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INDUSTRY LEADING BRIDGE ENGINEERING SOLUTIONS

CONSTRUCTING, MAINTAINING AND EXTENDING THE LIFESPAN OF BRIDGES ACROSS THE UK & EUROPE

Think Extraordinary. Think Spencer
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WE ARE SPENCER GROUP - BRIDGE ENGINEERING

Luke Fisher
Sector Lead for Bridges and Structures at Spencer Group
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I am proud to be part of one of the most innovative, collaborative and exciting engineering businesses in the UK.

We work on some of the worlds most prestigious structures providing pioneering solutions ranging from bespoke cable crawlers, enabling safe working over live bridges, to retro-fitted dehumidifiers, prolonging the life of bridges across Europe.

Through our vastly experienced teams of engineers we seek to solve our client's challenges by developing innovative, bespoke solutions (both static and dynamic), to cater for the nuances of any project.

By listening to our clients for over three decades we have developed a unique range of in-house services which add direct value to our projects, from inception to hand-back.

We support our client's teams through optioneering; early contractor involvement; buildability; programme optimisation; cost analyses and value engineering to ensure we deliver the best value-adding solution available.

We focus on stakeholder management; sustainability; diversity & inclusion and the environment to ensure we do things in the most caring and empathic manner. In this way we minimise disruption to the travelling public, the communities we work within and our clients.

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Menai Bridge Footway Panel Replacement

CAPABILITY AND EXPERTISE

HISTORIC BRIDGE RENOVATION | BRIDGE REPAIR, REFURBISHMENT & MAINTENANCE | INNOVATIVE TEMPORARY ACCESS SOLUTIONS
PERMANENT UNDER-DECK GANTRIES | RAIL BRIDGES | NEW STRUCTURES

SERVICES

STEELWORK / CONCRETE STRENGTHENING | BLASTING & PAINTING | M&E AND SYSTEMS INTEGRATION | SURVEYS & INSPECTIONS
BEARING REPLACEMENT | HANGER REPLACEMENT & TESTING | A-FRAME REPLACEMENT

EARLY CONTRACTOR INVOLVEMENT

Joe DiMauro CEng MICE
Engineering Manager Bridges & Structures at Spencer Group
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By applying our robust Early Contractor Involvement (ECI) processes, we are able to deliver best value for our clients by helping to shape the most appropriate technical solution for the project. We have a large in-house design team which works alongside our construction professionals during the ECI period, making the process seamless and effective.

ECI may include the preparation of initial engineering proposals for a range of options and then providing budget and programme data for each solution so that the most cost effective and appropriate design is taken forward. The buildability / safety of construction and the cost of maintenance of each option is also important - not just lowest initial cost.

The ECI approach can yield greater construction cost certainty and a significantly reduced risk/cost profile than a traditional procurement route. It means that construction mobilisation can commence sooner through efficient transfer of knowledge and removal of the procurement phase, provided a commercial agreement can be achieved or market testing can be demonstrated.

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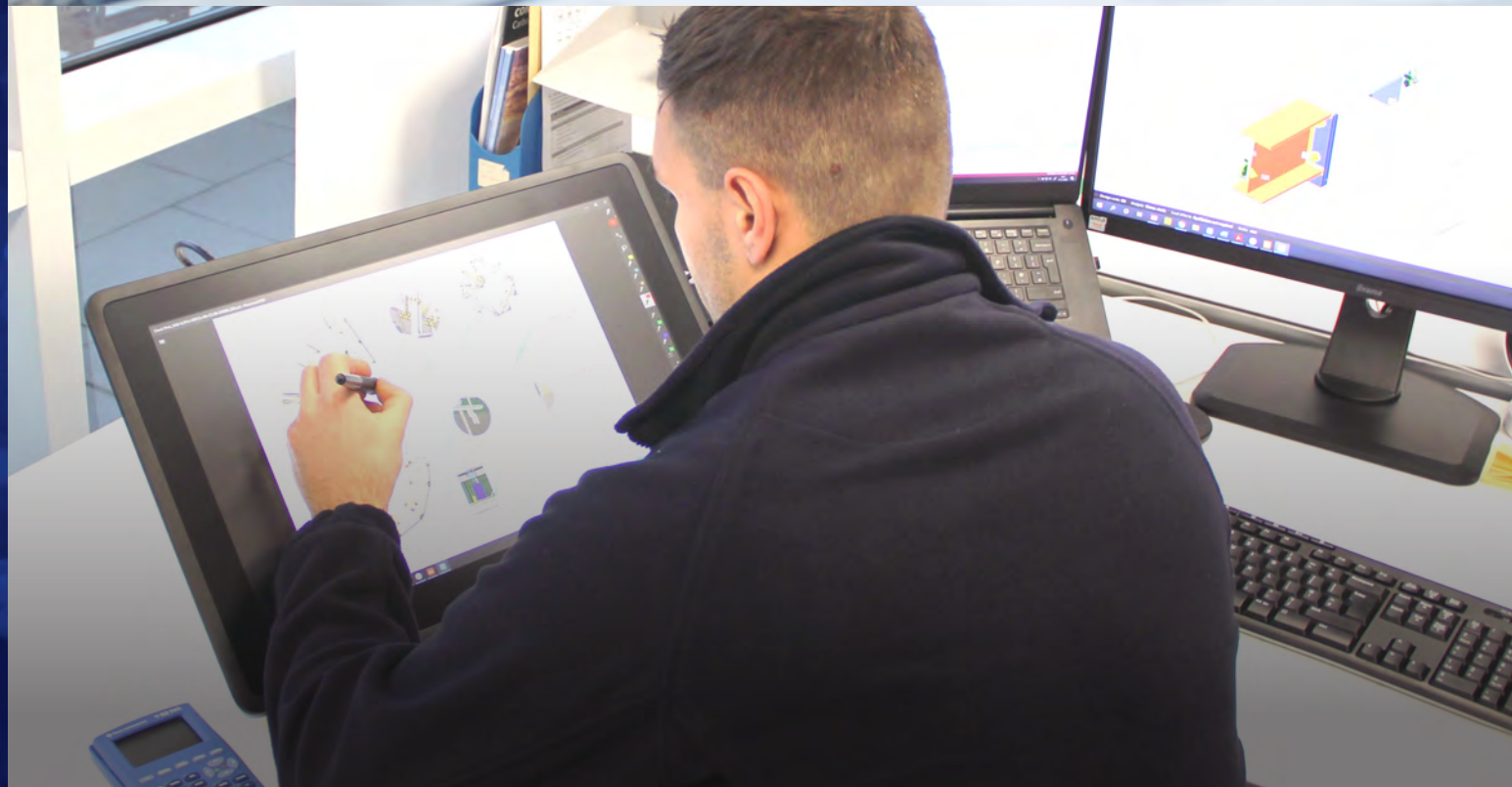

LARGE IN-HOUSE DESIGN TEAM

Mick Renshaw CEng MIStructE MIMechE MIED FCMI
Engineering Director at Spencer Group
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Few contractors in the UK have dedicated multi-disciplinary in-house design capabilities whereby complex, turnkey projects can significantly benefit from a bespoke design philosophy.

Huge benefits are borne through the efficiencies of internal collaboration between our construction engineers and civil, structural, mechanical and electrical control system specialist design engineers. Our collaboration extends to our client teams, critical stakeholders and supply chain so that the most sensitive third parties can have ownership of the design development process.

The importance of temporary works design is often overlooked at concept stage. We develop the most efficient, buildable and appropriate temporary works designs at pre-construction stage to ensure they are compatible with the permanent works design. Our temporary works experience covers suspended access, shoring of excavations and de-tensioning of hanger cables in addition to other interfaces such as lifting operations.

Permanent works design is implemented in a BIM compliant common data environment, making the sharing of information and hand back as smooth as possible. Our team have experience working on both steel and concrete bridges and the expertise of our in house mechanical engineers means we are equally adapt at working on both moving and static structures.

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Union Chain Bridge Refurbishment

OUR LEGACY

Diane Rowe
Stakeholder Manager at Spencer Group
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We become part of the community of every project we undertake - even if only for a short period of time. It is imperative that we recognise the complexities and sensitivities of these relationships in order for us to complement and enhance and not create conflict during the delivery process.

We see our projects as an opportunity to help support rather than be a negative experience – communicating positively with and caring for those who will see short-term impacts associated with our work.

Our aim is to add value to the communities we work in, whether that's through using local services and amenities to employing local people/subcontractors

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School Visit to the Humber Bridge

HISTORIC BRIDGES

Spencer Group have over 25 years' experience of refurbishing historic bridges over water, land and railways. Our bridges team of experienced chartered engineers and on-site delivery teams are highly experienced in the refurbishment of grade I and grade II listed structures across the UK.

We have developed significant expertise in the refurbishment of bridge decks, suspension systems, masonry repairs, grit blasting, inspections, steel-work execution, weld repairs and subsequent repainting activities.

Our in-house design team offer complex temporary and permanent works design solutions, providing safe access for our workforce whilst limiting disruption to local residents and businesses.

By combining pioneering engineering solutions with meticulous planning and excellent stakeholder relationships, we can ensure that any project is delivered to meet the client's requirements and expectations.

Our bridges teams are highly experienced with working on aging structures to deliver carefully executed construction methodologies required to preserve and maintain their iconic significance and structural integrity. Our site teams diligently work to our in-house procedures to ensure a first class quality offering is produced, extending the lifespan of these historic structures.

