CATTERICK BRIDGE

ARCHAEOLOGICAL MONITORING AND RECORDING

OF STRENGTHENING WORKS

Summary

Archaeological monitoring was undertaken of pre-strengthening works over the southernmost pier of the medieval half of Catterick Bridge. Excavation of a 20m length of the western carriageway exposed the mortar bonded stone core of the bridge pier at a maximum depth of 2.70m. The internal elevations of the bridge spandrel walls and their uneven construction from courses of river cobbles set in sand or mortar was observed. Further evidence for the survival of a considerable length of the eastern face of the original bridge was noted and a second course of masonry was recorded beneath the first order of offset chamfered stones set into the eastern bridge spandrel wall. The uppermost of these protected a small area of an earlier cobbled road surface only 0.40m below the modern road level. Elevations of the two bridge pier bases on the southern riverbank were drawn and photographed following the excavation of trenches adjacent to them. Part of the broken base of an abandoned cutwater against the southern bridge abutment was recorded.

1.0 INTRODUCTION

The bridge strengthening works were carried out during January 1996 by North Yorkshire County Council Highways and Transportation Department on behalf of the Ministry of Defence. Catterick Bridge is a scheduled monument (NY50) and a grade II* listed building. The archaeological monitoring and recording by Northern Archaeological Associates (NAA) was required as part of the scheduled monument consent for these works.

This report also provides a brief summary of the first phase of archaeological assessment and evaluation (Cardwell and Simpson 1995; Young 1995). It also presents observations on the bases of the two southerly bridge piers after removal of falsework erected in advance of the strengthening works.

A detailed description of each context recorded within the excavation and shown in brackets in the text is provided in the appendix. A site archive consisting of all primary written records, plans, sections and photographs has been prepared and catalogued and lodged with the North Yorkshire County Record Office.

2.0 LOCATION

Catterick Bridge spans the River Swale some 2km to the north-west of Catterick village in North Yorkshire (SE 227993) (Fig. 1). The bridge is presently crossed by the A6136, but originally carried the Great North Road across the Swale prior to the construction of the existing A1 dual carriageway to the west.

3.0 HISTORICAL BACKGROUND

A number of phases of building, alterations and repair to Catterick Bridge can be identified from documentary sources (Cardwell and Simpson 1995). The first recorded bridge across the Swale at this point was built between 1421 and 1425 by William de Burgh and seven other nobles of the area.

St Anne's chapel was a late 15th century addition and its location to the east of the southern end of the bridge is recorded from later documentary and illustrative sources.

The bridge was substantially rebuilt and repaired between 1562 and 1590. An agreement was made in 1562 between Roger Burgh of Brough and two other nobles of the area with two freemasons to build up and re-edify the southern pillar which had become decayed for £55. Further repairs were made to the bridge in the following years but even so it was recorded as being in a ruinous condition in 1674 (Slack 1986, 1993).

In 1792 the bridge was widened by 13 feet on the downstream side by John Carr of York. The chapel, by then ruinous, was demolished in the process. The bridge itself had been in poor condition as shown by an engraving of 1780 by Grenville (Fig. 2) and it was necessary to reface the north and south arches on the upstream side.

When Catterick Camp was established in 1914 the railway line to the camp ran across Catterick Bridge along the western carriageway of the existing bridge until 1922, when the steel girder railway bridge was built further upstream (Ludlam 1993).

4.0 ARCHAEOLOGICAL BACKGROUND

4.1 Service trenches

British Telecommunications and Mercury Communications trenches run along the east and west sides of the bridge. A watching brief was carried out by NAA during duct laying for the latter (Cardwell *et al* 1992). This trench was located 3m east of the upstream parapet and revealed the original bridge structure at a depth of 0.60m below the existing road surface above the northernmost arch and at a greater depth near the southernmost pier. Possible remnants of earlier road construction layers were identified.

