Hazlehurst lock 12 bridge,

Proposed method statement

V1

05.12.19

Rowan Taylor, BA, AWCB.

The content of this method statement is based on a non-intrusive, visual-only inspection and offers no insight into the structural condition of the ironwork involved and may not contain information which emerges during a more in-depth assessment of the ironwork. This method statement is copyright-protected and is not to be shared with third-parties outside of the author and the client. Any injury which may occur through the incorrect use of this method statement by third party contractors, the client or unqualified persons is outside of the author's responsibility as the methods referred to within the method statement are considered familiar only to the author. Use of this method-statement in relationship to the ironwork discussed herewithin by persons unconnected to the author will incur a consultancy fee of £2,000 while not accepting liabilities arising from the content of this method statement.



Figure 1: Hazlehurst lock bridge, December 2019

1) A Brief History of the site.

Hazlehurst lock 12 can be found on the Caldon branch of the Trent and Mersey canal.[i] The trent and Mersey canal project was authorised in 1766 and the first cut was by Josiah Wedgewood of that year. The Canal was officially completed in 1777, featuring 70 locks and 5 tunnels. In 1847 the canal was bought by the North Staffordshire railway company.[ii]

2) Description and visual-only condition survey of the bridge.

The bridge at Hazlehurst lock 12 appears to have been a split bridge originally. Split bridges were in effect two facing platforms with a narrow gap between them allowing for tow-ropes to be passed through the bridge unencumbered.



Figure 2: location of the split, prior to sagging of the structure.

The bridge itself has sagged over time, closing this gap. It also appears to have moved slightly towards the lock in its centre. Corrosion and/or failed fixings and /or failed anchor points appear to be responsible for this. It is also possible that the bridge sustained a lateral impact at some stage in the previous decade or was overloaded, based on the distortion evident in the modern handrails which appear to have been

fitted between 1980 and 2000. It would appear at this stage that the modern handrails are integral to the structure of the bridge.

Based on the design style, condition, corrosion state, fixing methods and materials used; the bridge itself likely does not date from the construction of the lock which would be prior to 1777 and the completion of the canal.

Instead I would suggest that the bridge dates from a period post-acquisition by the railway and is likely to date from between 1870 and 1900. The presence of mild steel, if confirmed, will post-date the construction beyond 1860 with certainty. It was likely constructed as a replacement for a previous bridge, either because the previous bridge was failing or in order to speed-up the lock traffic by providing a split bridge.

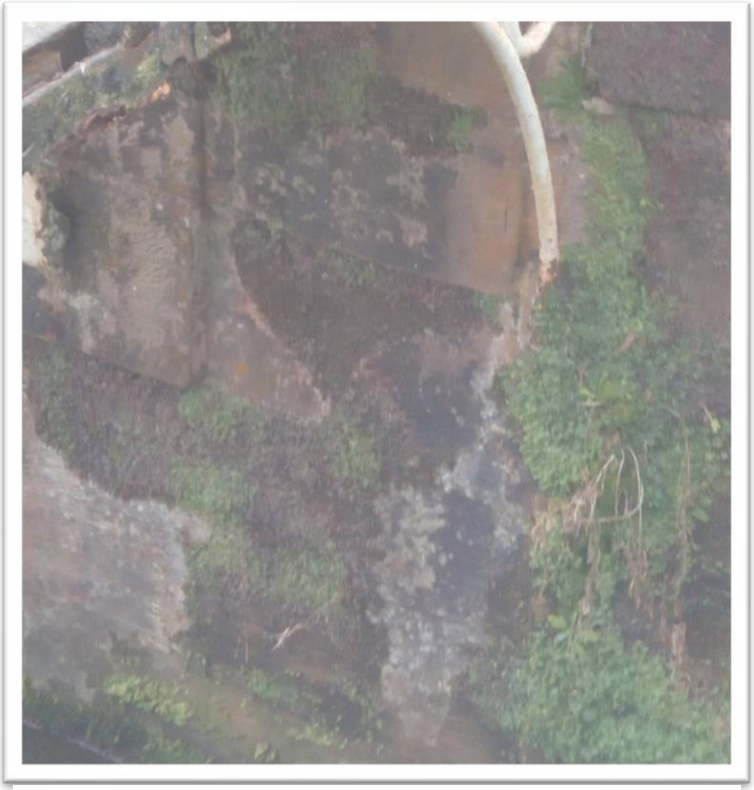


Figure 3: Grooves in the stonework, one of which contains a leaded pin (obscured in photo) may be traces of a previous structure or bridge.