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Union Chain Bridge


Menai Suspension Bridge


Horkstow Bridge


Balloch Bridge


Union Chain Bridge

PROJECT DETAILS

Client	Northumberland County Council
Start Date	August 2020
End Date	January 2022
Duration	17 months
Location	Northumberland

KEY STATS

1 BESPOKE OVERHEAD CABLE CRANE & ACCESS SYSTEM DEVELOPED

31T OF WROUGHT IRON CHAINS REFURBISHED

444 CHAIN RODS REFURBISHED

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UNION CHAIN BRIDGE REFURBISHMENT

Spencer Group were appointed by Northumberland County Council to carry out a programme of essential works to preserve the 200-year-old Union Chain Bridge linking England and Scotland. The works involve fully dismantling the bridge in order to carry out a complete refurbishment of the bridge components, restoring them to their original condition. This made possible through the use of a series of suspended underdeck access platforms, access cradles and an overhead cable crane which allow the project team to access any area of the bridge whilst it is being dismantled.

PROJECT SCOPE

The project involves removing the entire timber bridge deck using a suspended underdeck access platform and overhead cable crane. Removing all hanger rods using access cradles and an overhead cable crane. Removing all the suspension chains. Refurbishing the existing masonry towers using sandstone from the same nearby quarry, Swinton, as used originally to match the colour and geological characteristics, along with the same type of mortar. Restoring the chains to their original strength, with links repaired instead of replaced wherever possible. Every link and chain that can be repaired will go back in its original place. Installing new suspension chain anchorages either side of the bridge. Re-installing the refurbished suspension chains. Installing the new hanger rods using cradles and an overhead cable crane. Installing the new deck, using timber sustainably sourced timber from managed woodland, and completing resurfacing work.

PROJECT OUTCOME

The key aim of this project was to ensure that all all modifications are in keeping with the historical significance of the bridge whilst allowing it to continue to provide safe passage for bridge users in the future. This includes restoring, rather than replacing, the existing suspension chains and using the same type of stone to repair masonry work on the bridge's two towers.

A bespoke tagging & tracing system allowed the site team to tag, remove and refurbish bridge components, ensuring that they are put back in their original position on the bridge upon completion.

The approach roads from both England and Scotland will be remodelled to incorporate parking for visitors to the bridge, which is accessible to both vehicles and pedestrians and is a popular tourist attraction.

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PROJECT DETAILS

Client	Environment Agency
Start Date	June 1998
End Date	June 1999
Duration	12 months
Location	Lincolnshire

KEY STATS

II* GRADE II* LISTED STRUCTURE

1 1 OF THE EARLIEST SURVIVING SUSPENSION BRIDGES

1/6 HISTORIC BRIDGES WHICH FORMED THE OVERALL PROJECT

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HORKSTOW BRIDGE REFURBISHMENT

The overall project was to repair 6 historic bridges across Lincolnshire. The scope of works on this project was to fully refurbishment the bridge. The refurbishment entailed a blast and clean of all the stonework to the towers and anchor blocks, full encapsulation of the bridge to blast and repaint the main cables and hangers, replace any of the stonework which needed replacing and to replace the hardwood timber decking and all the crossbeams.

PROJECT SCOPE

The refurbishment works came with a range of difficulties such as matching the stonework and cables for colour and cut to existing stonework.

While the works were undertaken Spencer Group discovered the articulation wasn't working correctly on the top of the towers and the anchor blocks had the chain jammed in them.

Because of this, Spencer Group were contracted to take the stonework off the top of the anchor blocks and towers then refurbish the articulation of the bridge so it was free to move again.

PROJECT OUTCOME

Due to the excellent end product Spencer Group were awarded the Historic Bridge Award for that respective year.

The other 5 bridges involved in the overall project were Saxby Bridge, Broughton Bridge, Hibaldstow Bridge, Cadney Bridge, Snitterby Bridge.

All these bridges are also historic bridges where the scope of works Spencer Group were contracted to undertake were similar for each bridge.

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REPAIR, REFURBISHMENT & MAINTENANCE

Spencer Group has an outstanding track record of work on some of the largest bridges in the UK and Europe. We have developed significant expertise on undertaking highly technical maintenance and repair works to assist our clients in extending the lifespan of bridges, using a combination of disciplines across the civil engineering sector and beyond to develop game-changing solutions to unique problems.

Our extensive experience in the maintenance of bridges allow us to perform works of all disciplines to maintain the structural integrity or the bridge aesthetics. prioritising innovative solutions that save the client time and money are imperative in our bridge maintenance. From unique cable dehumidification methods on large suspension bridges to bearing replacements on large multi span bridges, we're sure to have the experience to complete the job successfully again. We're often commended by our clients in the speed in which we operate on the bridges, this is because of our years of extensive experience which have allowed us to design and fabricate temporary access gantries and platforms to ensure works are as safe and efficient as possible.

This innovative approach extends beyond the engineering solutions into the planning side, with a focus on ensuring our clients experience as little disruption as possible during the project by minimising the need for closures and carriageway possessions. By combining ingenious engineering solutions with meticulous planning and excellent stakeholder relationships, we can ensure that any project is delivered to meet the client's requirements and expectations.

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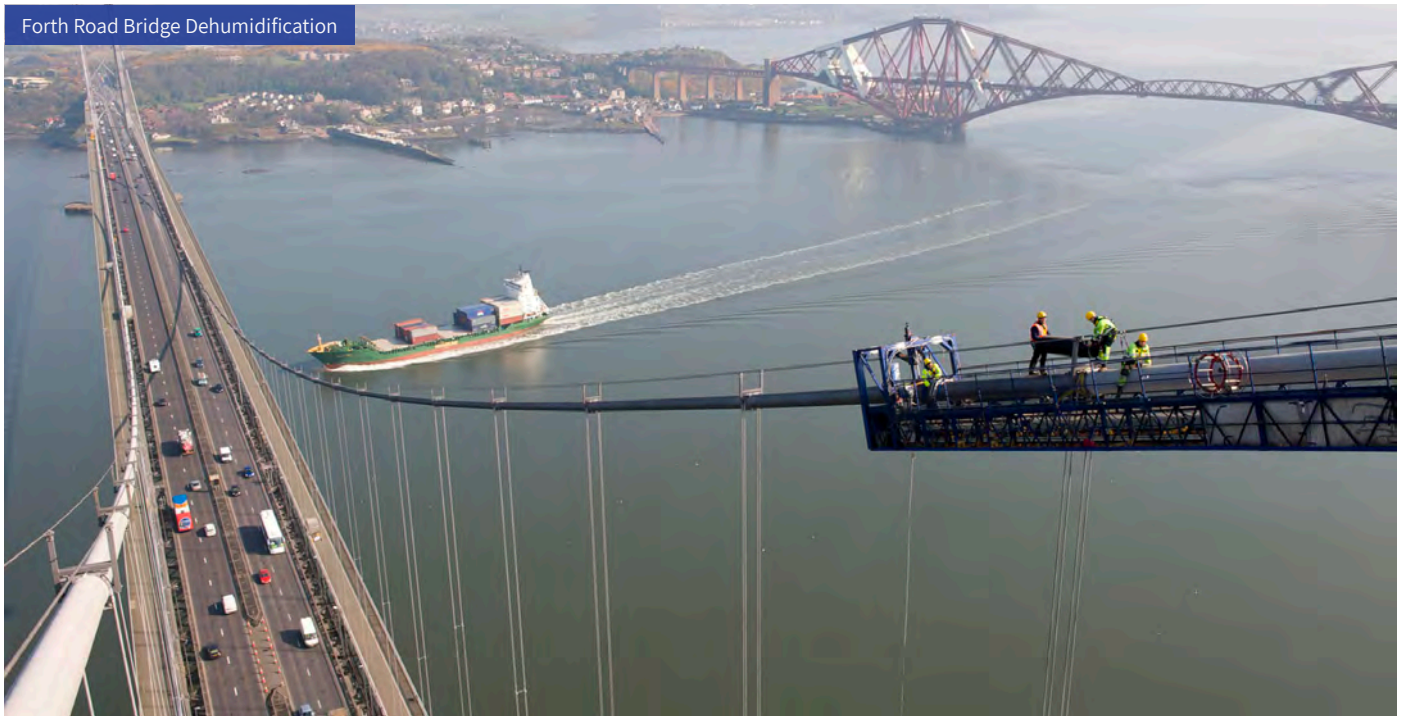
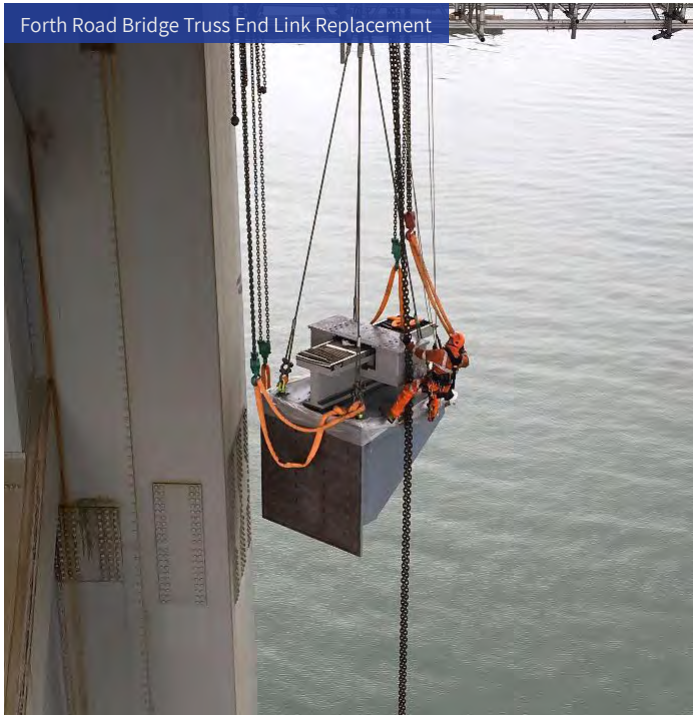
Forth Road Bridge Dehumidification

