



Over-Bridge Trouble Sorters

A road over rail bridge which failed stringent assessment tests, has now been given a clean bill of health thanks to specialist analysis and strengthening overseen by engineering experts at HBPW.

Non-linear Finite Element Buckling Analysis is a specialism available at HBPW and can make the difference between a bridge being certified fit for purpose or not, with the resultant cost implications if a structure irretrievably fails.

Partner, Jon Livesey, said: "The Network Rail bridge in question at New Cross Street in West Bowling, Bradford had previously been assessed by a third party as part of their assessment contract with NR, however, it failed to reach the required 40 Tonne capacity.

"HBPW was asked to review the assessment and recommend a strategy going forward. We realised that some elements of the bridge would require conventional strengthening, however, we also concluded that the element requiring of the most strengthening, namely the edge

girders, would also benefit from the use of sophisticated analysis."

Jon said that analysis codes for certain forms of construction, especially half-through girders, often used on rail bridges, were inherently conservative.

"A non-linear analysis removes those conservatisms," he said, "and provides for full utilisation of the plastic capacity of bridge girders. We thought that the girders had sufficient capacity for 40 Tonne capacity – it was just a case on demonstrating this."

The real key, said Jon, was knowing when to use sophisticated analysis and which technique to apply.

"In the case of New Cross Street the edge girders were failing in shear so we needed to use a non-linear buckling analysis to realise the full capacity. However, in addition to the under-capacity on the edge girders, the inner girders also failed the assessment, although engineers concluded that a buckling analysis would not yield the same benefits and was, therefore, of less value.

"To that end, we proposed the installation of a new concrete slab over the centre of the bridge to improve load distribution and to remove the need for reliance on the deck plates which had also failed the assessment.

"This meant the deck plates could be ignored and the girders only needed some simple strengthening following a less complex grillage analysis."

The combined use of sophisticated analysis and simple strengthening significantly reduced the overall costs to get the bridge to the required capacity.

"Non-Linear Finite Element Buckling Analysis is an incredibly useful tool in the armoury of a bridge engineer, and this certainly proved to be the case in Bradford. A happy outcome for both engineer and client!" added Jon.

Client: Network Rail

Contractor: AMCO



New Cross Street Bridge in Bradford

CONTINUED FROM PAGE 1

Fellow Partner, Jon Livesey, has an interesting tale in this edition. I admit, 'Non-linear Finite Element Buckling' is quite a mouthful, but if such an analysis was going to slash your budget wouldn't you want to know about it? Well, here's your chance! And, by the way, we couldn't resist the headline!

Our very own northern powerhouse, Drax, continues to deliver some interesting challenges and this quarter, it is an opportunity for James Cable to explain how we have been helping this mammoth site keep the dust at bay as it shifts increasingly towards biomass electricity production.

I've been doing a Lotta work on greenhouses (!), my Partner colleague, Emyr Parry, has been supervising a very special 'hammer' and Ross Hardy has been following in the wake of HMS Ark Royal!

For now we continue to work on some great projects so please keep an eye on the HBPW blog to see what we've been up to (www.hbpw.co.uk).

Enjoy the read!

PAUL WITHERS
MANAGING PARTNER
HBPW LLP

Welcome



Paul Withers - Managing Partner

By the time you are reading this there is one certainty that no-one can dispute; we will either be 'in' or out of the European Union! However, since I can do little to influence the political maelstrom that has been gripping our country for the last two years, I shall desist from making comment, other than to say, life has a habit of levelling the playing field and, whatever the decision, we will all be fine. Optimism must always triumph in the face of adversity or disagreement!

I work on engineering projects every day, however, if variety is the spice of life, I can hardly complain at the diversity of work that seemingly finds its way across my desk.

But, I can't take all the credit because HBPW does have three floors of engineers although, as the elder statesman within the company and, therefore, one of the longest serving engineers, I am occasionally asked for an opinion!

CONTINUED ON BACK PAGE

Dust The Job For Drax



Drax Power Station

Five years after beginning work on one of its largest ever contracts – the Immingham Rail Freight Terminal (IRFT) – HBPW has been working at the opposite end of the rail tracks to give Drax Power Station a 21st century engineering makeover.

In September 2013 Associated British Ports (ABP) asked HBPW to undertake the civil engineering design of its multi-million pounds IRFT.

The aim was to create a storage facility for wood pellets, imported from around the world, ahead of their onward transmission to UK power stations via rail, principally Drax Power Station near Selby in North Yorkshire.



