Industrial Archaeology
Notes

Edited by
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‘Although industrial archaeology is one of the Society’s main areas of activity, very little industrial archaeology material has been published in the last two issues of the journal. This does not mean that no work has been done in this field . . .’ Thus Catherine M. Wilson introduced the first ‘Industrial Archaeology Notes’ in volume 12 (1977) of *Lincolnshire History and Archaeology*. Industrial archaeology notes have not been seen in this journal for some years and the time, twenty years after the first compilation, seems apposite for a revival.

Tattershall Bridge

B. M. J. Barton

I read with great interest the paper by W. M. Hunt in the 1996 volume of the Society’s journal which discusses Tattershall Bridge and the turnpike that crossed it. This paper gives the impression (vide the opening and closing paragraphs) that the bridge still to be seen today is the original (c.1796) structure? I believe this is not the case, and that the ‘old’ bridge is, in fact, a replacement built in about 1816.

Although the early history of Tattershall Bridge is confusing, there is a considerable body of documentary evidence to support the ‘replacement bridge’ theory. An anonymous local guidebook published in 1813 describes Tattershall Bridge as ‘a fine bridge of four arches’. Even allowing for the inaccuracies in such guidebooks, this, if the bridge then extant had only three arches, would have been a fairly basic error for the author to make.

Four arch bridges are relatively unusual, given the tendency for early bridge builders to use an odd number of arches for aesthetic reasons. Was the original Tattershall Bridge (if indeed it was of four arches) a rather amateurish design? We do, however, have the Trustees’ expressed desire for a ‘brick bridge of three arches’ in their June 1793, *Lincoln, Rutland and Stamford Mercury* notice to consider, although since they took John Jagger’s single arch proposal seriously they were clearly receptive to alternative suggestions. As Jagger’s arch would have required a span of well over a hundred feet, it would have been a most impressive structure, and remarkably bold for its time. Would however, the ten soils have withstood the hefty horizontal thrusts imposed at the abutments?

What seems to have happened (although, perhaps understandably, the evidence is circumstantial) is that the original bridge collapsed at some time between 1813 and 1816 during, and perhaps as a result of, the major channel improvements carried out along the River Witham under the Witham Drainage Act of 1812. In 1816 John Rennie (Senior), the Engineer to the Witham Drainage and Navigation Commissioners, reported in the context of scheme costs exceeding estimates that this had been due *(inter alia)* to the ‘fall of Tattershall Bridge which had to be rebuilt’. This rebuilding is also mentioned in a footnote by Padley.* If the original bridge was possibly not as well engineered as it might have been, as has already been hinted, it is reasonable to assume that its foundations may not have been entirely adequate and were destabilised by the river channel works carried out under the 1812 Act.

Under the circumstances, the replacement bridge would have been an economical structure, quickly built, to minimise the embarrassment to all concerned. This may account for the odd lack of documentary evidence, but, as John Rennie was involved, the replacement bridge was inevitably an elegant and well-engineered structure. The design and proportions of the new bridge are wholly characteristic of Rennie, who was unquestionably one of the finest civil engineers working at that time. Rennie’s bridge lost its original brick parapet walls in the 1920s and, although its appearance is sadly marred by the modern, steel crash barriers, it still retains much of its early elegance. A ‘Tattershall Bridge’ remarkably similar to Rennie’s bridge is shown in a contemporary engineering sketchbook.

Incidentally (apropos note 4 in W. M. Hunt’s Tattershall Bridge paper), William Weston is generally regarded as being responsible for the design of Gainsborough’s Trent Bridge. Although his role is not entirely clear, he was certainly involved in the construction. This was his English swansong before emigrating to pursue a distinguished engineering career in the United States, where he is much better known.

Notes

2. For photographs of the bridge see Hunt, ‘Tattershall Bridge’, Figs 1 and 2, p.42.
3. A *Topographical Account of Tattershall in the County of Lincoln* (Horncastle, 1813).

St John’s Hospital Water Tower, Bracebridge Heath

B. M. J. Barton

One of the most prominent features of Lincoln’s southern skyline is the tall concrete water tower on Bracebridge Heath. Until recently, although it overtopped them, it was almost entirely surrounded by the buildings of St John’s Hospital. Since the closure of the hospital in the late 1980s, demolition of some of the buildings has, perhaps for the first time, enabled this remarkable structure to be seen in its entirety.

Water towers have been an integral part of public and private water supply systems for as long as pumps have existed to fill them. York’s Lendal Tower, part of the city’s medieval defences, was converted to a water tower in about 1684 and still houses the offices of the York Waterworks Company. The water tower was a prominent feature of the Victorian and Edwardian townscape; a sectional iron tank on a massive, sometimes highly ornate, masonry or brick tower. Lincoln’s Westgate water tower is a classic example. Dating from 1910-11, it is one of the last of its kind although isolated examples of that type continued to be built into the 1930s, notably in Essex.

In 1900 Bournemouth’s Meyrick Park water tower was built, the first in Britain to be constructed in reinforced concrete. Up to World War I reinforced concrete was still in its infancy, only just emerging from its experimental stage. Until then, reinforced concrete design theory had been the preserve of a relatively small handful of specialist civil engineers and was not yet a material with which the average civil engineer felt confident.

After the war a lot of things changed. The exuberant spirit of the age infected not only the popular culture of the 1920s, it also
made itself felt in engineering design. Reinforced concrete was suddenly the material in vogue, perhaps even more so on the continent than in Britain. The caution of the pre-war years gave way to a brash self-confidence, bold almost to the point of recklessness. Anything steel could do concrete could do better. Nothing illustrates this more than the new reinforced concrete water tower at St John’s Hospital.

