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BROOMHAUGH & RIDING PARISH COUNCIL

MARCH BURN BRIDGE

STRUCTURAL INSPECTION

STRUCTURAL CONSULTANT:
BT Bell

Revision History

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Issue	**Date**	**By**	**Checked**	**Amendment**

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Our Ref: BTB/ SMW 11023

Date: 31 March 2011

Broomhaugh & Riding Parish Council
c/o Sandyford,
Healey
Riding Mill
Northumberland
NE44 6BA

Dear Sirs,

BRIDGE INSPECTION, MILLFIELD ROAD, RIDING MILL

1.0 General

1.1 In accordance with your instructions, following our exchange of letters, this bridge was inspected by our Mr B T Bell and Mr S M Ward, on 29th March 2011.

1.2 The survey was carried out in accordance with the requirements of the Highways Agency Standard BD63/07 as a 'General Inspection'. Most areas of the bridge were within touching reach and thus the inspection was largely a 'Principal Inspection'.

1.3 In accordance with this standard we should be provided with copies of previous inspection reports on the bridge. We have obtained some information on 8th December 2001 and 6th January 2004 inspections from the parish council website http://www.ridingmill.org/news/index.html but are not aware of any inspections since 2004.

1.4 Our survey is a visual inspection from the ground level along with a survey from beneath the bridge, using waders, within the channel of the beck. No areas were opened up and no non-destructive testing was undertaken. No areas were cleaned off during the inspection. The inspection is to identify obvious defects on the assumption that the structure was properly designed and constructed. This report is prepared for your use only and our liability is limited solely to Broomhaugh & Riding Parish Council.

2.0 Observations, generally.

2.1 The bridge lies on Millfield Road within the village of Riding Mill in Northumberland, a little to the South of the A695. It carries Millfield Road over a burn called Ridingmill Burn on some maps and March Burn on others. Millfield Road connects to the A695 at its north eastern end and to Church Lane at its soutwestern end. Marchburn Lane is a smaller dead end road branching off from Millfield Road. The eastings and northings for the bridge are: 401676 561398; the landranger grid reference is NZ 016613; the WSG84 latitude and longitude are N54:56:50; W1:58:31 respectively and the nearest postcode is NE44 6DL.

2.2 It is difficult to date the bridge but we suspect that it dates back to the 1920's or 1930's, ie it is currently between 75 and 95 years old. We are advised that the bridge was definitely constructed after 1911. This age appears to be concurring with the period of the surrounding houses.

2.3 We are advised that Millfield Road is an un-adopted private street from the A695 to the bridge and beyond the burn up to Church Lane.

2.4 The bridge abutments are of concrete. The bridge structure is of steel beams with a concrete deck and expanded metal parapets. The road surfacing above is a thin layer of macadam on top of the concrete deck.

2.5 The bridge has been built with a skew of around 30°. The road also snakes over the bridge with the part of the road towards the A695 turning east and then turning north east and the other end reasonably straight to the south west. The bridge itself is level; the road towards the A695 is fairly level and the other end of the road rises away from the bridge. The sides of the beck are tree lined.

2.6 Overall the bridge feels in a solid condition with no movement or excessive vibration evident from either above or below whilst vehicles pass across it.

3.0 Survey observations

3.1 The approximate bridge dimensions can be summarised as follows:

- Width of burn between abutments 6.75m
- Width of bridge deck 4.885m
- Abutment length 5.7m
- Clearance beneath beams to water level 1.67m (on day of inspection)
- Water depth under bridge 0.1m (S side), 1.05m (N side)
- Length of bridge between abutment piers 7.69-7.82m (skew length)
- Length of wing walls forming abutment sides 1.25m approx (varies to each corner)
- Width between parapets at road level 4.885m
- Carriageway width 4.885m
- Deck thickness 0.2m
- Surfacing thickness 0.025m approx

3.2 *River Course* As noted above, the beck snakes through the bridge. The natural water flow is directed towards the east side and accordingly, there has been more general scour to this side of the bridge leaving the water significantly deeper to the east side than to the west. Just upstream of the bridge some boulders have been placed within the east side of the channel to direct water flows towards the western side. It is apparent, from wrack deposits on the underside of the bridge deck between the beams that in times of flood the water level

can rise up to the level of the bridge deck. The river bed is of fairly coarse material, gravel and cobbles.

3.3 *Abutments* The abutments and wing walls are of mass concrete. The concrete is of poor quality, made from rounded river gravel and appears to have been poured into a shutter with no further compaction, as a result of which it has a honeycombed appearance. The thickness of the concrete abutment is not known and could not be readily measured. The wing walls vary in length due to the differing site conditions at each corner. To the north eastern corner some further mass concrete has been added in front of the wing wall to bring the wall back onto the alignment of the beck.

