



Bridge of the Month No22 October 2012 Leaths Bridge, Castle Douglas (demolished)



There is a group of people in Germany by whom I am known as the Brueken Vernichter (Bridge Killer). It was a mistake to give a talk on tests to destruction to a group of monument conservation engineers! And here I am re-affirming the reputation. I hope the knowledge gained is sufficient justification.

But first the months notices.

News and Events

Civil Engineering Heritage Exchange (CEHX) is an email list run by the Institution of Civil Engineers provides an email platform for discussion of issues pertaining to history (which is very broadly defined) a typical question might be “where can I find drawings for????” and they get answers.

Sign up at <http://bit.ly/PuEVFq>. I worried about getting too much traffic but I don't.

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.

Two papers in the upcoming edition of the ICE Bridge Engineering journal:

Stiffness and damage in masonry bridges. (now published), and

A spatial view of the flow of force in masonry bridges

Both aiming to enhance understanding.

Bill will be in New Zealand from 9th to 27th November (away from the office for rather longer)

Speaking in Auckland and Whangarei on 21st 22nd and 23rd November. Details from bill@obvis.com

Leaths Bridge, Castle Douglas

<http://goo.gl/maps/NXW6S>

Bill Harvey Bill Harvey Associates Ltd and OBVIS Ltd

pdf from www.obvis.com/news



We will return to Leath's bridge another month to look at the outcomes of a test there but in the mean-time here is a simple review of the bridge itself. It is just to the East of Castle Douglas in SW Scotland. Long disused, it used to carry the A745 over the railway but the railway was closed and the alignment taken over for realignment of the road. The bridge was left in a loop and totally neglected for many years.



Since it was a bridge over a railway, I rather imagined it would have a round number span in feet but the number that came from a survey was just less than 28.3feet. This is mid-way between two “likely” dimensions of 28.25 and 28.333. This question was resolved when I realised that the skew is exactly 45 degrees. The skew span is 40feet and the square span therefore necessarily 28.285feet, very far from being a round number but not a leading dimension. The original rise seems to have been 5feet, which gives an 8:1::Span:rise ratio on the skew span. With such a small angle of arc and with considerable later distortion it is very difficult to determine whether the centres were circular on the square or on the skew but on the skew direction, the round numbers seem likely to be those used. The leading dimensions require a radius on the skew of 42ft 6in exactly, whereas on the square the radius would be 22ft 6.01in which is remarkably close to a “round” number.

The arch is both shallow and thin, typical of the construction of skew bridges by John Miller, though this bridge was apparently designed by his son.



Note here how the beds in the wall sag in the lower courses and are gradually made up again.



The down turn in the more random coursing of the spandrels is obvious here. Also note the spalled points of the skewbacks.



From this level it is obvious that the cope stones have a sag despite all the efforts of makeup. One might think this would be a result of abutment movement but we will see later that this is not necessarily the case.



Once we began to dig the fill off the arch, the internal construction became clearer. The sloping face to the left here is effectively concrete, though made with shards of stone and mortar.



As the concrete was removed, the general condition of the arch extrados became clear.



This shows more clearly the nature and depth of the haunching. Readers might wish to turn back to the July 2012 edition and consider the implications for the Bridgemill bridge, built in the same year barely 50 miles away.



Once all the haunching was removed we could see the great depth and the hollow construction of the abutments.



This very small shoulder supports the surface skin of the spandrels. Behind that dressed stone is a random rubble wall.



The very shallow depth of the arch itself is made abundantly clear by this edge view.



The bridge was demolished at the end of our visit. Note here how the three stones still stuck together show the twist built into the individual stones so that the mortar beds are constant thickness. Note also the teeth on the skewbacks and the way the bottom edge of them has spalled off. Similar damage is also evident in an earlier photo of the complete bridge above.