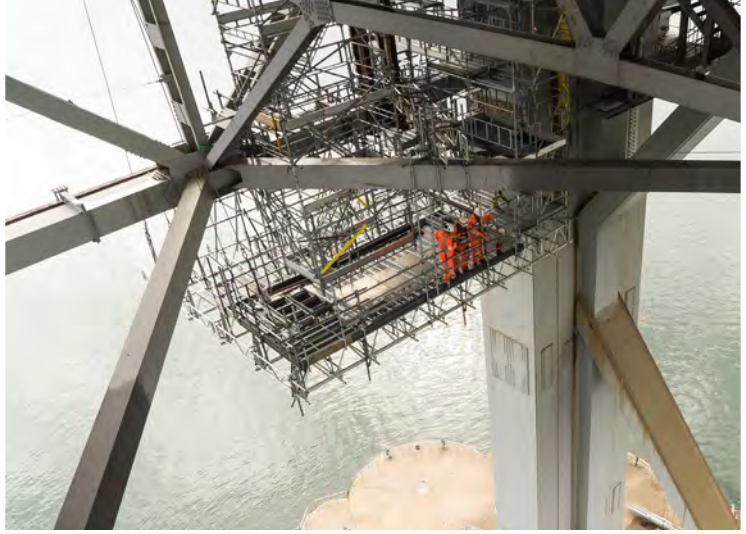


Humber Bridge Hanger Replacement

Aldwarke Bridge Refurbishment

Forth Road Bridge Truss End Link Replacement





PROJECT DETAILS

Client	Transport Scotland
Start Date	August 2017
End Date	November 2018
Duration	15 months
Location	South Queensferry, Edinburgh

KEY STATS

7 REPLACEMENT OF 7 TRUSS END LINKS

50M SCAFFOLDING 50M ABOVE THE FIRTH OF FORTH

SSSI SITE OF SPECIAL SCIENTIFIC INTEREST

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FORTH ROAD BRIDGE TRUSS END LINK REPLACEMENT

Spencer Group were appointed as Principal Contractor by Transport Scotland to repair the truss ends on the Forth Road Bridge, following a high-profile fracture in the North East main span link that connects the tower to the road deck, forcing the bridge to close for three weeks. The works involved replacement of seven truss ends which connect the bridge deck to the tower.

PROJECT SCOPE

Spencer Group were tasked with cutting out the obsolete sections and replacing them with a unique sliding bearing system. This required removing the temporary solutions on the main deck and installing bearings, as well as installing both the temporary solutions and the new bearings on the side decks.

We also strengthened tower cells to take the combined 14 tonne weight of the support bracket and new sliding bearing. To enable the installation of the new bearing, the current truss was modified, with a section of the end post and bottom chord cut away and replaced with new sections.

We also conducted modifications to make future works on the bearings considerably easier, this included installation of new access stairs and permanent access platforms to allow easy maintenance all year round, reducing disruption to bridge users during future repairs/maintenance.

PROJECT OUTCOME

A number of key challenges were overcome in order to successfully deliver the project, this included working safely on an operational bridge and at height. For example, temporary scaffolding was required 50m above the River Forth and traffic management measures were implemented on the bridge to reduce speed restrictions and the number of vehicles on the bridge.

Furthermore, the Forth Road Bridge, is located within a Site of Special Scientific Interest, we therefore coordinated all work with the Scottish Environmental Protection Agency to ensure our works had no adverse environmental impacts.

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ERSKINE BRIDGE BEARING REPLACEMENT

Spencer Group were awarded the contract by Transport Scotland to deliver an extensive programme of maintenance and painting on the Erskine Bridge. An element of the project involved the temporary works design, replacement methodology and construction works for replacement of the main bridge bearings at the South abutment.

PROJECT DETAILS

Client	Scotland TranServ
Start Date	February 2018
End Date	November 2020
Duration	33 months
Location	Scotland

KEY STATS

400MM — CONFINED WORKING SPACE DURING BEARING REPLACEMENT

1/2T — STEEL SECTIONS MANOUVERED USING BESPOKE TEMPORARY WORKS DESIGN

SSSI — RAMSAR & SITE OF SPECIAL SCIENTIFIC INTEREST

PROJECT SCOPE

Due to wear and corrosion of the South East bearing at the south abutment, supporting the deck box between the abutment and pier 1, the bearing roller was not in full contact with both upper and lower surfaces of the bearing assembly.

We were required to stiffen and strengthen the end diaphragm to provide new jacking points inboard of the existing bearings to permit the deck to be jacked up using a temporary jacking system. This enabled each bearing to be dismantled and removed, followed by the installation of new bearings including welding new wear plates to existing structural steelwork. We also repaired cuts and painted the original tie backs, in addition to preparing the abutment wall and bearing shelf concrete surfaces through using high-pressure water jetting to remove all traces of paint and dirt, followed by concrete repairs and waterproofing.

PROJECT OUTCOME

The Inner Clyde Estuary is both a RAMSAR and SSSI site, requiring intricate planning and environmental protection measures to prevent any adverse impacts on the surrounding flora and fauna. We therefore worked closely with Transport Scotland and the Scottish Environmental Protection Agency to implement a number of mitigation measures including encapsulation of work areas, spill kits and debris netting.

The bridge remained open to traffic and the public throughout the contract, demonstrating our ability to work at height, above an operational highway and within close proximity to the general public.

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PROJECT DETAILS

Client	Humber Bridge Board
Start Date	July 2013
End Date	October 2014
Duration	15 months
Location	Hull

KEY STATS

1.4M 1.4 MILE BRIDGE LENGTH

4 A FRAMES REPLACED

2 AWARD WINS

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HUMBER BRIDGE A FRAME REPLACEMENT

Formerly the world's longest suspension bridge, the Humber Bridge spans the Humber Estuary from East Yorkshire to Lincolnshire across a 1,410-metre roadway. Wear and tear caused by 32 years of strong weather conditions necessitated the replacement of the A-Frames, which connect the deck to the towers and allow the bridge to expand and contract naturally in the heat and cold.

PROJECT SCOPE

Following design optioneering, Spencer Group's innovative scheme was selected to replace the main span's A-frames with a pair of vertically orientated pendels and a wind shoe at each tower, thus separating out the horizontal and vertical forces, with benefits for construction and maintenance. This would not only replace the existing A Frames, but also reduce the stress on the new replacement to increase its lifespan and reduce the cost and frequency of maintenance. The project was a complex scheme involving several engineering disciplines, as well as working at height in the cramped below-deck area, whilst minimising the effect on the bridge's operation – as a vital artery and Hull's only fixed crossing.

PROJECT OUTCOME

Using Spencer's in-house design resources, we were able to create an end product that was highly praised by our client. As well as the design being highly innovative, the delivery of the project allowed us to keep the bridge operational while works were carried out, leading to an ongoing relationship with the client. The project won the Civil Engineering Project of the Year (up to £10m) category in the British Construction Industry Awards 2015, the ICE Smeaton Award and was nominated for the Prime Minister's Better Public Building Award, and was the subject of a paper by the ICE. Spencer Group implemented a new main span A-Frame replacement system that ensured the integrity of the bridge and simplified future maintenance.

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INNOVATIVE TEMPORARY ACCESS SOLUTIONS

Spencer Group has unrivalled experience in providing access solutions for our clients. Our multi-disciplinary approach gives us the ability to utilise engineering experience from across our sectors to deliver efficient & effective access on complex structures within challenging environments.

Originally used during suspension bridge main cable inspections, our patented cable crawler design has also been used to retrofit dehumidification systems to some of the largest suspension bridges in the world. Since then we have designed and built a range of gantries that allow our engineers to carry out suspension bridge hanger cable replacements, replace suspension bridge cable clamp bolts, repaint cable stay main cables and repaint suspension bridge hanger cables.

Our gantries allow work to be carried out safely at height within an enclosed environment, whilst also keeping bridges operational and minimising disruption to bridge users.

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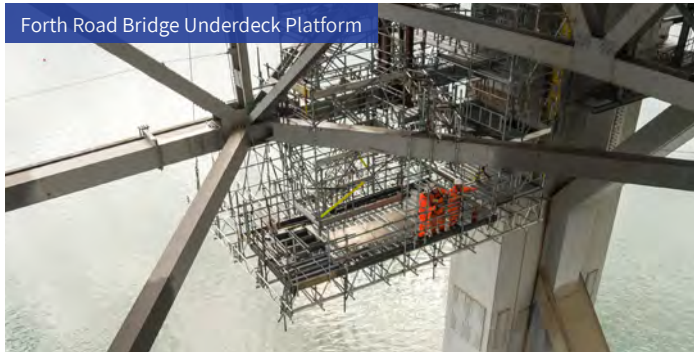
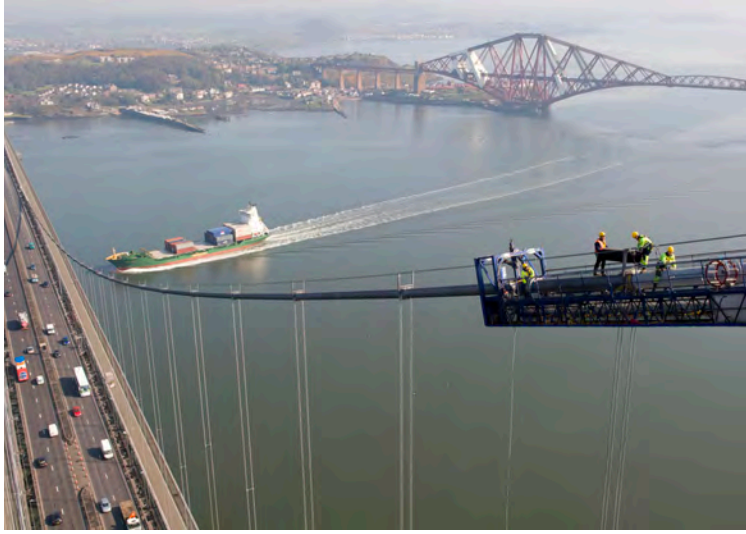
Humber Bridge Cable Crawler

Humber Bridge Hanger Gantry

Forth Road Bridge Underdeck Platform



Union Chain Bridge Suspended Access System



PROJECT DETAILS

Client	Forth Estuary Transport Authority
Start Date	January 2007
End Date	July 2009
Duration	30 months
Location	Edinburgh

KEY STATS

1 ONLY ONE LANE CLOSURE REQUIRED

1 UNIQUE ‘CABLE CRAWLER’ ACCESS GANTRY DESIGN

3 THREE SETS OF DEHUMIDIFICATION PLANTS WERE PROVIDED

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FORTH ROAD BRIDGE DEHUMIDIFICATION

Our works at the Forth Road Bridge were the first works of this type that we were commissioned to undertake. Using our bespoke ‘cable crawler’ access gantry, we installed a dehumidification system to the main cables to inject dry air into the cable at a number of locations. This reduces the speed of corrosion and extends the life of the cables.

