Panel for Historical Engineering Works

Newsletter

Number 167

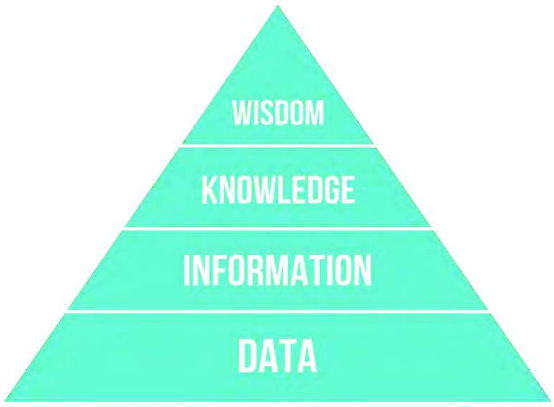
Contents:

Chairman's column

By Gordon Masterton

We are indeed fortunate in this issue to have articles by our two most respected Engineering historians, Roland Paxton and Mike Chrimes. Both clearly demonstrate that whilst they may have retired from some activities, they have certainly not stopped being enthusiastic advocates and disseminators of useful knowledge. Indeed, more than that, they are still applying their experience and wide reading to convert that knowledge into wisdom.

And therein lies the essence of the added value of what we stand for in the field of engineering heritage. It could be represented, usefully, as the DIKW pyramid.



In PHEW, we build from the data we acquire (our foundation being, largely, the Historic Engineering Works data sheets). We organise these into information on a common platform (our HEW database). In our outreach activities we then bring our accumulated wider contextual reading to bear, with the added benefit of hindsight, to create useful knowledge from the information. This knowledge can be structured in many ways: career overviews, developments in design philosophy, the application of construction materials, the study of failure or success (the former more popular in the literature than the latter), lessons learned from major engineering programmes, reappraisals of legacies and influences, changes in social, political and economic goals for infrastructure. It is through these various interpretations and insights that knowledge is made useful. And useful knowledge, applied with integrity and an ethic founded on an improving mindset, may then lead to wisdom. Only then should we even attempt to engage in the risky business of engaging in foresight on what may be the right goals to be set and the right things to do for a sustainable and fulfilling future.

Hence our title for our Community of Interest. "Engineering foresight from hindsight".

TS Eliot may have had a good grasp of this when he wrote:

"Where is the wisdom we have lost in knowledge?

Where is the knowledge we have lost in information?"

Data, Information, knowledge and wisdom: they all have a part to play but all are interdependent on wider learning too. The conversion of information into knowledge requires skilled practitioners with domain expertise, not just information processors. And the conversion of knowledge into wisdom depends on lifetimes of hard-won experience, very little of which has been written down.

So the lessons passed down from our grey-haired philosophers (with apologies to Roland and Mike) are the most valuable of all.

In the sphere of data and information, I am very pleased to see Carol's new sharepoint platform being used by our PHEW representatives for the sharing of data such as lists compiled over many years, categorised into specialist areas such as water towers, bridges, transport structures, piers, etc. We all want our efforts to be of value to others and this secure and trusted repository is an excellent way of mitigating the risk of losing many hours of accumulated worth. So, if any readers have Excel spreadsheets or Word files that may be of interest to future engineering historians and interpreters, please pass them on to ICE archivist Carol.Morgan@ice.org.uk.

	rock	Telford		
Strood	Hydraulic lime/roman cement	Clark	1819 - 24	Simms & Strickland
Harecastle	Barrow hydraulic lime; hardened after 2 days	Telford	1766 - 75, 1824 - 26	Telford Life; T/TR/23; T/TR/49
Thames	Roman cement	Brunel	1825-43	

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Horkstow Bridge

By Roland Paxton

Introduction. Union Bridge near Berwick-upon-Tweed, heralded a new era in suspension bridge development, Horkstow Bridge [NGR SE 973 190], with its Historic England Grade II* listing, is a prime example of the type that developed indirectly from the former. It formed part of the extensive River Ancholme Drainage Scheme [1825-44] designed and built under the direction of leading civil engineer Sir John Rennie (1794-1874), Engineer for New London Bridge. His father, John Rennie, was consulted by Capt. Samuel Brown on Union Bridge. Horkstow is said to be the only suspension bridge designed by Sir John. In 1999 the EA Environment Agency dated its design as 'c.1830', which is consistent with progress on the main project.

Fig. 1. Horkstow Bridge [above 's' of 'Horkstow'] From Sir John Rennie's Ancholme Drainage paper 1844

Origin. The purpose of the bridge was to maintain local access between Horkstow and Winterton villages, from east of the channelised river [near its entry into the Humber west of Hull - Fig. 1] via a narrow lane and, west of the bridge, on a bridlepath southward on top of the riverbank. The bridge is now subject to a 3T traffic weight-limit.

In his Horkstow Bridge design, Sir John Rennie was influenced by Capt. Brown's landmark application of the long iron eye-bar link at Union Chain Bridge in 1820 and its developed use at Hammersmith Bridge [of which he would have known when working on London Bridge] to adopt the concept for his economical pier-free crossing of the Ancholme. Horkstow Bridge was erected in 1835-36 under the supervision of the Drainage Scheme's resident engineer, Adam Smith. Its longevity is testimony to the skill and professionalism of its engineers; the ironfounder and erector, Gospel Oaks Ironworks [J. & E. Walker], Tipton; and contractor, Jolliffe & Banks.