Ferrying Biomass to Drax

Once everything was running smoothly Drax called HBPW directly to help them out with another challenge, more than a decade on from when the firm first visited the North Yorkshire site.

Managing Partner, Paul Withers, takes up the story: "Ten years ago wood pellet rail transfer infrastructure and storage facilities needed installing and we were called on to support Drax with the necessary engineering design.

"However, more than a decade on the site has had to change massively now that Drax is playing a vital role in helping change the way energy is generated, supplied and used in the UK, particularly as the country moves towards a low carbon future.

"The facility is responsible for generating 7% of the UK's electricity and, with the huge shift towards biomass, they required the installation of new dust handling facilities, something we were asked to engage with, from an engineering perspective, by mechanical contractors Philford."

It is critical that pellets remain dry with the consequent result that dust becomes a major problem.

"The IRFT has four 25,000 tonne biomass silos and when you consider what is required to keep Drax operating from a 'fuel' point of view, it goes without saying that dust is more than an inconvenience, it is a critical hazard.

"We were delighted that Drax approached us directly and good to know that we were working in an area of the business where we already had on-site engineering credentials."

Drax is now predominantly biomass-fuelled with 70% of the electricity it produces – enough to power Leeds, Manchester, Sheffield and Liverpool – made using compressed wood pellets rather than coal.

Client: Drax Power Station
Contractor: Philford Design Engineers

Temporary Works Signal Start of £600k Docks Makeover



The 70 tonne dock gate lift

A temporary works project led by HBPW has played a key role in the £600k makeover of historic Blyth Docks in the North East, the place where the world's first modern-style aircraft carrier, HMS Ark Royal, was built in 1914.

As part of the wider site refurb temporary works were required to facilitate the safe removal, repair and reinstallation of a 20m wide x 9m high fabricated steel plate dock

gate located at the entrance to dock gate three.

Engineer Ross Hardy takes up the story: "AMCO originally tendered for the works on behalf of leading offshore renewables technology and innovation centre, the Offshore Renewable Energy (ORE) Catapult, who occupy the docks site.

"The 70-tonne dry dock gate which needed to be removed and in place

since the 1980's, supported a full head of tidal water from the Blyth Estuary and had not been operated in many years. Unusually its opening mechanism comprised of four pivots at the base which enabled the gate to rotate from its vertical position to a fully submerged horizontal position on the dock bed

"The solution involved the replacement of each of the pivot pins with smaller diameter pins that could then be easily extracted on the day of the gate removal. Our

"It was a big task requiring a lot of precise thinking"

temporary works were required to support the gate laterally against the hydrostatic water pressure during the pin replacement process.

"The temporary steelwork also remained submerged in the dock during the refurbishment to act as a guide in ensuring that the gate was precisely re-installed to its original position."

Removing the dry-dock gate from its home of more than 30 years required a 750-tonne crane, with local consultant Fairhurst working alongside contractors KGAL and AMCO to complete its refurbishment.

"It was a big task requiring a lot of precise thinking," added Ross, "however, despite some initial challenges the dock gate refurb was successfully completed, paving the way for the rest of the project to steam ahead."

In recent years the docks have been a testing ground for some of the very latest next-generation technologies being developed for the offshore renewables sector – from innovative cable laying techniques to trenchers and remotely-operated vehicles (ROVs).

This investment, beginning with the refurbishment of the gate, will help maintain the docks' legacy of ground-breaking innovation, putting the site at the heart of the renewables energy revolution and enabling ORE Catapult to maximise the use of its saltwater testing environment to support businesses and bring new products to market. Future technologies to be tested there will include robotic underwater inspection vehicles and new anti-corrosive materials for wind turbine foundations.

Client: ORE Catapult
Contractor: AMCO

Mega Hammer Nails The Job

The 'hammer' used to bring a prime North London industrial property to fruition would have put most rivals to shame.....it weighed in at a cool 10 tonnes!

Midpoint is a high quality building strategically located on Jeffreys Road between junction 25 of

the M25 and the A406 North Circular Road.

However, whilst the site was extremely desirable to retailers, it required extensive ground improvement due to poor conditions underfoot.

HBPW Partner Emyr Parry said:

"We decided to specify dynamic compaction across the site, to avoid requirement for piling, so that we could provide competent ground to support building loads. At the outside we had to be mindful of the possible damage piling might cause to adjacent properties – largely due to vibration – hence the dynamic compaction route."

"Dynamic compaction is achieved by dropping a 10 tonne conical weight from around 10m on a regular grid across the site. The resulting depressions are then filled with stone and the process repeated until the ground is satisfactorily stabilised. The strategy was a complete success," added Emyr.