Grooves cut into the side of the lock and the presence of one surviving leaded-rivet inside the groove off-side, lockside groove may be the traces of the previous bridge – possibly iron, possibly timber, or may be unrelated.

3) Specific condition of the bridge and proposed remedial work.

a) Angle iron beams.

Four angle-iron beams support a timber deck. The angle iron beams appear to be bent ant 90 degrees on the ground-side in order to be anchored into the stonework of the lock. It is probable that 1 or 2 rivets are also used to fix the angle into place. It is likely that these anchor-rivets, if present, are leaded into the stonework. The angle iron support on the towpath, lock side is in an advanced state of corrosion with rust jacking visible. Condition of the remaining three lengths of angle iron is indeterminate at this stage. Based on the corrosion patterns and the angle-iron, it is likely that these are made from early mild-steel with a slightly raised carbon content.



Figure 5: Angle-iron beams, probably early mild-steel. The one on the left of the image has degraded.



Figure 4: Curve visible at the anchor point, indicates that the angle iron is bent and set into the stonework.

Restoration by welding new steel sections will be attempted if/when possible. In the event of a need for replacement, as will likely be the case with the lockside, towpath example, an S325 replacement will be manufactured to the same dimensions and shape as the original and date-stamped for identification.

b) Support braces.

Four support braces - two per platform, placed either side of the deck, help the angle-iron support the weight of the bridge. The braces are forged from what is likely coarse wrought-iron round bar, with wider bar scarf welded onto each end and spread into a foot. The reason for scarfing broader material onto the roundbar is to provide enough volume of iron to produce the broad feet.

The lower feet are hot-punched with a single hole and a fixing wedge is rivetted perpendicular to the foot in order to be leaded into the stonework of the side of the lock. On the tailside of the bridge,

both of these lower fixings have become unattached from the masonry of the lock. The towpath-side anchor point has lost its lead, while the lead still encapsulate the anchor on the offside.



Figure 6: Failed anchor point. The rivetted anchor has come out of the stonework with its lead fixing, possibly due to failure of the stonework.



Figure 7: Failed fixing towpath side, with rivetted anchor having come loose from the stonework, possibly due to cavities in the lead.

In order to remove the bridge for restoration, the removal of these four anchor points will be necessary. While one anchor point has already come out, it will be likely necessary to remove the rivet head from the anchor point in order to take-down the braces. The anchor points will then be removed from the stonework by drilling and chiselling the lead. New anchors will then need to be forged unless the originals can be repaired to a satisfactory degree.

The upper feet are thinner and narrower and appear to be double-punched in order to be fixed to the deck of the bridge from the underside. On the lockside of the bridge, both of these upper feet appear to be in a state of degradation with loss of around 40% of material in the areas of corrosion.



Figure 8: The upper feet of the lockside braces show deep corrosion.

It is likely that the upper feet will simply need unbolting from the angle-iron.

Areas of corrosion will be cut-out and new

material will be forged to section and welded into position. It is best-practice to replace missing material in as like-for-like a manner as possible and I would thus suggest scarf-welding new wrought-iron material to replace the corroded fabric. It would be equally possible to gas-weld a new wrought iron section into position. While it would be possible to punch the holes in the upper feet prior to fitting, it would make the installation of the bridge easier to drill these fixing holes in-situ.

c) Ringwelded support loops.