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Description. In Civil Engineering Heritage Eastern and Central England, [1993] Ted Labrum records Horkstow Bridge as "a fine example of an early suspension bridge, one of only a handful to have remained as originally designed. Because of its secluded location at the end of a little-used country lane it has survived almost intact from the time it was completed in 1836 … the imposing and well-proportioned rusticated towers, which rise to a height of 36ft [11m] above river level have semi-elliptical arches

over the 14ft [4.2m] wide roadway." The chains pass through the towers on a roller/spindle assembly at arch crown level. Vessel headroom is 16ft [4.9m]

"The single 133ft 9in [41m] span has double wrought iron suspension chains, one immediately above the other, on either side. Each chain consists of two ¾ by 1 inch [19x25mm] links, 7ft 3in [2.2m] long. [Fig. 2] There are 33 pairs of 7/8th [22mm] square iron hangers from which are slung the timber cross members supporting the simple plank deck. The deck has a pronounced upward curvature [Fig. 3] and its lightweight structure results in a significant motion under live loads.

Fig. 2. Note the elegant stone tower with elliptical arch. Deck replaced by harder wood in original form ©Redmore

Fig. 3. Twin bar main chains, drilled eyes and use of hexagonal nuts © Redmore

In September 1979 an articulated lorry weighing 21 tons attempted to cross the bridge, but the tractor unit fell through the timber deck into the river. The driver was lucky to have escaped unhurt as his cab was completely submerged, one quarter length of the bridge deck was destroyed and the suspenders in this section were bent outwards at their lower ends, one being broken. The masonry, chains and remaining three-quarters of the deck survived without damage.

For the bridge's sensitive refurbishment in 1999, society is indebted to its owners the Environmental Agency, Anglian Region; Posford Duviver, consulting engineers [present owners Royal Haskoning DHV]*; and C. Spencer Ltd, the main contractor [forerunner of the Spencer Group now restoring Union Bridge]. In 1999 the project was entered in the Institution of Civil Engineers PHEW/County Surveyors' Society's 'National Historic Bridge Award Competition, recognising and encouraging excellence and innovation in conservation. The judging Panel, after carefully inspecting and considering all aspects of the project, awarded it a well-deserved 'commendation'. The Panel, on which I served, was impressed by the minimal intervention to the original ironwork, anchorages [Figs 5 & 6] and masonry. Also, that a 1993 Departmental Standard BD Assessment 21/93 giving the bridge a zero tonnes live load capacity did not lead to its closure, but to the practical expedient of a 2-ton [now 3T] weight limit.. This decision found support from the bridge's withstanding 4 years earlier the 21-ton load described previously. The only original iron chains not reused in 1999 were the c. 8m lengths of partly-corroded back chains underground [Figs 4 & 5]. Their replacement with 50mm dia. high tensile tie rods was an ingenious way of extending the bridge's life and providing extra strength where it was most likely to be needed in future. This allowed all the original chains above ground [c.80% of total] and the anchors and masonry, to be kept, hopefully beyond the bridge's bicentenary. Figs 2-3 & 6-8 show its state in June 2021.

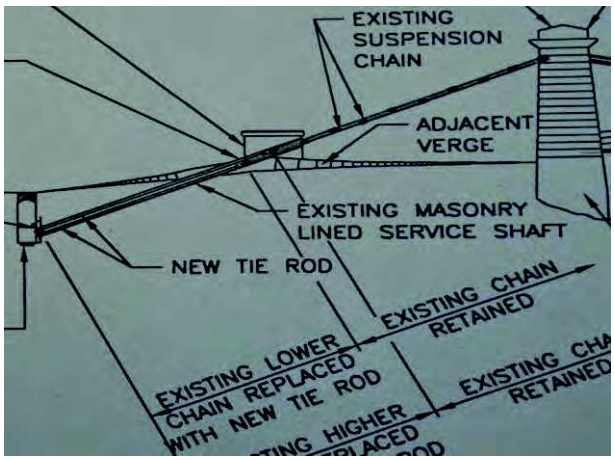
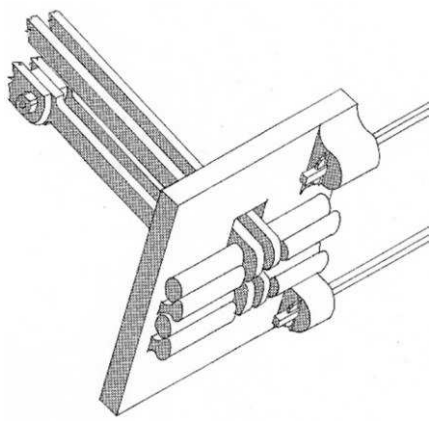


Fig. 4 Anchor chamber [L]. Anchor plates, hangers and all chains

Fig. 5 Tie rod replacement of lower retained, except short corroded lengths shown ©Posford Duvivier back chain ©Posford Duvivier

Conclusion. Industrial archaeologist Dr Michael Lewis stated in 1973, that of suspension bridges earlier than Horkstow in the UK, almost all have been altered to some degree. Since then, this process has continued, even at Horkstow in 1999, and is now ongoing at Union and Whorlton bridges. Depending on the extent of alteration to the latter, Horkstow Bridge may already be the earliest, least-altered, vehicle-carrying, suspension bridge in the UK and worthy of wider public appreciation by means of an ICE National Historic Engineering Landmark plaque, a viewing area with bench seat, and cycle and modest parking provision. Such measures, are now in hand at Union Bridge by the Council and the bridge's 'Friends'. If done at Horkstow, they should encourage environmentally friendly use of the facility and reduce the level of anti-social activity noted by NLincsCouncil in 2015*, including a 2013 car arson incident that caused extensive deck damage.



Figs 6 & 7. One of a pair of Cast Iron Anchor Plates [920x1165x100mm] in a cross-road arched tunnel [6m long x 2.2m x 0.7m wide] with its extrdos at near road level. ©Redmore

Fig. 8. Horkstow Bridge June 2021. [On 'National Byway' cycle route - Scotland to S. England] ©Redmore

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