4.2 Archaeological evaluation

Prior to the evaluation in advance of the proposed strengthening works a geophysical survey using ground penetrating radar was carried out on the internal structure of the bridge by GeoQuest Associates (Noel 1995). Evidence was found for internal anomalies beneath a 20m length at the southern end of the bridge which indicated variation of the bridge fill and possible structural defects.

An archaeological assessment and evaluation of Catterick Bridge was undertaken by NAA in March 1995 (Cardwell and Simpson 1995). The documentary assessment indicated that the bridge had been repaired and altered on several occasions since its construction in the 15th century. The excavation of seven trial trenches was undertaken to investigate and assess the importance of the archaeological layers over the bridge structure and the effect of the proposed strengthening works on it (Fig. 3). Part of the eastern face of the original bridge survived and part of what may have been a series of offset courses were discovered barely 0.40m below the modern road surface (trench 2). The apexes of the central arches were visible in trenches 2 and 5 and the construction of the arches from vertically set stones was observed. Part of the chapel of St. Anne, possibly the base of a porch, was discovered beneath the southern abutment of Carr's bridge. Little evidence for early road surfaces was uncovered as these were presumably removed during later repairs to the bridge structure, particularly during Carr's widening of 1792.

A second radar survey was carried out in May 1995 by G B Geotechnics as part of a loading assessment of the bridge. This survey detected the 18th century arches laid as two rings with an average combined thickness of 1m while the 16th century bridge arches were initially thought to be laid in a single ring of stones 0.6 - 0.7m thick. Comparison with the results of earlier trial trenches (trench 5) showed that it is in fact a two ring structure. The construction identified by the radar survey correlated well with the differences observed in the depth of the arch structures encountered in the previous assessment (Cardwell and Simpson 1995).

Archaeological monitoring of an additional four trial trenches (trenches 8 - 11), positioned over the bridge piers on the southern side of the bridge, was undertaken by NAA in August 1995 (Young 1995). These trenches were positioned to examine the structural integrity of the piers and the depth and nature of the overlying deposits. The mortar bonded stone structure of the bridge piers was encountered in three of the four trenches. It was evident that the make-up layers beneath the modern road surface on the medieval side of the bridge differed from those on the side of the 18th century widening. No trace of the pier structure was encountered within trench 8 despite its excavated depth of 2.5m. This was perceived as an apparent weakness and resulted in the works to strengthen the bridge pier.

5.0 METHODOLOGY

Excavation of a 20m length of the western carriageway was carried out over the southernmost pier of the medieval bridge. The resulting trench was 4.8m wide and entailed the removal of an area covering 100sq m including a pedestrian retreat sited over the bridge pier. Surface layers

were broken up and lifted using a heavy toothed bucket after the perimeter edge had been cut out. At this point the telecommunication services and lighting ducts were exposed, as were the tops of the spandrel walls. The services required regular support along their exposed length. This was achieved by tying them to planks placed at right angles across the width of the trench. As excavation proceeded it became clear that the cavities within the bridge pier and between the spandrel walls were much smaller than anticipated. As a consequence of these restrictions a JCB with a ditching bucket was brought in to complete the operation. All loose infilling materials were removed as were any thin or weakly mortared details. The final cleaning out of the bridge structure was done by hand, joints were brushed clean and the whole area dusted with an airline.

Where structures or features of archaeological interest were exposed, these were cleaned and recorded with drawn sections, plans and photographs. A series of profiles across the excavation were drawn and levelled with reference to the bench mark to the north of the bridge at a height of 64.09m OD.

The persistent snow showers which fell during the last two days of the excavation prevented a full photographic record being made.

6.0 ARCHAEOLOGICAL RECORDING

The material infilling of the bridge pier was removed exposing its internal structure which was constructed of mortar bonded river cobbles. At the lowest and central point in the pier, the floor or saddle was 2.7m below the modern road surface (Fig. 4). The circular nature of the structure was accentuated by its battered sides rising at an angle of 45 degrees to the base of the parapet wall within the pedestrian retreat (section B, Fig. 5). Spandrel wall 06 continued into the bridge pier on the downward side as a low cobbled wall 0.9m high. Above this wall the layers of material that had filled the pier were present in the section.

