at the right hand side where the curve seems to sharpen towards the springing. Part of the problem with such simple observation is the chequer board “please don’t hit this bridge” warning.

The road is too busy to stand in the middle and get a square shot and the skew is so great that perspective will distort the profile anyway. This picture was taken from a traffic island some distance away but the foreshortening caused by the telephoto lens helps. This shows clearly, I think, that the arch is circular on the square span. That means that the spandrel view (top) should show an elliptical curve with the major axis horizontal. This is quite hard to spot on such a modest segment but the square view is diagnostic.

These two profiles are mirrored below, where it is also easier to see the 120degree angle of the basic arch form. Like most arch bridges, this has probably sagged somewhat, creating an even flatter central portion.





Look closer, though, at the right hand corner.

Here, you can see that there is a chamfer on the corner tapering from nothing near the crown to about 9in or a brick wide at the springing and down the abutment. This taper is clearly intended to remove the razor edge of the arch and is pretty much essential in highly skewed bridges built entirely from brick.

A better view of the soffit shows the severity of the angle of skew and the concomitant angle of the helical courses of brick.

Notice here that the helix meets the edge more or less at right angles at the crown but at a progressively more acute angle as it progresses towards the springings. This inclination is particularly disadvantageous at the obtuse corner (of the bridge, but where the edge of the arch inclines towards a razor edge). That is part of the reason for the chamfer. This fixed helix also results in very poor bond of the brickwork in the corner shown above. The repairs emphasise that the bricks here are essentially stack bonded.

Notice also, though, that the end of the bricks in the bottom course are lozenged whereas those in the higher courses are still essentially square (see the detailed picture below). I have looked at this bridge many times since I moved to Exeter in 1995 but I only noticed this detail when pulling out photographs for the note. What this shows is that only the inner course is laid in a spiral. The outer 5 rings are laid horizontally.

But at the obtuse corner (to the right here) there are six full courses of square bricks above the chamfer compared with six total at the left. So the ring has gained thickness round the ring.

This picture of the edge shows how it is constructed. Alternate courses have a brick right through on the diagonal and a trimmed soldier up the spandrel face.

It seems unlikely that this taper is across the full ring, and without proper measurement it is impossible to know whether the true circle is the intrados or the line of the courses. Construction convenience, though, makes a basically circular centre almost certain.

At the south facing obtuse corner, the bricks are clean and original. The reason for the lozenge shape is clear. Note also how the bonding has failed again and the edge bricks are coming free. This is the sort of thing that is prevented by the complex coursing at Cowley Bridge Junction (BoM11 August 2011), but at what cost.