The braces are prevented from distorting by one ringwelded coarse iron loop per brace. These loops Have at least one fixing point holding them to the brace with a blind rivet. It can be expected that a second rivet would be affixed to the deck of the bridge and a third rivet would hold them against the stone work – however a visual only inspection of the bridge did not confirm this. The forge-welded rings appear to have been drilled rather than punched. This is an inferior way of piercing the rongs for the rivets as it removes material, thus weakening the rings. It may therefore be the case that the rivets are brazed into the rings, though no evidence for this was immediately visible. One of the rings on the lock side, offside brace is skewed. It is probable that this skew is not due to distortion in the bridge but was fitted in this manner in order to allow the ring itself to sit in a groove in the stonework. The groove was probably unknown to the workers who made the bridge, resulting in this poor positioning.



Figure 9: Lockside support ring. This is not sitting square to the bridge or brace and is sat in a previous groove in the stonemasonry. It is likely that this is original to the construction of the bridge.

While it would be preferable to not remove the rivets holding the forgewelded rings to the braces, this may be inevitable in order to remove the bridge components for restoration/conservation works. While it is likely possible to leave the brace/loop joinery in position, it is probable that the loop/masonry joinery will need drilling out and the anchor rivet removing from the stonework. It may also be the case that the loop is rivetted rather than bolted to the angle-iron beam, in which case the same principle applies.

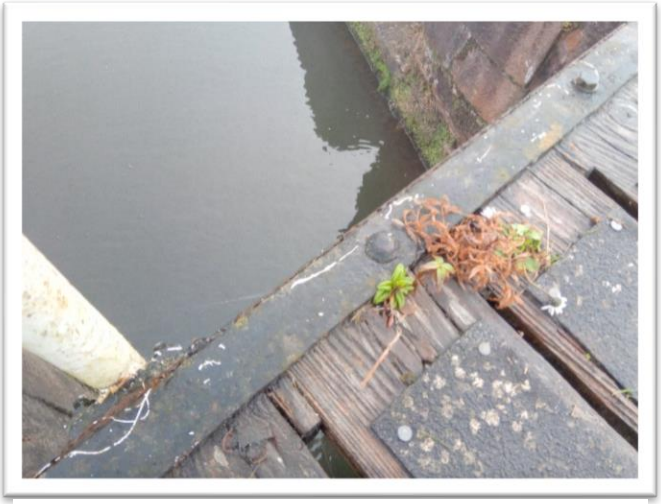


Figure 10: Possible original fixing still in place.

d) The deck.

The wooden planking of the deck is bolted to the angle-iron beams of the two platforms. Two of the fixings holding the decking appear to be hand-made and are possibly historical examples. All of the remaining fixings are modern and likely date to the last time the deck was replaced.

Wooden deck replacement will be done by CRT.

The modern fixings will be removed and replaced with reproduction, hand-made fixings to match the two historical examples already present on the bridge. These replacement fixings will be forged from S325 steel.

Four metal strips, likely wrought iron, are placed over the top of the wooden decking, lengthways to the bridge and appear to act as washers. It is possible that these are hot punched with square holes to retain the fixings and prevent them from rotating when nuts are placed on the underside of the deck.

Condition of these strips is good and all that will be done with them is to strip them of their coating and re-paint them.

e) The handrails.

Two handrails span the length of the bridge. As mentioned previously, these are likely to date from 1970 – 2000 and are not historical. The lockside example is distorted either from a lateral impact or overloading.



Figure 11: The modern handrails.

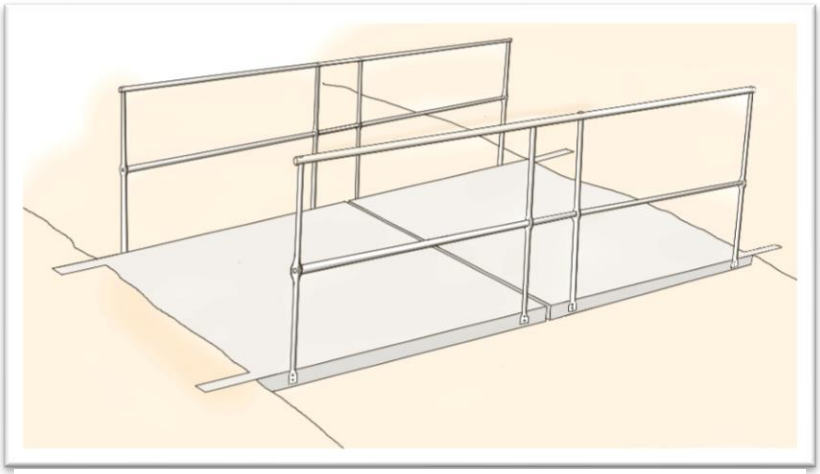


Figure 12:Potential replacement handrail with full length, traditionally joined handrail based on nearny railings.