To the north and south of the pier the decking over the arches of the bridge curved up towards their respective crowns and were surfaced with flat rounded cobbles (19) at each apex. The interior faces of the pier spandrel walls rose from this decking before merging into the sloping inner core of the bridge pier. The southern end of the western spandrel wall (05) was 3.0m in length and had a maximum height of 0.6m. At the point nearest the pier a large re-used(?) sandstone block 0.7m in length was incorporated into the wall of roughly coursed cobbles. These cobbles were 0.1 - 0.4m in diameter and common to both sets of spandrel walls. Parallel to wall 05 the eastern spandrel wall (06) was of a similar length and separated by a gap of 1.2m. This wall contained a number of dressed sandstone blocks and continued around and into the bridge pier for a further 3.0m. It rose almost vertically for 0.75m at its deepest point within the spandrel before sloping eastwards where it supported masonry (07). The spandrel walls of the bridge arch to the north (section A, Fig. 5) showed a greater gap between them of nearly 2.0m and a length of approximately 5.0m was exposed. Though superficially they appeared to be of the same make-up as walls 05 and 06 their construction was supplemented by at least three separate horizontal layers of mortar separating bands of cobbles in a red sandy matrix.

A line of parapet stones (07 and 16) was visible along the easternmost side of the excavation with a gap over the pier. These stones were displaced and broken only at the extreme ends of the trench over the apexes of the arches. A further course of stones was visible beneath these over the spandrel wall north of the bridge but it was not possible to ascertain whether these were also chamfered. The outer rings of arch stones (18) set on end were visible where the parapet stones had been removed at the point where trial trench 2 had been positioned at the north-east corner of the strengthening works.

The details of the infilling layers within the bridge structure could not be accurately described because of their extraction by machine. However, deductions could be made from the occasional sampling that was possible and the results of previous trial holes dug within the area of the excavation (trial trenches 2 and 8) (Fig. 3).

Trial trench 8 centred over the bridge pier to investigate its structural integrity and loading capability was excavated to a depth of 2.5m. The earliest layer encountered consisted of a pink silty sand which was partially excavated to a depth of 1.5m. Above this was seen a layer of yellow-green silty sand 0.6m thick containing occasional fragments of sandstone masonry and which extended up to the base of the modern road make-up. These layers then represent the general fill of the pier base and almost certainly of the southern bridge spandrel too.

The east section wall against Carr's pier base showed a similar sequence of layers but these were complicated to the north by a mortar layer (12) interposed between the layers of sand. This mortar layer was 0.5m thick against the lower course of masonry 16 and seemed to spread from within Carr's bridge pier around the northern lip of the earlier bridge pier within the trench. The mortar thinned out and separated into three layers 0.1m thick across the area between the bridge spandrels and became incorporated into the construction of wall 10.

Trial trenches 2 and 5 were sited over the crown of the northern bridge arch and were contained in part within the excavated trench. Here the structure of the arch was exposed at a depth of 0.45m below the modern road revealing the tops of large squared vertically set courses with tightly mortared joints. Also recorded were the blocks of masonry representing the 15th century chamfered offset stones of the bridge parapet only 0.30m below the modern road surface. Against these was found a small area of cobbled road surface (14) measuring 1.0m x 0.8m and composed of flat rounded cobbles 0.15m in diameter set in loose mortar..