PROJECT SCOPE

Spencer Group were appointed by the Forth Estuary Transport Authority to install a dehumidification system to the main cables of the Forth Road Bridge.

The project involved the design and installation of a unique ‘cable crawler’ access gantry design which allowed the for the process of wrapping the main cables with an airtight membrane followed by installing a number of inlet and outlet ports with associated piping.

Three sets of dehumidification plants were provided, one at the main mid span and one at each end of the main towers.

A key part of the process was the subsequent sealing of the cables with a proprietary material to create an air-tight environment.

Significant risks associated with working at height were minimised through the use of the cable crawler gantry.

PROJECT OUTCOME

Our approach to works of this type required only a single carriageway possession for installation of our bespoke ‘cable crawler’ gantry. Once the gantry had been manoeuvred from the delivery vehicle to the landing trestles, the carriageway could then be re-opened with only a lane-one closure required.

Our in-house development of the ‘cable crawler’ gantry for suspension bridge main cables not only had significant positive contribution to project programme, quality and methodology, it also created opportunities to carry out other essential works without the requirement for carriageway possessions on heavily used and critical transport routes. Any other methodology would require full-time lane closures, carriageway possessions, multiple crane lifts and significant disruption.

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PROJECT DETAILS

Client	Humber Bridge Board
Start Date	March 2018
End Date	December 2018
Duration	9 months
Location	Hull

KEY STATS

1 GRADE 1 LISTED STRUCTURE

7 200T FULL SCALE LOAD TESTS CARRIED OUT

4.5X3M BESPOKE, PURPOSE BUILT ACCESS PLATFORM

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HUMBER BRIDGE HANGER REPLACEMENT

Spencer Group were appointed by the Humber Bridge Board to test hangers in areas of high stress on the bridge, as part of the Humber Bridge Board's asset management strategy. Investigations into the current condition of the existing hangers were necessary to establish the life expectancy of these structural elements. This work allowed the Humber Bridge Board to determine the current life-span of the existing hanger cables, and predict when intervention would be necessary.

PROJECT SCOPE

Spencer Group were appointed as Principal Contractor and temporary works designer, with Atkins providing project and commercial governance, along with the design of the permanent works.

The bridge deck is suspended from 484no. 62mm diameter inclined hangers with the longest hanger on the bridge being 125m and the shortest hanger at 2.25m.

In order to test the capacity of the hangers, we removed the specified hanger cables from the bridge for testing and replaced them with new and improved hangers.

This was a technically challenging project requiring complex temporary works access and working within constrained and difficult environments. The project was completed with minimal disruption to bridge uses. The works were carried out only at off peak hours, with no daytime lane or carriageway closures required.

The hangers were tested to destruction by simulating actual fatigue performance and based on these test assessments, the remaining life span of the hangers could be determined. The hanger removal process can also be used to facilitate future hanger replacements, utilising lessons learnt to implement the most efficient and effective methodology when the 484 hangers are eventually to be replaced on the bridge.

Our internal design team designed a bespoke, purpose built access platform to allow engineers to access and inspect the bridge's hangers. This 4.5m x 3.1m x 4.3m static frame structure provided a safe space to work within, whilst also opening up via an articulating floor to enable the exchange of hangers.

Several challenges were faced on this scheme, most significantly the unknown load in each of the individual hangers, and the requirement to work in line with Historic England due to the bridge's Grade I listed structure status. Therefore, tight controls were placed upon jacking operations and displacement of the structure, and communication maintained with Historic England throughout the project.

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PERMANENT UNDERDECK GANTRY DESIGN & INSTALLATION

Spencer Group has unrivalled experience in the design, supply, installation and commissioning of permanent moving under-deck gantries on major crossings. Our team deliver innovative and efficient access solutions on complex structures within challenging environments, right from concept design to handover and ongoing maintenance.

We work collaboratively with our clients to understand the requirements of the access on each bridge, and engineer a bespoke gantry to suit the particular constraints and geometries. Moving gantries are a complex safety critical integration of structural, mechanical and control system disciplines, often requiring long operational design lives and robust maintenance strategies. Spencer group are industry leading in this field and have provided some of the most complex systems in use today.

Our off-site and on-site teams have a proven ability to overcome the many challenges that arise when working on bridge structures in demanding environments, including working at height over waterways and within live operational and sensitive environments.

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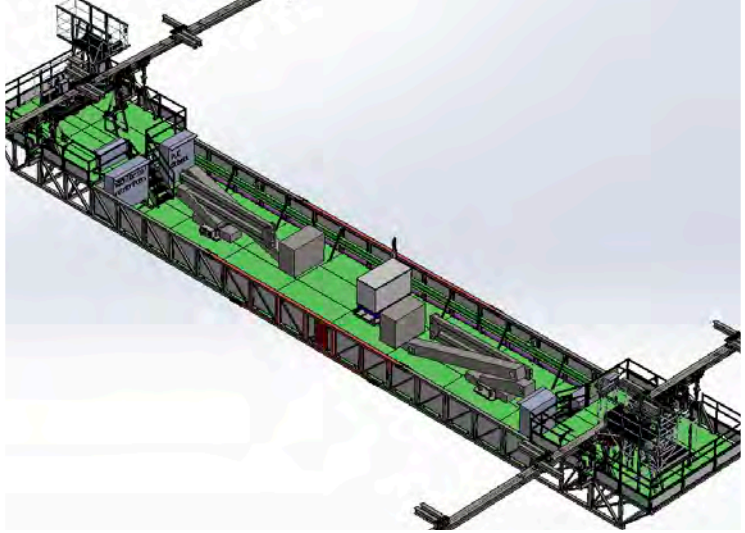
Kessock Bridge Underdeck Gantry

Forth Road Bridge Underdeck Gantry

Erskine Bridge Underdeck Gantry



FORTH ROAD BRIDGE UNDERDECK GANTRY

Due to the harsh marine environment of the Forth Road Bridge (FRB) location and their age, the existing underdeck access gantries on the Forth Road Bridge had reached the end of their operational life. A more refined and robust version was required. The Spencer Group were awarded the contract by Amey and Transport Scotland to build, CE Mark and off-site factory acceptance test a new high specification main-span under-deck motorised gantry.

PROJECT DETAILS

Client	Amey (Transport Scotland)
Start Date	March 2020
End Date	December 2020
Duration	9 months
Location	Off Site Works

KEY STATS

25T WEIGHT OF GANTRY STRUCTURE

1 NEWLY CONSTRUCTED GANTRY

CV-19 PROJECT RAN ON TIME AND TO BUDGET DESPITE COVID-19

PROJECT SCOPE

The new gantry was required to be manufactured, painted and off-site factory acceptance tested to meet the stringent criteria of BS EN 1090-2 Execution Class 3 (EXC3), specification for highway works and the IStructE Purple Book.

Particularly robust quality control procedures were in place for the duration of the works to ensure the gantry met the design life required and withstood the environmental conditions the gantry would be exposed to within the location of the Forth Road Bridge.

In addition to the gantry primary structure, two bespoke MEWP's were also manufactured to EXC3 and mounted to the frame, which provide access to the under-deck of the FRB when in service.

The gantry control system was required to be modified to include additional equipment over and above the previous gantry design, and integrated as required into a previous EC&I design of the new gantry. The new gantry was mounted onto a dedicated test rig and subjected to a number of mechanical and operational tests to verify performance against the designers requirements.

PROJECT OUTCOME

Despite the project running through the full period of the Covid-19 restrictions, mitigation was put in place to minimise the impact to programme and budget.

Robust systems of inspections on the steel-work and painting were implemented throughout the project and reported back to the client to demonstrate compliance with the specification and designers requirements.

Minor improvements to the design were made during the construction stage in collaboration with the designer, to ensure a very high specification gantry was provided to the client, maximising operational lifespan of the equipment for years to come.

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PROJECT DETAILS

Client	Bear Scotland
Start Date	October 2018
End Date	Ongoing
Location	Inverness, Scotland

KEY STATS

1KM LENGTH OF GANTRY TRAVEL

3 GANTRY ARTICULATES AROUND THREE AXES

160MM GANTRY GROWS IN LENGTH DUE TO CHANGE OF RAIL GAUGE

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KESSOCK BRIDGE UNDERDECK GANTRY

The existing underdeck access gantries on the Kessock Bridge had reached the end of its operational life. A more refined and robust version was required. The Spencer Group were awarded the contract by BEAR Scotland and Transport Scotland to fully design, build, install and commission a new under-deck motorised gantry that could be used year-round to maintain the bridge for the client. The new access solution would need to allow access to the entirety of the under-deck area and outer faces of the main girders, as well as providing a solution for emergency escape from the gantry in all locations on the bridge.

PROJECT SCOPE

The new gantry would be required to articulate around the geometry of the bridge in order to run freely along each span, providing access to the under-deck of the bridge as well as the piers and the exterior of the bridge utilising specially designed scissor lifts on each end of the gantry.

The scope included upgrades to the gantry parking area at the North side of the bridge to allow gantry to be safely stored and maintained when not in use. The gantry can be jacked up from the bridge utilising specifically designed jacking frames, permitting a detailed inspection of the load bearing components of the gantry, prolonging its operational lifespan and maximising its availability.