3.4 The abutments were formed of shuttered concrete and this appears to have been laid onto a foundation dug into the sand and gravel formation. Due to the passage of time, the river bed has lowered and the rough edges of the foundation are now exposed to both abutments. On the eastern side there is a small scour pocket under the abutment and a similar pocket under the north eastern wing wall. These are a maximum width of 0.5m or thereabouts so are beneath the outstand of the foundation but do not extend particularly under the mass of the abutment at this time.

3.5 On the western side there are the remains of some 'telegraph pole' sized timber posts set into a concrete foundation and sitting just in front of the abutment. The history and purpose of these is not known, but they could be the remains of columns from an earlier timber bridge on this site.

3.6 *Steelwork.* The bridge itself is supported on six steel beams, spanning on a skew, between the abutments. The beams were measured as a 16" x 6" x 50 lb/ft universal beam section, referencing to the 1932 Dorman Long handbook. There are bar ties running between the beams at mid-depth with either 3 or 4 sets of ties within each bay. The ties are staggered horizontally where they pass through and are bolted to, the beam webs. The beams are built in to the abutments at either end. The beams are all painted with a dark green finish over a lighter green undercoat.

3.7 The two readily visible edge beams are in extremely poor condition. The paint finsh has broken down and there are corrosion pits to both the web and flanges. The flange of the northern side beam at its western end has almost corroded away to nothing. There is fairly severe lamination to the beam steel in other locations. The northern edge beam is in marginally worse condition than the southern. The central four beams are, by contrast in quite good condition with little other than superficial corrosion apparent. The exception to this is where there has been some water seepage and where the beams are built in to the

concrete abutments at either end where the steel cannot be inspected, nor painted. In these positions some corrosion is apparent, although the extent cannot be determined.



3.8 *Deck.* Sitting on the top flange of the beams is the bridge deck. This is of shuttered concrete and appears to have been made using the same river gravel as the abutments, with a similar limited degree of compaction. The deck is approximately 200mm thick. We could not determine from a visible inspection whether the deck is reinforced or not. There is no spalling or other deterioration to suggest that any embedded metal is corroding within the concrete. There is evidence of some leaching of water through the deck in a couple of locations but this appears to be relatively minor.

3.9 *Roadway.* The road surface is of a macadam material. This appears to have been overlaid with a surface dressing of fine gravel within a bitumen emulsion. This coating is breaking down and much of the gravel is sitting loose on the surface of the roadway. From what could be seen of the macadam beneath the surface dressing this may not be in good condition.

3.10 *Parapet walls.* The parapet walls are formed from steel angle posts, bolted to the top and bottom flanges of the edge beams. There are five posts to each parapet. Spanning between the posts are angle rails, one at the top and one just above the road surface level. Between the rails are sheets of expanded metal mesh clamped and bolted between the angles and flat plates. To the edge of the road deck there appears to be a continuous angle fixed to the top flange of the beam. This has almost wholly corroded away.



3.11 *Drainage.* There is no drainage provided on the bridge deck itself. There are two road gullies at the kerb on the southern side of Millfield Road 4.9m and 13.4m uphill of the bridge. One of these appears to discharge onto the river bank just upstream of the bridge and the other onto the riverbank just below the bridge. It appears as if the water runs off the side of the bridge deck onto the edge beams below.

3.12 *Services.* There are three piped services which cross the bridge. There is a pipe attached to the southern edge beam which appears to be either gas or water. There are two smaller pipes between beams 2 and 3, and between beams 3 and 4. These may be electricity, street lighting or water. There is a capped off service that was formerly attached to the northern edge beam.

3.13 *Road Restrictions.* Works have been carried out fairly recently, we understand by Northumberland County Council, to restrict the road. There are plates showing a 3 Tonne weight restriction. This restriction is reinforced by four bollards, two to each end of the bridge that limit the width of vehicle able to pass across the bridge. The bollards have a clear space between them of 11.75m and restrict the road width to 2.16m. This width is visibly reinforced by a solid white line between the bollards. The bollards are constructed of a relatively soft recycled rubber material. This appears to be becoming cracked at the bottom on a couple of the bollards. Prior to the most recent restriction the bridge had a 7.5 tonne weight limit (as can be seen on 'Google Earth Street View' images).

4.0 Opinions

4.1 This bridge is important to the residents of Millfield Road and Marchburn Lane as it provides their most direct route onto the highway network. There appears to have been a request from residents during the 1990's to Northumberland County Council to adopt the road and the bridge. As a result of this there was a bridge inspection which concluded that upgrading/ replacement of the bridge was required before any adoption could take place and that a proportion of the cost of this work would need to be borne by the frontage owners. The 7.5 tonne weight limit on the bridge at that time was, in practice, impossible to police, ie there was nothing to physically prevent larger vehicles from using the bridge. The County Council have subsequently decided to impose a 3 tonne limit on the bridge, restricting the available width of the carriageway using bollards and white lining such that HGV's cannot drive over the bridge.