7.0 CONCLUSIONS

The aim of the 'pre-strengthening works' was to remove all material seen as non-structural prior to refilling the bridge pier and spandrels with layers of mass concrete. This was undertaken with some speed and completed almost totally by machine. Observations made during machining and an inspection afterwards confirmed that the lower fill of trial trench 8 was the primary deposit across most of the excavation except for the crown of the northern arch. This layer of broken angular pink sandstone in a sandy matrix is suggestive of waste from stone-working and could therefore have been readily available at times when the bridge was under repair. This layer was

found at the base of trial trench 1 which was sited 8.0m further south over the bridge abutment. This was more than 0.6m deep and its use as a levelling layer is postulated. Sherds of 16th century Cistercian ware were associated with it suggesting the date of its deposition. This layer was also recorded in trial trench 7 which was placed over Carr's southern bridge abutment. Here it lay directly over the mortar bonded structure of the bridge and against the partly dismantled masonry at a depth of 0.9m below the modern road surface.

If this layer is solely a 16th century event, when documentary evidence states that substantial work was carried out on the southern half of the bridge, then it should be contained within the earlier structure and not be part of Carr's 18th century work. Carr could have re-used this pink sandstone infilling from the earlier bridge to cover his structure as seen in trial trench 7, or he could have used his own debris from working similar material. Comparisons of the fills of this excavated bridge pier with those of its 18th century counterpart in trial trench 9 showed that they differed substantially. Also the pink sandstone layer was not present in either of the 18th century bridge piers sampled in trial trenches 9 and 11. This in turn would appear to demonstrate that the lower layers within the medieval bridge, at least in the case of this sand deposit, remained undisturbed by the 18th century activity.

The northern arch spandrels show a different method of construction from those of the southern arch. Boulders within a matrix of this pink sandy material form an integral part of the walls which would date their construction as being earlier than Carr's improvements, but later than the construction of the southernmost arch. The upstream spandrel of this southern arch is very wide and contains Carr's additional widening. This extra arch ring is clearly visible from below (Fig. 7) but the top of the spandrel wall was obscured by services preventing any constructional details from being recorded.

That most of the internal fill of the spandrel wall was preserved during Carr's activities is surprising but possible given the fact that the original downstream 'face' of the earlier bridge shown by the line of coursed parapet stones (07 and 16) survives. Considering also the ruinous state of this bridge pier as evidenced in contemporary etchings (Fig. 2), the only keying-in to link the old and new bridge structures was through the piers themselves, the arches remaining free standing.

A slight deviation in the line of the eastern side of the earlier bridge structure could be seen in plan. If this line is projected as far as trial trench 7 it must coincide with the north-south aligned wall (77) whose east facing outside face showed signs of weathering. This in turn has the remains of the porch of St Anne's chapel butted to it and both are absorbed within the structure of Carr's bridge.

Only a small area of road surface (14) survived which had a direct relationship to the earlier bridge parapet base stones against which it was preserved. It could be dated to the 15th or 16th century period of bridge construction.

The extensive nature of the bridge strengthening works exposed a considerable area which enabled the full interior structure of the pier and spandrels to be recorded. Useful information was obtained which confirmed the documentary detail of the bridge repair and development.

8.0 PIER BASE OBSERVATIONS

Prior to the excavations into the bridge pier it was necessary to erect 'falsework' beneath the two arches affected . This temporary structure of rigid scaffolding was designed to support the full weight of the existing arches and to counteract any stresses that might result from the removal of bridge infill material.

To support this 'falsework' system five substantial concrete plinths were cast against the bases of the two southern bridge pier bases, and against the bridge abutment with the last sited centrally under arch 2. These concrete blocks were 0.7m wide by 0.8m deep and were longer than the width of the medieval bridge by 0.6m to either side (Fig. 6). The soil beneath the two arches had been levelled by machine before the trenches in which these blocks were sited were dug. This operation was not supervised by an archaeologist. It is understood that no archaeological material was observed and that the main deposits seen were layers of cobbles beneath riverine silts. It can be estimated that in places, particularly adjacent to the bridge piers, disturbance up to a maximum depth of 1.5m would have taken place.