In addition, improvements to the gantry infrastructure have been installed in the form of dedicated gantry charging points along the length of the bridge at selected piers, to ensure the gantry can be plugged in to electrical supply when not in use, ensuring optimum maintenance and prolonging its operational life.

PROJECT OUTCOME

The gantry is one of the most complex designs of this type of equipment known, which demonstrates Spencer Group's competency in multi-disciplinary engineering, by combining mechanical, structural and electrical expertise.

Spencer Group's in-house mechanical design team designed the gantry from concept to detailed design. An innovative design feature of the gantry includes hydraulic 'span compensator' cylinders (rams) which the full weight of the gantry structure is suspended from. Each of the rams is connected to a piston accumulator system, which provides a constant force onto the rams to assist with skew control and anti-crabbing when traversing along the runway rails. Full information and feedback is provided through the HMI control screen, providing the operator with complete control of the gantry functions.

The gantry was factory acceptance tested, site acceptance tested, commissioned and handed over to the client by Spencer's in-house bridges delivery team.

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M&E AND SYSTEMS INTEGRATION

Coupled with our structural and civil capability, we offer a mechanical and electrical systems integration package for moving bridges or any bridge specific applications. Our in-house mechanical and electrical control & instrumentation (EC&I) engineers work closely with our structural teams to deliver complex moving bridges and motorised access systems.

We work collaboratively with our clients and their consultants to understand the requirements of the moving bridge or access system, and engineer a bespoke solution to suit the particular constraints and geometries. Spencer group are industry leading in this field and have provided some of the most complex systems in use on bridges today.

Our moving structures portfolio includes hydraulic lifting bascule bridges, telescopic bridges, self-leveling under-deck gantries, bespoke MEWP's and many more. Our systems are self-delivered by Spencer Group from concept design to client handover, including off-site factory acceptance testing and on-site commissioning to the relevant LOLER Regulations and Machinery Directives.

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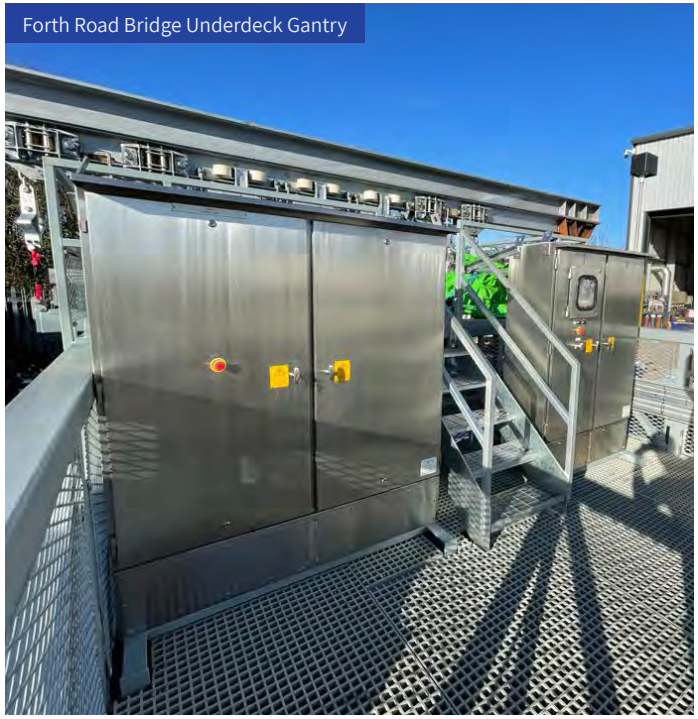
Glasgow Science Centre Bridge

Forth Road Bridge Underdeck Gantry

Forth Road Bridge Underdeck Gantry



PROJECT DETAILS

Client	Glasgow Science Centre
Start Date	2006
End Date	2007
Duration	13 months
Location	Glasgow, Scotland

KEY STATS

44M FIXED SPANS

2 LIFTING BASCULES

35M NAVIGABLE WIDTH

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GLASGOW SCIENCE CENTRE BRIDGE

Spencer Group were appointed to design and construct a double bascule bridge over the River Clyde, linking the prestigious £75m Glasgow Science Centre on the South Bank with the Scottish Conference and Exhibition Centre on the North Bank.

PROJECT SCOPE

The project involved the design and construction of a double bascule bridge with a total span of 128m, consisting of 2 fixed spans of 44m and 2 lifting spans of 35m. The navigable channel with the two spans raised is 35m wide. The bridge sub-structure is formed from a triangular tubular steel lattice frame connecting a single bottom boom with two upper boom members.

The lifting spans are raised by twin hydraulic cylinders mounted in line with the bottom boom, which maintain the same gradient as the fixed span approaches when in a lowered position.

The bridge is radio controlled with the two spans operated separately and remotely to avoid the need for pipework or cables linking the two ends of the bridge.
We were responsible for the concept design and detailed manufacturing drawings for the structural, mechanical, electrical and hydraulic systems. Each fixed span is supported at the lifting position by a single 1520mm diameter tubular steel pile and at mid span by a 914mm diameter pile.

All marine piling and dolphin works were conducted internally by Spencer Group operatives utilising the company's floating barge the 'Meeuw'.

During the detailed design phase, our internal design department proposed an alternative design for a lift bridge, in place of the originally proposed swing bridge, which reduced the project duration and budget.

PROJECT OUTCOME

Spencer Group constructed the bridge both on time and on budget providing Glasgow with a vital link over the Clyde for pedestrians and cyclists, whilst maintaining the navigational passage of the river. Following our success, we were approached a Consortium of Swedish Property Developers to deliver a further double bascule footbridge at the Port of Vasteras in Sweden, mirroring both the aesthetics and operation of the Glasgow Science Centre footbridge.

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PROJECT DETAILS

Client	Nobel Exhibition Trust
Start Date	September 1998
End Date	September 1999
Duration	13 months
Location	Irvine, Scotland

KEY STATS

60M RETRACTABLE BRIDGE

18M NAVIGATION OPENING

2000MM DIAMETER PILES

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IRVINE BRIDGE OF INVENTION

Spencer Group were approached by the Nobel Exhibition Trust to construct the first retractable bridge which was the longest of its kind at the time of commission. This project is recognised as “The Scottish Bridge of Invention” and is acknowledged as a highly innovative piece of engineering.

PROJECT SCOPE

The 60m span ‘retracting’ bridge structure provided an essential opening for the navigation of 18m wide ships. At the time of construction, it was the longest of its kind in the world.

Spencer Group delivered a range of benefits for our client through providing innovative and alternative design solutions. For example, we proposed the construction of a retracting footbridge, rather than an opening bascule bridge as suggested by the Client.

Our alternative designs required a reduced level of marine piling and embankment works, together with reduced wind loading when in the open position: a major factor on the exposed marine estuary.

Spencer Group operatives utilised our self-propelled piling barge, the ‘Meeuw’ to drive tubular steel piles, 2000mm in diameter. The barge was also used to transport and install large prefabricated sections of the bridge to the north bank of the estuary where there was no access for heavy lifting.

PROJECT OUTCOME

We were highly commended by our client, the Nobel Exhibition Trust for our alternative and innovative approach to works, reducing risks associated with the project and anticipated maintenance costs.

The bridge is acknowledged as the “Scottish Bridge of Invention”, acting as an iconic structure, providing key pedestrian access across the harbour.

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STEELWORK STRENGTHENING

Spencer Group has unrivaled technical capability in the execution of steel-work strengthening works on bridges, self-delivered utilsing our own in-house welding qualifications and NDT procedures in accordance with our NHSS 20, BS EN ISO 3834-2 and BS EN 1090-2 accreditation's. We follow our own company NDT procedures and have a fully qualified inspection workforce in both CSWIP and PCN certifications, qualified to carry out Visual and NDT inspections on major bridges and structures.

The quality of steel-work strengthening on major bridges is paramount to ensure the design life of the structure is maintained. Their location is often in highly corrosive marine environments and subject to fatigue loading, therefore the quality of the inspections and welding repair works must be of a high standard. Integrated with our delivery teams, our structural engineers, metallurgists and welding engineers provide technical support and guidance on achieving quality levels to our clients.

Coupled with the utilisation of our bespoke access solutions, painting capability and temporary works execution, we are able to provide a comprehensive self-delivery offering to our clients for all steel-work strengthening and welding requirements.

Our team engages with key stakeholders throughout the project cycle to consider access, plant, site constraints and environmental impacts associated with steel-work strengthening activities, for every project we undertake.