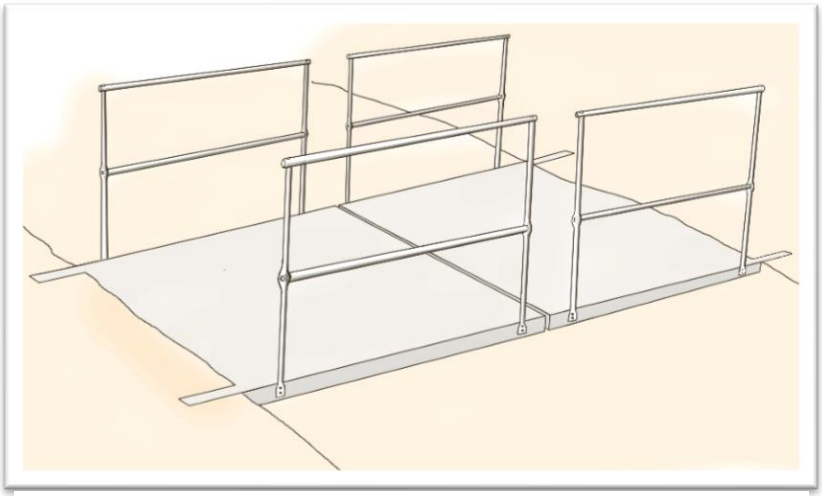


Figure 13: Potential replacement handrail, based on nearby railings and reinstating the rope-split in the bridge.

Distortion will be straightened. No further work is necessary.

There is a possibility of replacing them with a more traditional design, mirroring that of the 1880's guard rail found around the pound. This would render the overall appearance of the bridge more "in keeping" with the surroundings but is not immediately necessary.

Once the bridge has been restored, if the rope-gap is to be re-instated, it may be necessary to re-drill the fixing points for the modern handrail as the spacings will have changed.

4) Removal of the bridge.

All removed parts with the exception of the timber and non-slip strips would be numbered in order to ensure that they are returned to their point of origin, in line with best conservation practice.

In order to remove the bridge for restoration, it would seem easiest and safest to dismantle it from the top down. It would be prudent to brace the bridge during dismantling by placing a wooden beam or steel RSJ on each side of the bridge to which the deck structure and braces would be fixed or suspended. This would prevent the risk of a collapse of the bridge during the dismantling process, particularly when the modern handrails are removed from the superstructure as there is a strong

possibility that these are preventing the bridge from collapsing at the moment. A gantry could also be used to support the various parts of the bridge during the dismantling process.

The bridge would then be dismantled by first removing the iron strips on the wooden deck, followed by the wooden deck itself. It will be important at this stage to preserve the two remaining historical fixings in order to reproduce them.

Following the removal of the deck, the modern handrails can be taken off the structure by removing the 8 bolts holding them in place.

With the weight of the deck thus lightened, the braces can be removed, beginning with the two tailside braces which have lost their anchor points.

Once the braces are removed, the angle-iron beams can be lifted. This will likely be a time-consuming affair as they appear to be bent at 90 degrees on their landward extremities in order to be fitted into the stonework and it is likely the case that they have been leaded into position.

Scaffold access would be necessary to the underside of the bridge and to the lower feet of the braces. It is possible that the lower feet can be accessed via boat.

5) Re-fitting the bridge.

As above, in reverse order. The fitting of the all anchor points could be done via the use of lead-fixing techniques of via chemical-resin anchoring techniques.

It is possible/likely that repairs to the stonework may need to be carried-out whilst the bridge is in a removed condition.

---

[i] Canalplan.org.uk/place/je9d

[ii] https://en.m.wikipedia.org/wiki.Trent_and_Mersey_Canal