The concrete block sited centrally beneath arch 2 was later removed, as was the block against bridge pier 2, while the others remained as a permanent consolidation below ground level. It was possible to observe and photograph these portions of walling above the concrete blocks and below the ground surface before they were covered up and the original surface restored.

8.1 Arch 1

This is the southernmost land arch and is supported on one side by the southern bridge abutment. The abutment wall below the lower arch course was exposed for 0.75m to the top of the concrete block. Two masons' marks were observed but generally the surface of the stones appeared degraded and some areas had been patched. The 15/16th century bridge arch measured 4.25m in width. This had been extended by Carr in 1792 by an extra outer ring of voussoirs 0.95m in width giving a total width of approximately 5.2m. These stones were supported on an earlier broken stone block shaped with an outward angle equivalent to the bridge cutwaters supporting the central bridge piers. Hidden below ground at a point where the arch is abutted by a garden wall this shows a departure by Carr from the design of the earlier bridge structure.

The pier base of this arch (Fig. 7) was exposed for approximately 0.4m below the previous ground level. Four masons' marks were visible but soil adhering to the wall would have obscured others. No marks were seen under Carr's bridge. The chamfered corners of the outer courses of the early bridge were 4.1m apart. The overall width including Carr's addition was 5.0m.

8.2 Arch 2

Arch 2 is essentially a land arch but takes flood water when the river is in spate.

Bridge pier 1 below arch 2 (Fig. 8) has at least three masons' marks over the four stone courses visible above the concrete block. The lowest of these is chamfered and this continues round westwards as an integral part of the cutwater. The width of the arch is 4.55m. The chamfered course is broken for *c*.0.65m at its eastern end and shows a recess 0.12m deep probably the result of the 18th century widening. Evidence of a weakness in the pier stones is seen here by mortar repairs and two iron ties strengthening cracked stones.

The concrete block against pier 2 was removed and a further two stone courses below the chamfered course were visible. The top of the course directly below the chamfer was broken and formed an ill fitting joint in comparison with most of the bridge structure. This could be a rebuilding of the arch onto previous foundations or a re-facing. Two matching slots cut into the ashlar blocks below the chamfered course, at each end of the pier, could have been related to the construction of the pier. They measured 0.70m wide by 0.17m high and 0.04m in depth. No mason's marks were seen on or below the chamfered course.

The concrete block was removed so that the flow of water round this side of the bridge pier would not be obstructed when rivers levels were high. Plywood baffles had protected the stonework while the concrete was in position.

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APPENDIX

CONTEXT SUMMARY

Layer 01

A surface of flattened oval cobbles 0.10 - 0.15m in diameter lying directly below a thin (0.10m) layer of modern tarmac. Set upright in mortar, their extent was restricted to the area of the pedestrian retreat.

Layer 02

A compacted sandy silt, grey to yellow-brown in colour, which contained frequent small pebbles <0.20m in diameter. This layer 0.15m thick supported the cobbles (10) within the pedestrian retreat.

Layer 03

Large sub-rounded cobbles 0.10 - 0.20m in diameter arranged randomly within a matrix of hard grey mortar 0.25m thick forming the top of the inner bridge wall (05). Continued as the upper core of the bridge pier at a slope of approximately 45 degrees.

Layer 04

A loosely compacted pink sandy layer 0.40m thick that contained small pebbles and larger rounded cobbles up to 0.30m in diameter against wall 05. It formed the primary fill of the southern area of the trench. Deepest at a central point within the bridge pier, it wedged out against the southern arch.

Masonry 05

The interior 'face' of the south-west earlier bridge spandrel wall 3.0m in length. It rose vertically 0.60m from the bridge decking within the spandrel at its deepest point before turning into part of the sloping inner core of the bridge pier. At this point a large re-used sandstone block 0.70m in length was incorporated into the wall of roughly coursed cobbles 0.10 - 0.40m in diameter.