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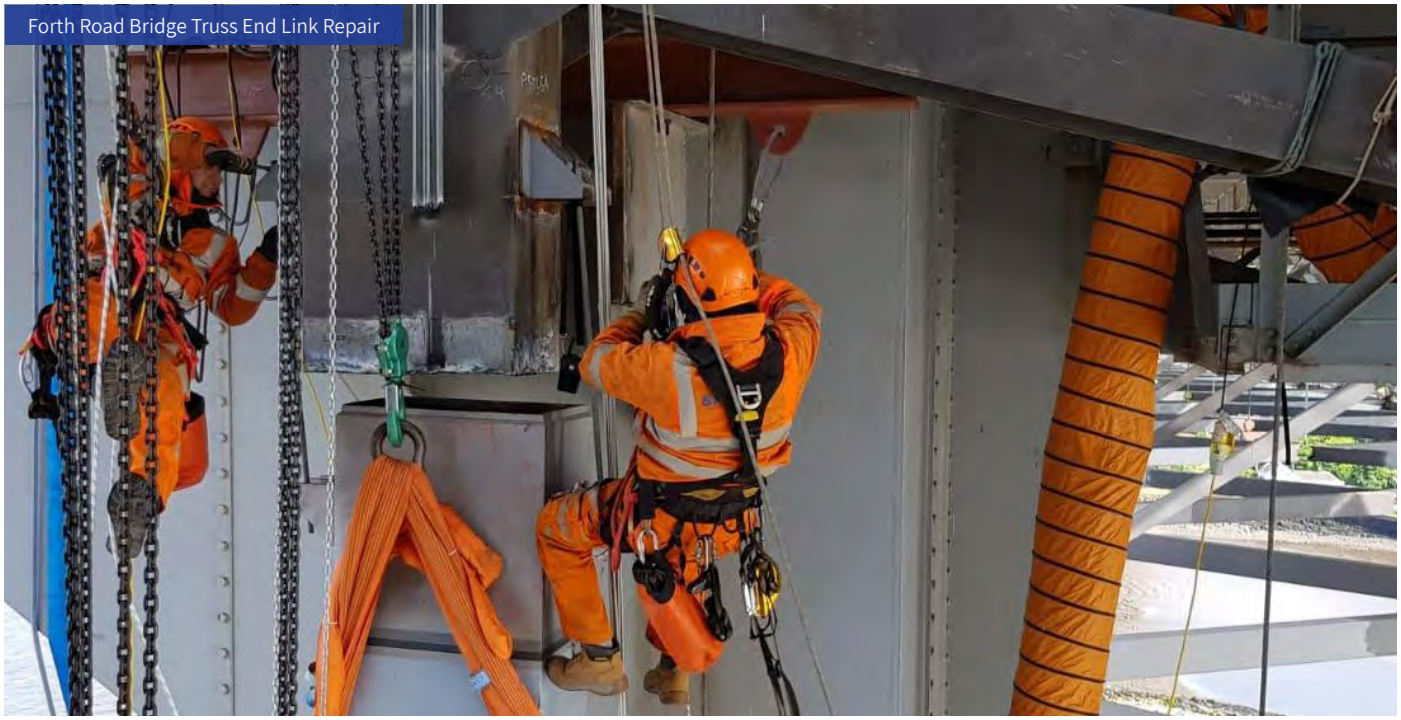
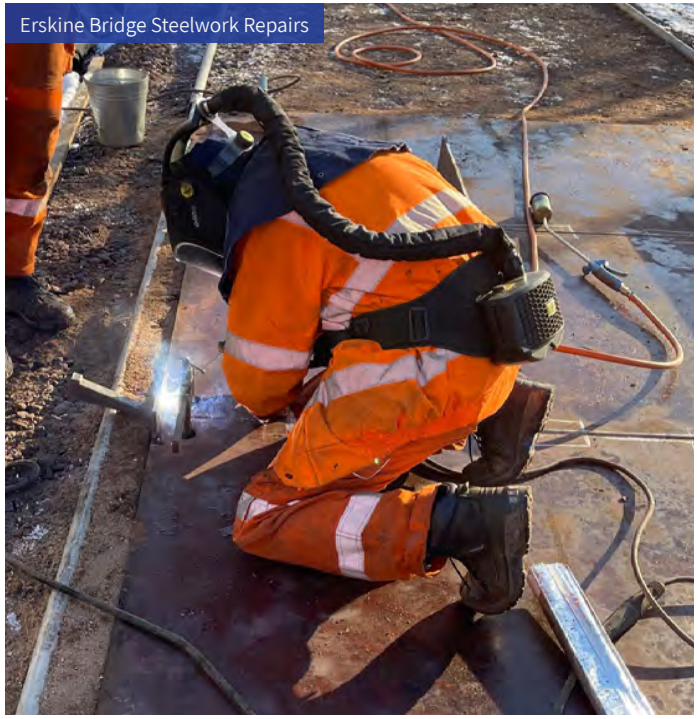

Forth Road Bridge Truss End Link Repair


Erskine Bridge Steelwork Repairs


Erskine Bridge Steelwork Repairs

BLASTING AND PAINTING

Spencer Group's capabilities include self-delivery of onsite blasting and painting works, working on bespoke structures in challenging environments including working at height, over waterways and within live railway environments.

As a sector scheme 19a contractor, our team are experienced in self-delivery of blasting, painting and associated inspection works on highway structures utilising our in-house procedures to control the quality of the painting works in strict accordance with the specification of highway works series 5000.

The quality of the preparation and painting on bridge works is paramount to ensure the lifespan of the paint system is realised. Their location is often in highly corrosive marine environments, therefore the quality of the painting must be of a high standard and applied strictly in accordance with the paint manufacturers data sheets to provide guarantees on the life of the coating.

Coupled with the utilisation of our bespoke access solutions, steel-work and welding capabilities, we are able to provide a comprehensive self-delivery offering to our clients for all blasting and painting applications on bridges and structures.

Our team engages with key stakeholders throughout the project cycle to consider access, plant, site constraints and environmental impacts associated with blasting and painting activities, for every project we undertake.

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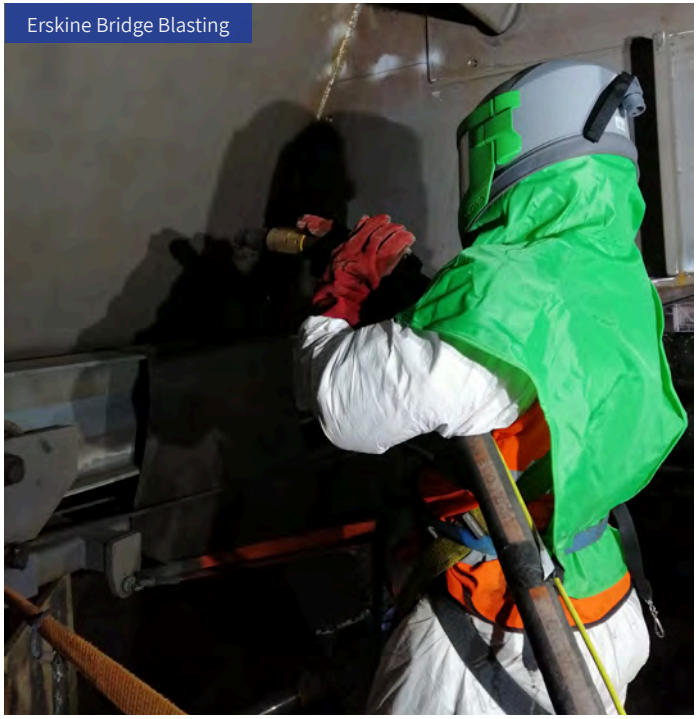
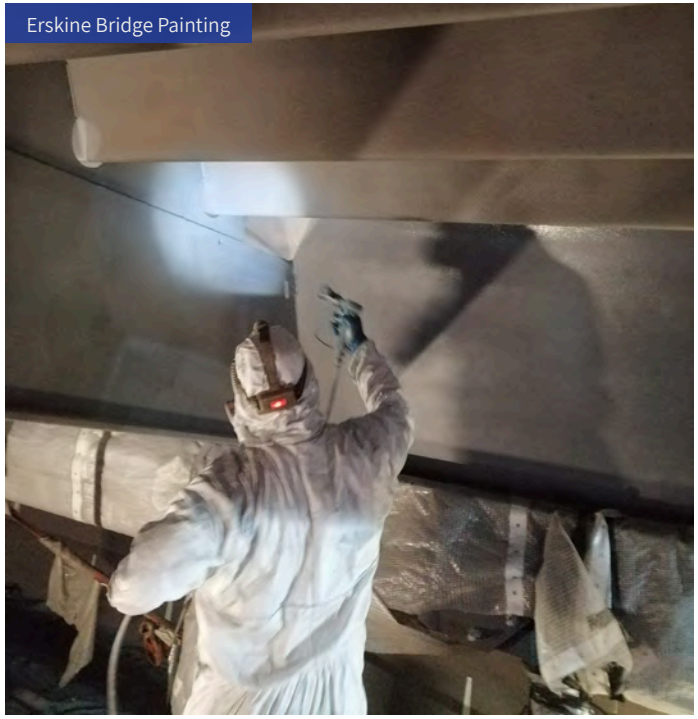
Boothferry Bridge Encapsulation

Erskine Bridge Blasting



Erskine Bridge Painting



PROJECT DETAILS

Client	Transport Scotland
Start Date	March 2019
End Date	March 2023
Duration	48 months
Location	Scotland

KEY STATS

46,000 LITRES OF PAINT ACROSS EVERY PART OF THE STRUCTURE'S STEELWORK

2 TWO WEEK CARRIAGEWAY CLOSURE OVER THE WHOLE 4 YEAR PROGRAMME

60M WORKS CARRIED OUT 60 METRES ABOVE WATER

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ERSKINE BRIDGE MAJOR MAINTENANCE WORKS

Spencer Group were awarded the contract by Transport Scotland to deliver an extensive programme of maintenance and painting on the Erskine Bridge. An element of the project involved the design and construction of a footway panel removal, refurbishment and reinstatement scheme.

PROJECT SCOPE

The major phases of work involve the removal, refurbishment and reinstatement of 2.8km of the bridge's footpath panels, including removal of redundant gas mains underneath.

Provision of specialist temporary access above and below the structure including surveying, inspection and strengthening of the existing steelwork.

Full paint removal, blasting and re-painting of the under-deck and towers to Series 5000 of the Highways Specification.

The project will involve Spencer Group teams applying 46,000 litres of paint across every part of the 1.3km length of the structure.

The works involve working at height, crossing over a Site of Scientific Interest (SSSI), the River Clyde, a live railway line and residential properties.

PROJECT OUTCOME

The works on the footway panel refurbishment offer Transport Scotland quality, value and a solution that will minimise impact on journeys across the bridge. Particular attention was required around a live watermain below the footway panels and in close proximity to live traffic.

Significant loading constraints were placed on the adjacent cycleway of the bridge, resulting in the requirement for innovative temporary works designs and construction methodologies.

A feasibility study was carried out to determine the most efficient means of removing, refurbishing and reinstating 160 footway panels, each of which were 17m in length weighing 4.5 tonnes.