4.2 The abutments are of plain mass concrete. The concrete is of poor quality and this has been commented upon in previous inspection reports. Nevertheless there appears to have been little or no deterioration of the concrete within the life of the bridge. The abutments continue to perform satisfactorily. There is evidence of scour beneath the eastern abutment and to a lesser extent beneath the north eastern wing wall. It is important that action is taken to fill in these holes without delay as they will become larger and could affect the overall stability of the bridge if not attended to. The flow of water through the bridge has, over time, lowered the bed of the beck. It is likely that scour pockets will become an increasing problem in the future as the water flows past soil beneath the footings rather than just between the abutments. The water appears now to be around 0.3m deeper under the bridge than it was in the early 1990's. There is a section of mass concrete in front of the wing wall to the north eastern corner. It may be that this was placed in order to address the scour noted in the 1990's reports, but this section of concrete is itself now subject to scour and should be addressed in the same way as the abutment.

4.3 The four central bridge beams are in quite good condition and, except at the bearings where they are built in to the concrete abutments; continue to function as intended when the

bridge was built. The paint coatings are reaching the end of their life and the beams would benefit from maintenance repainting with an appropriate industrial coating. The same is not the case for the two outer beams. These have suffered, principally from the effects of driving rain and water run off from the bridge deck. The corrosion to these is significant and has resulted in a loss of cross section to the steel beams. We assess this as a 50% loss of strength. These beams should be cleaned and repainted without delay otherwise plans will need to be put in place to remove these beams from the bridge. Even after painting the beams will still have a reduced residual strength and a reduced life expectancy compared to the central beams.

4.4 The concrete bridge deck remains in a serviceable condition. We suspect that the deck is un-reinforced and may in practice struggle to transfer high wheel loads onto the adjacent beams. There is evidence of some leaching of water through the deck. What effect this may be having on the top flange of the beams is not known. Maintaining the macadam wearing course on the top of the bridge in good condition will help to ensure some waterproofing to the deck.

4.5 The surface dressing applied to the bridge at the time the bollards were added is breaking up in cold weather. The macadam layer beneath is also not in good condition. It would be prudent to lift and replace the macadam layers in order to maintain the integrity of the bridge deck waterproofing and to maintain the quality of the surface finish texture.

4.6 The parapets to either side are in quite a poor condition, being attached to the corroding edge beams and subject to the same weathering, water run-off and road spray. The connections from the parapet posts to the beam are particularly poor, especially the top flange fixing. These should be thoroughly cleaned off and repainted and may require further remedial works to make them secure. The design of the parapets would not be considered as suitable to todays standards as they will be unable to provide much, if any resistance to a stray vehicle driving off the side of the deck. The fences on the approach to the bridge are simple timber boundary fences and, in a similar way, will offer little resistance to prevent vehicles accidentally falling into the beck.

4.7 The absence of any drainage to the bridge will be a contributory factor to the poor condition of the edge beams. Providing better drainage will be difficult in practice on an existing structure.

4.8 The bollards and weight restriction imposed on the bridge by the County Council have fairly effectively restricted the class and size of vehicle able to use the bridge. Previously, although there was a 7.5 tonne weight limit on the bridge, there was nothing to prevent much larger vehicles using the bridge and the road. The central four beams have significantly greater strength than the two edge beams. The restriction is in practice fairly effective in keeping vehicles on the bridge largely to the central section where the beams are stronger. Whilst larger vehicles would not unknowingly be able to get onto the bridge there is nothing to prevent cars from driving right on the edge of the bridge deck in the space between the pairs of bollards, resulting in loading on the weak edge beams.

4.9 The surface of the bridge is a ‘shared space’, ie pedestrians and vehicles use the same surface without separate roadway and footways. The space between the bollards has been made so narrow that, as well as acting as an effective speed restriction to traffic, there is a visual separation between the centre of the bridge used by vehicles and the sides for pedestrians.

5.0 Discussion & Recommendations

5.1 The bridge requires some repairs to the scour beneath the abutment, to the paint coatings on the bridge beams, the road surfacing and to the parapet fixings in order to extend its life.

5.2 The weight and width restriction applied to the bridge is fairly effective in:

- preventing heavier vehicles from using the bridge
- slowing traffic speeds over the bridge
- maintaining some separation between vehicles and pedestrians
- keeping smaller vehicles from driving in such a position where they are loading the weakened edge beams.

5.3 Irrespective of short term remedial works as noted in 5.1 the condition of the bridge will continue to deteriorate. At some stage in the not too distant future the steel edge beams will fail and it will be necessary to cut out and remove these with an associated section of bridge deck. The bridge could be provided with more robust edge protection and kept in use as a narrow bridge (in the order of 3m) on the central four beams. It may be more prudent to replace the bridge in its entirety, increasing the width slightly to allow two-way traffic flow and providing a stronger structure to carry unrestricted 44 tonne vehicles.

5.4 You should allow budget costs in the order of £5,000-10,000 for the repairs noted in 5.1. We estimate a cost of £145,000 or thereabouts for a complete replacement of the bridge, to adoptable standards.

Please contact us if you have any queries in connection with this report or if we can be of assistance in the implementation of our recommendations.

Yours faithfully

Stephen M Ward

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