Masonry 06

The interior 'face' of the original bridge spandrel wall 3.0m in length parallel to 05. It then curved around and into the bridge pier for approximately 3.0m at a lower height. It rose almost vertically for *c*.0.75m from the bridge decking within the spandrel at its deepest point, before sloping back at the top to support masonry 07 at the extreme east of the excavation. Contained a number of cut sandstone blocks set in mortar bonding but mainly large rough coursed cobbles as 05.

Masonry 07

A line of six sandstone blocks down the centre of the bridge in a single course from above the bridge pier towards the apex of the southern arch. These formed the lowest course of the medieval parapet - the largest surviving stone measuring 1.10m long by 0.25m high with an estimated width of 0.35m.

Masonry 08

The top course of wall 05 running north from the bridge pier for approximately 5.0m. Made up of large rounded cobbles averaging 0.20m in diameter arranged randomly within a matrix of hard grey mortar. Layer was 0.35 - 0.40m thick and contained a number of squared dressed sandstone blocks.

Layer 09

A loosely compacted mid-brown sandy layer 0.20m thick that contained frequent small pebbles and separated from 08 by *c*.0.10m thick layer of mortar.

Masonry 10

Nearly vertical wall face rising *c*.0.50 - 0.60m above bridge decking where wall height is greatest. It rose from the sloping sides of the bridge pier and formed the interior face of bridge spandrel. Separated from 09 by 0.10m thick layer of mortar. A loose construction of large round cobbles set in a loose red sandy matrix with occasional mortar lenses.

Layer 11

A loosely compacted yellow-green silty sand which contained a number of fragments of sandstone blocks up to 0.25m across. The layer was directly below the modern road make-up and within the bridge pier. Almost 0.60m thick where it appeared to continue as a common layer with the fill of Carr's bridge.

Layer 12

A mortar layer spreading from within Carr's bridge pier around the northern lip of the 15th century pier within the excavation. Pale grey in colour; contained numerous small pebbles. Up to 0.50m thick against the north-east bridge interior wall 15. It quickly thinned out to a general thickness of 0.10m across the width of the northern lip of the bridge pier core.

Layer 13

A loosely compacted pink-grey silty sand layer that contained small chips of pink sandstone. The layer was 1.60m thick within the bridge pier and was the primary fill of the southern half of the excavation.

Layer 14

A small area of cobbled road surface preserved between the bridge parapet course (17) and the modern Mercury Communications trench. Made up of flat rounded cobbles with an average diameter of 0.15m set in loose mortar and measuring 1.0 x 0.80m.

Masonry 15

Wall 6.0m in length running parallel with wall 10 north from the bridge pier core. Nearly vertical for *c*.0.60m at its deepest, it sloped back at roughly 45 degrees for a further 0.20m to a total height of 0.80m where it supported masonry 16. Made from rough courses of cobbles interleaved with three main horizontal layers of thin mortar.

Masonry 16

Masonry of 15th century bridge parapet surviving as a double course over the bridge spandrel but reduced to a broken single course over the apex of the bridge arch to the north. A continuation of the north-south alignment of 07 but separated by the bridge pier.

Layer 17

A thin layer of dark yellow/brown sand 0.05m thick which partially sealed masonry 16 at the northern end of the trench.

Masonry 18

Squared sandstone blocks that formed the structure of the bridge arch. The outside courses were aligned east-west and set on end with tightly mortared joints. Visible where parapet stones 16 had been removed, they measured 0.5m in length by 0.25m wide with an uncertain depth.

Layer 19

A levelling surface of flat rounded cobbles of average dimensions 0.30 x 0.20m. Set in mortar and with a depth of 0.1m above masonry of bridge decking.

Layer 20

Modern tarmac road surface and underlying roadstone base forming a consistent layer across the trench with an average thickness of 0.40m. Sealed layers 11 and 17.

Fig. 2 Engraving of 1780 by G Grenville of Catterick Bridge from the north-east before Carr's widening (YML:Catterick 1)

Fig. 3 Catterick Bridge: location of trial trenches and strengthening works