Firm ground meant engineers were then able to erect a 100x50m warehouse with 10 metres of clear internal height along with first and second floor storage and office areas.



Midpoint's 10 tonne conical hammer at work

"In designing the steelwork, foundations and external works, we sought to future proof the building by creating inbuilt flexibility. That means it can either work as one large unit or be split into two or three smaller ones, giving letting agents – and prospective clients – more flexibility.

Client: Newable Property developments
Contractor: Chalcraft Construction
Architect: Aplus Architects

A Watery Solution for DIRFT III



Work at Long Dole taking shape

HBPW has been playing a key 'flood protection' role in the continuing development of Daventry's huge International Rail Freight Terminal (DIRFT), a civil engineering project that has now entered its third decade.

DIRFT is a rail-road intermodal freight terminal, with an associated warehousing estate, located four miles east of Rugby and six miles north of Daventry in Northamptonshire.

The original 300-acre development came into operation in 1997 and a

130-acre extension, often referred to as DIRFT II, was given the planning green light in 2005 with the ambition to be 100% rail connected. A huge Tesco distribution centre became the first tenant in 2011.

Now a second huge 'rail connected' extension, DIRFT III, is underway on the former Rugby radio station site, featuring more than 7.5m sq. ft. of warehousing.

It is bounded by the M1 to the east, with the A5 running through its centre. It was the A5 that presented several challenges for HBPW.

Engineer James Cable takes up the HBPW story:

"There is an existing culvert running beneath the single carriageway A5 – Long Dole - which carries Clifton Brook, however, due to the size and scale of DIRFT III and, more specifically, the nature of developments taking place in the area near the culvert, it had to be replaced with a larger structure in order to increase water flow capacity and enhance flood protection."

The Permanent Works were put together by PBA Associated whilst HBPW designed the temporary works to support excavations.

"The road had to remain open at all times and Clifton Brook was diverted whilst the new culvert was constructed. This involved the use of flow diversion pipes. Temporary excavation was also required so, overall, there were several key elements that were required to support the smooth flow of work."

In addition, HBPW also carried out the Permanent Works design for the new replacement Danes Way culvert which runs under the Danes Way dual carriageway estate access road and, again, allows for greater flow capacity.

"Finally, a 125m long, 2.8m high sheet piled training wall was installed between Long Dole and Danes Way culverts so that contractors could excavate and lower Clifton Brook's bed base level. The brook, like the culverts that carry it, also has a higher water flow capacity," added James.

The culvert replacements were required as part of works to regrade Clifton Brook so that it could be returned to its natural gradient, enhancing flood protection to both the A5 and Daventry's International Rail Freight Terminal.

Client: Prologis UK Ltd
Contractor: Buckingham Group Contracting
Architect: Highways England



Some of the flow control structures being put in place

What A Lotta Greenhouse!



Withers at the end of a smashing day!

Bridge engineer and HBPW managing partner, Paul Withers, rolled up his sleeves when he visited a local school to take part in one of his most important engineering projects to date!

Paul, who is used to wearing a suit and working with huge clients such as Associated British Ports and Network Rail, came to the aid of Tuxford Primary Academy in Newark, East Midlands.

Teachers there wanted to give students hands-on experience of how to grow flowers and food in a greenhouse but, when they saw the cost of aluminium greenhouses, they came up with the idea of making their own.....out of old plastic drink bottles.

Paul, also a member of Rotary, intervened and managed to persuade his Retford Club to find some cash to fund the project.

"The Retford Club's Foundation and Youth Committees, together with the Tuxford Legacy, a sum of money donated to Rotary by a former resident, enabled us to make cash available to purchase a greenhouse frame and then I turned up on the appointed day to coordinate the engineering!"

Youngsters collected hundreds of empty two litre bottles to form the



Youngsters hard at work

'skin' of the greenhouse which now stands on a sturdy concrete base, courtesy of the school's resident engineer, a certain Mr Withers!

"I was delighted to get involved on behalf of HBPW," said Paul "because projects of this nature not only teach children about preserving the environment and the concept of re-using valuable resources, but also encourage them to learn about food and its origin.

"Bottle greenhouses are relatively cheap, sturdy and easy to repair," he added, "and they also link to the National Curriculum in that they support learning with things like label writing, counting and caring for the environment. It was a real community effort and a day of great enthusiasm with a tangible outcome that youngsters will remember forever."



Bottle greenhouse