The solution involved systems of lifting davits, bespoke handling units, utility vehicles and trailers to remove the footway panels off-site for refurbishment, all within the confines of the narrow adjacent cycleway.

The operation eliminated the requirement for any traffic management, lane closures and lifting operations from the road envelope.

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SURVEYS & INSPECTIONS

Spencer Group carry out bridge surveys & inspections on structures across the UK and Europe. Our inspection process involves investigating defects, their causes and potential repairs. Inspections either take place from a distance or by utilising specialist access techniques such as pontoons, rope access or suspended gantry platforms.

Our thorough investigation work assists our clients in extending the lifespan of bridges, using a combination of disciplines across the civil engineering sector and beyond to develop game-changing solutions to unique problems.

Spencer Group have a number of in-house weld and paint inspectors allowing us to react quickly to identify defects and highlight potential issues & solutions.

We have the capability to inspect a wide range of problematic areas including cables, bearings, bridge deck and A frames. Our experience in specialist access techniques enables us to perform inspections with minimum disruption to bridge users and the local environment.

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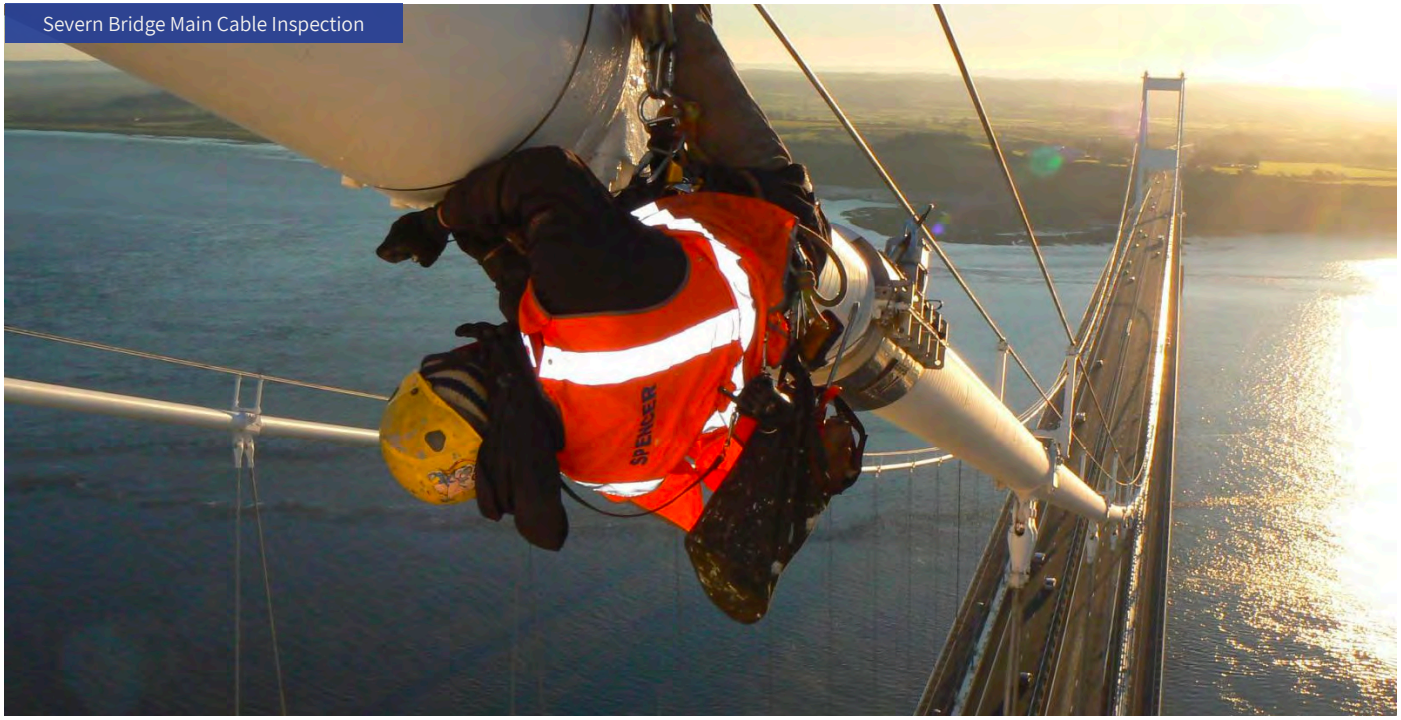
Severn Bridge Main Cable Inspection



Erskine Bridge Steelwork Inspection

Union Chain Bridge 3D Laser Scan Survey

RAIL BRIDGES

With twenty years of experience in the rail sector and an industry leading set of expertise in the construction of bridges, Spencer Group have an unrivalled ability to deliver civil engineering projects that span the full range of requirements for a rail client. From construction and maintenance to special requirements like replacement and relocation – our expert teams of engineers, designers and planners have what it takes to build the extraordinary.

We love a challenge and we understand that our clients' needs are often urgent and always precise – that's why we have developed a specialist in delivering projects that others just can't manage. Whether it's height, access or restricted possession, our team of in-house designers are there to create clever engineering solutions to whatever a project can throw at us. We also pride ourselves on stakeholder management and our planning department will be there every step of the way to ensure the works are as transparent and collaborative as possible for all involved.

Where we have the edge is our ability to self-deliver the most complex packages of works involving multiple disciplines. We're experts in a wide variety of fields and bring all of that expertise to bear on a rail project to ensure the whole thing – from the OHLE to the civil to the electrical and mechanical engineering is delivered like clockwork. Our blank-slate approach guarantees a bespoke take on any project with no assumptions, so any new bridge project is unique to our clients' needs.

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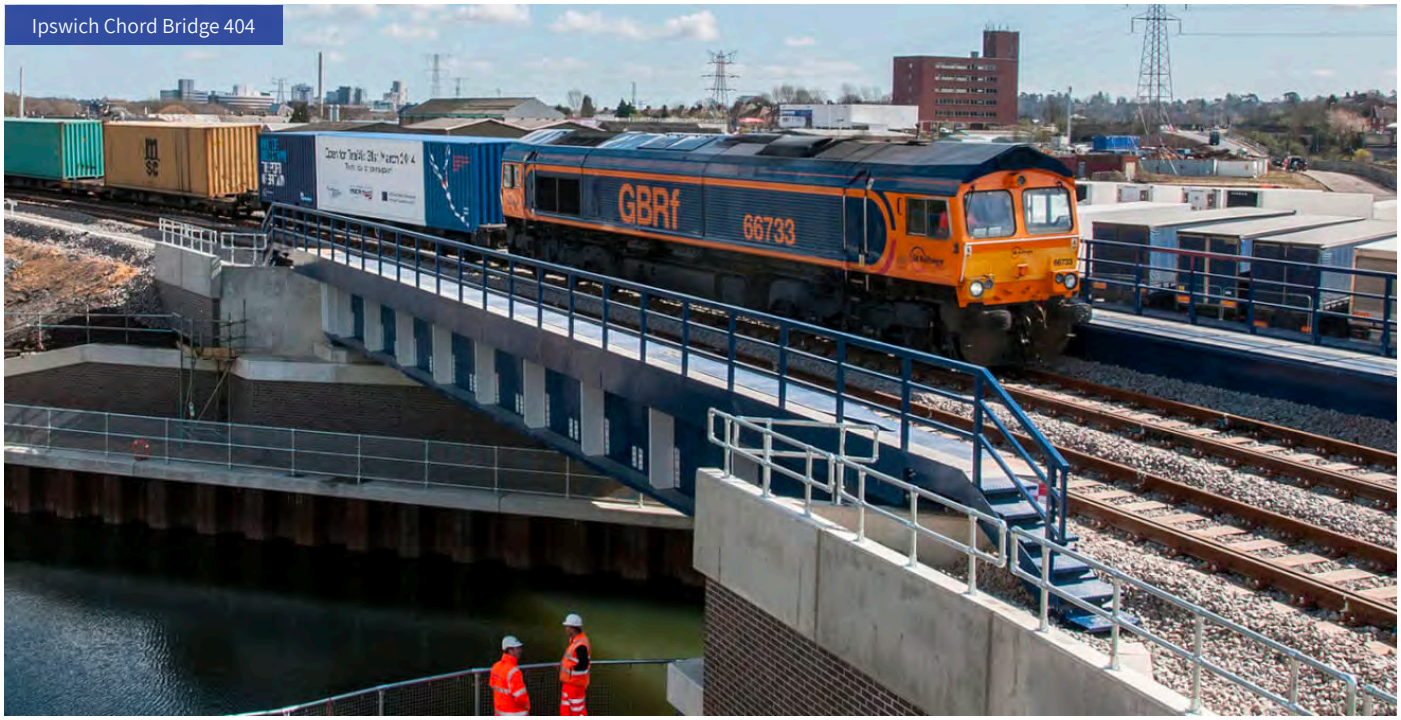
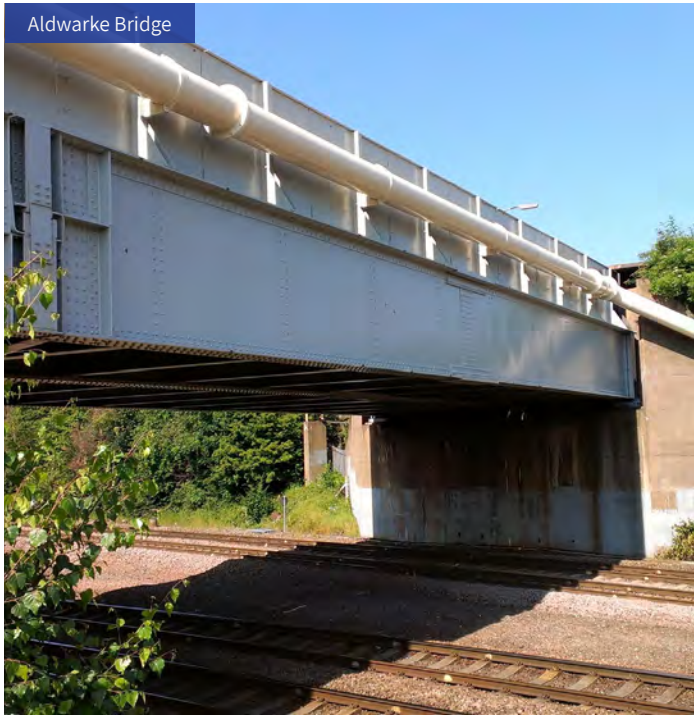
Ipswich Chord Bridge 404



Aldwarke Bridge



Ipswich Chord Bridge 404

PROJECT DETAILS

Client	Network Rail
Start Date	August 2012
End Date	March 2014
Duration	20 months
Location	Ipswich

KEY STATS

4 NEW BRIDGES IN TOTAL

413M RETAINING WALL

2 NEW EMBANKMENTS

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IPSWICH CHORD BRIDGE 404

The Ipswich Chord is a new 1.2km double track railway providing essential connection between the East Suffolk Line and the Great Eastern Line. The Chord forms part of the strategic freight network between Ipswich and Peterborough. Spencer Group was commissioned by Network Rail for the design and construction phase of the project.