Although the hospital itself, originally the County Pauper Lunatic Asylum, dates from 1849-52, the water tower is a relatively late addition dating from 1924-25. A hexagonal 30,000 gallon (136,000 litre) capacity tank surmounted by a small clerestory is supported on six slender columns which are cross-braced by a triangular arrangement of beams at six unequally spaced levels. The structure measures 115ft 6in. (35.2m) from ground level to the top of the tank and 126ft (38.4m) to the top of the clerestory. The tank measures 22ft 8in. (6.9m) across its external faces and the distance between the centres of opposing columns increases linearly from 18ft 6in. (5.6m) below the tank to 23ft (7.0m) at the base. As far as can be determined from the record drawings, the foundations consist of a 26ft (7.9m) diameter 3ft (0.9m) deep reinforced concrete raft with its base a mere 50 (1.5m) below ground level, apparently cast directly onto the underlying limestone.

The overall impression, even when partially obscured by the tall hospital buildings, is one of a remarkably tall, slender structure. I know of no other water tower like it. Compared with St John’s, every other concrete water tower in Lincolnshire is squat and solid. Not even the two ‘wineglass’ designs of the early 1980s at Folkingham and Gedney have the same disconcertingly willowy feel to them - and that is before you discover how shallow its foundations are. From the point of view of the hospital’s water supply it is difficult to understand why the tower needed to be quite so tall, sheer bravado being the only obvious explanation.

It is highly doubtful whether, constrained by modern Codes of Practice for the design of concrete structures, St John’s Hospital water tower could be built today. Its extreme slenderness, both in its overall proportions and of the individual structural members, and its minimalist foundations suggest that the design must have been pushed very close to its safe limits. Yet the tower has stood for over seventy years and shows no obvious signs of distress or decay, although it was superficially refurbished about twenty years ago. Other more recent and far less ambitious concrete water towers, Skegness, Mablethorpe, Fishtoft and Quadring, have come and gone yet St John’s survives.

Until 1988 the construction drawings labelled ‘Indented Bar and Concrete Engineering Co. Ltd’ and signed ‘Charles Horobin Esq.’ were still kept in a cabinet in the Clerk of Works’ office across the yard from the tower. Then the hospital was closed and the entire hospital complex put up for sale. The Clerk of Works’ office was vacated and the drawings were removed, reportedly to St George’s Hospital, but all attempts to locate them there were met with denials or simply ignored. Perhaps the Health Authority did not want the sale of the St John’s site to be jeopardised in any way.

Almost all the original hospital buildings on the site had already been ‘listed’. Although impressive as a group none of them were individually outstanding and they were typical of Victorian County Asylums up and down the country. One of the few exceptions was the water tower, arguably the hospital’s most interesting and important structure, its omission illustrating all too clearly the failing of the ‘listing’ procedure and its bias in favour of architecture and against technology. Pleas for it to be separately listed have fallen on deaf ears. Belatedly this bias is slowly being addressed, but St John’s water tower is still virtually unprotected in law. Disused as a water tower it faces an uncertain future although its present role as an ad hoc mobile-telephone and radio mast may offer some protection for a while.

The ACE HIGH communications station at former RAF Stenigot

Chris Lester

Early in 1997 the communications station at former RAF Stenigot was demolished and the Wolds skyline lost a Cold War feature which had been evident for over thirty years; four large dish-aerials which could be seen from at least twenty-five miles away!

RAF Stenigot was one of the British relay stations in the NATO ACE HIGH tropospheric scatter communication system which extended from northern Norway through Britain, Denmark, Holland and Germany to NATO HQ in Belgium and on to Italy, Turkey, Greece and Cyprus. The purpose of the system was to carry air defence radar data and communications between NATO sites.

The system was built in approximately 1960 and it appears to have been taken out of service in the early 1990s. It was operated for NATO by the Royal Corps of Signals.

The south-facing aerials at Stenigot communicated with a site in Kent; the north-facing ones with a site in Northumbria.
The main building comprised an equipment hall which housed two 10kW klystron transmitters and four receivers for each direction. The frequency of operation was in the range 860-930MHz. The transmitters were water-cooled and the heat-exchangers were housed in the west end of the building. In August 1995 most of the equipment (which was mainly American-made), except the klystrons, was in situ. The east end of the building contained offices, stores and domestic facilities. The equipment was connected to four, approximately twenty-metre-diameter, steel, parabolic dish-aerials by waveguides running along the ground under weatherproof shelters.

Adjacent to the equipment building was the standby-set house containing a pair of Rolls Royce diesel engines and electric generators. The fuel tanks and a garage were also nearby.

The NATO site was in its own fenced compound within the RAF Stenigot disused Chain Home radar station. At its entrance on the south side was a police house and the remains of a dog pound. The entire site was surrounded by floodlights.

Notes
1. The author is grateful to the Royal Air Force for granting access to the site.
2. Strictly speaking, the system is a super high frequency over the horizon tropospheric scatter communications system. Tropo scatter (as it is fortunately known) is a means of long range communication in which large amount of radio energy are radiated a few degrees above the horizon. The energy is scattered by the troposphere and some of that scattering is in a forward direction, enabling communication to be established over the horizon i.e. beyond the line of sight. Large transmitters, large aerials and highly sensitive receivers are required. Because the forward-scattered signal is weak and fluctuating, space and frequency diversity techniques are used to enhance reliability of the link. Two transmitters with separate aerials are used and each transmits at a different frequency. There are four receivers, one for each frequency on each of the two aerials. The received signals are combined and this combination of signals of different frequency and spatial separation ensures consistently reliable reception.