PROJECT SCOPE

The team was faced with access difficulties to a site hemmed in by rail , river and urban development; and in successfully gaining the support of local landowners and users for the permanent and temporary work.

Working alongside a live railway required a significant disruptive possession regime including a 5-day blockade over Christmas 2013. This required an intricate plan of staged construction and testing to maintain operational performance without comprising site safety.

Spencer Group enjoyed a full collaborative relationship with Network Rail and also formed an effective alliance with lead designer, Arup. This created an ideal platform for finding joint solutions to problems on-site, resolving commercial issues and managing risk.

PROJECT OUTCOME

Bridge 404, a two-track rail over water bridge was replaced during the Christmas blockade, one of four bridges in this project. This was achieved in just 52 hours through use of precast units.

Despite the extreme complexities of the project and some of the worst winter storms on record, the work was completed on time and to budget with no complaints. The Ipswich Chord will cut journey times by at least 30 minutes and the increased capacity on the railway will mean 750,00 fewer lorries on the road.

This will be huge relief for commuters on the congested A14 and will make a significant contribution to meeting carbon reduction targets.

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PROJECT DETAILS

Client	TATA Steel
Start Date	March 2013
End Date	April 2014
Duration	13 months
Location	Rotherham

KEY STATS

3 COAT PAINT SYSTEM

50 YEAR OLD BRIDGE REFURBISHMENT

0 ACCIDENTS

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ALDWARKE BRIDGE

The Aldwarke North Bridge spans the Sheffield to Rotherham railway line and links the north west of TATA Steel's Aldwarke site to the road network. Erected in 1963, the bridge required extensive maintenance of its paintwork to remain structurally sound and operational, as well as the removal and replacement of its existing coats of lead-based paint with a modern alternative.

PROJECT SCOPE

The work required the Aldwarke North Bridge to be completely refurbished, including the cleaning, structural and steel paint repairs and the repainting of the remainder of the bridge.

The works required scaffolding to fully encapsulate the bridge on its under-slaw due to the painting and blasting of existing lead based paint that coated the entirety of the structure.

The outdated lead paint was to be replaced with a modern 3 coat system that would greatly improve its resistance to weather and pollution, as well as reduce the need for further maintenance.

Works also included removal of redundant services and working over live Network Rail lines, so maximum efficiency and safety during the works were of paramount importance.

PROJECT OUTCOME

Using our expertise in working with live sites in the rail sector, Spencer was well placed to carry out these works to the maximum safety and efficiency standards, working closely with both the client and Network Rail to ensure minimum disruption to the work of both parties.

Our in-house design team created a complex scaffolding system to encapsulate the bridge without hampering the live track beneath, and the whole project was carried out with zero accidents.

The outcome of the refurbishment of the bridge included a smart and aesthetically pleasing design whilst ensuring the bridge's structural integrity, which left our client extremely happy with the end result.

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NEW STRUCTURES

Bridge building is one of the core skills that underpins the Spencer Group business. With an international portfolio of successful projects behind us, we have both the depth and breadth of experience to take on any challenge in contexts from marine to rail. We've left our mark in some of Europe's most iconic cities and it's that variety that sets us apart from the competition. Wherever we're needed, our design-led approach has delivered the kind of unique engineering that makes a project extraordinary.

When building new bridge structures our multidisciplinary approach comes into its own, bringing with it the combined wisdom of several sectors to ensure consistent and informed decision making gets the most out of each design. We specialise in complex multidisciplinary projects which allow us to work cross sector to provide quality engineering. The ability to cross sectors have allowed us to build a range of bridges from rail under/over bridges to double bascule bridges.

Ground-breaking engineering is only part of the story – our clients also benefit from industry-leading planning that is designed to get the most out of a project by ensuring it is built efficiently with the best engineering decisions. Through value engineering and our excellent stakeholder relations we ensure minimum disruption to the normal operation of a site while works are carried out.

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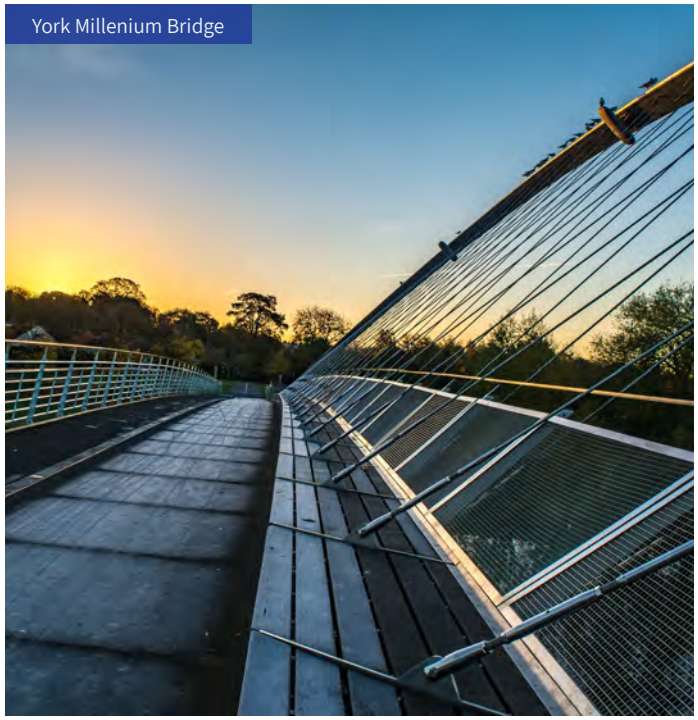
Port of Vasteras Bridge

Irvine Bridge of Invention

Torbay Footbridge

York Millenium Bridge



PROJECT DETAILS

Client	York Millenium Trust
Start Date	November 2000
End Date	May 2001
Duration	52 weeks
Location	York

KEY STATS

80M SPAN STRUCTURE

19MM SUSPENDED FROM 19MM DIAMETER STAINLESS STEEL CABLES

50° ARCH INCLINED AT 50 DEGREES TO THE HORIZONTAL

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YORK MILLENNIUM FOOTBRIDGE

Spencer Group were contracted to provide a new footbridge in the centre of York to provide essential pedestrian and cycle access across the River Ouse.

PROJECT SCOPE

Spencer Group adopted new fabrication techniques and an innovative construction methodology to launch the bridge across the river following assembly on one side of the bank. This method was imperative to reduce disruption in York City Centre. The 80m span structure was constructed using a complex box beam structure supported on a stainless steel raked bowstring.

The associated River Walks were enhanced with hard and soft landscaping involving the construction of bank-side viewing platforms, paving, street furniture, plaques, signposts, fencing, gates and a lighting scheme. All the works were carried out within particularly rigorous environmental constraints.

PROJECT OUTCOME

The new bridge has provided a landmark pedestrian/cycle access route over the River Ouse through the heart of York, being regularly used by the local residents of York as well as by students accessing the University. The project was successfully completed without any unplanned disruption to the local community. Spencer Group also planted trees and carried out wild flower seeding to improve the local environment.

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PROJECT DETAILS

Client	Kadesjos
Start Date	October 2004
End Date	August 2005
Duration	10 months
Location	Sweden

KEY STATS

2 HYDRAULICALLY LIFTED SPANS ON THE BRIDGE

90M MOVING FOOTBRIDGE

35M OPENING SPAN

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PORT OF VASTERAS

Off the back of our innovative double bascule bridge across the River Clyde for the Glasgow Science Centre, Kadesjos approached Spencer Group to design and build a replica at the Port of Vasteras. Similar to the Glasgow Science Centre Bridge, the lifting bascules allow easy and efficient access in and out the dock.

PROJECT SCOPE

Spencer Group provided the design, consultancy and management services on the moving bascule bridge, as marine based bridges experts, selected by the Swedish Consortium following research into moving structures.

They identified a 128m span 'Glasgow Science Centre Bridge', designed and constructed by Spencer Group, as providing the most economic and elegant solution for their needs. Following initial discussions in Glasgow – when the Client was able to inspect the bridge - and subsequent visits to Sweden by the Spencer design and engineering teams, negotiations were successfully concluded.

Spencer Group have profound experience working within port environments and working at height over water, as demonstrated by works on the Port of Vasteras Moving Bascule bridge.

We are therefore aware of the numerous risks and challenges these projects involve and are confidently able to identify these during planning and design stages to ensure all risks are mitigated and all areas of works are taken into consideration.

PROJECT OUTCOME

This provides clients such as Kadesjos, with the confidence that we can perform all of our projects using the most cost-effective methods, despite working in remote and constrained environments.

The client, Kadesjos were also particularly pleased with our engagement with the local community and stakeholders throughout the project and during the maintenance period. For example, the bridge was fabricated using a local fabrication company in Sweden, close to the site location, demonstrating how we utilise and support local SME's close to the project location.

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