Structural Steel Design Awards 2018

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INTRODUCTION

"Again, there has been a pleasing increase in the overall number of entries to the Awards Scheme.

Scales of entry range from the largest civil engineering and transport projects, through prestige city office buildings, to smaller community and public buildings and sculptures. While there are fewer residential projects this year, we see an increase in office buildings of high quality and a welcome return of top-end industrial buildings.

There are jaw-dropping achievements here, as well as beautiful gems. I believe everyone involved in the steel construction industry should be proud of what has been achieved, and I trust that the Structural Steel Design Awards reflect the quality of that achievement."

Chris Nash BA (Hons) DipArch RIBA FRSA - Chairman of the Judges Panel

THE JUDGES

Chris Nash BA (Hons) DipArch RIBA FRSA - Chairman of the Panel
Representing the Royal Institute of British Architects

Richard Barrett MA (Cantab)
Representing the Steelwork Contracting industry

Paul Hulme BEng (Hons) CEng FICE
Representing the Institution of Civil Engineers

Sarah Pellereau MEng CEng MIStructE
Representing the Institution of Structural Engineers

Professor Roger Plank PhD BSc CEng FIStructE MICE
Representing the Institution of Structural Engineers

Julia Ratcliffe MEng CEng FIStructE PE
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Bill Taylor BA (Hons) DipArch MA RIBA FRSA
Representing the Royal Institute of British Architects

Oliver Tyler BA (Hons) DipArch RIBA
Representing the Royal Institute of British Architects

OBJECTIVES OF THE SCHEME

"...to recognise the high standard of structural and architectural design attainable in the use of steel and its potential in terms of efficiency, cost-effectiveness, aesthetics and innovation"

AWARD

London Bridge Station

PROJECT TEAM

Architect:	Grimshaw
Structural Engineers:	Arcadis WSP JV
Steelwork Contractors:	Cleveland Bridge UK Ltd and Severfield
Main Contractor:	Costain
Client:	Network Rail

© Rick Roxburgh

As part of Network Rail's London Railway Upgrade Plan, London Bridge Station is undergoing a stunning transformation that will deliver a better experience for users and a reduction in delays. It will also ensure greater connection between London's home counties and increase passenger capacity by two-thirds.

The station transformation includes an enlarged street level concourse underneath the tracks, new entrances and new platforms for more trains, and three of the nine terminating platforms converted to through platforms. The concourse is set to be one of the largest in Europe.

The rolling redevelopment programme started in 2012 and has been scheduled in such a way as to ensure the station remains open for business at all times. On 2nd January 2018 the final section of the massive new concourse and five platforms opened to the public, with the remaining redevelopment works to be completed in the spring.

Elegant curves are integral to the station's design and respond to the track geometry and curvature of the site. Steel is the natural material for the project as it allows the necessary design flexibility. It also offers sustainability benefits as it is recyclable and lightweight.

All 15 platforms have been rebuilt to be covered by a striking undulating canopy of steel and aluminium, fabricated and installed by Severfield. The eye-catching canopy roof is modularised using open sections where each module is approximately 9m deep by 3m wide. There are an astonishing 1,200 prefabricated steel cassettes, with each one a bespoke unit due to the changing rooftop geometry. To save time cassettes were prefabricated offsite and then craned into position, allowing the canopy to be built during short night-time construction hours.

The canopy structure comprises Y-shaped columns supporting a longitudinal spine beam formed from fabricated box sections that have extended webs to create service routes. Platforms and canopies sit outboard of the bridge girders, supported on transverse 'elephant ear' frames, and as trains pass over the bridges any deflections cause the tips of the 'elephant ears' to move longitudinally. The plates that connect the frames to the bridge girders are designed to balance strength and stiffness to resist the applied loads, while remaining flexible enough to avoid fatigue.

The centrepiece of London Bridge Station is the concourse which is nearly 80m wide. There is also an expansive central space at the heart of the concourse which deals with the level changes across the site. The large span of this space was achieved by using a longitudinal V-column to support a 5m deep Vierendeel truss, and this allowed for glazing between the vertical members to form the rooflights above.

Cleveland Bridge supplied steelwork for the rail bridge decks spanning the new concourse. The work has included fabrication, trial erection at the company's Darlington facility, painting, delivery and installation.

The concourse bridge decks are made up of three to four spans of simply supported decks for each rail line. Each rail bridge deck comprises six main girders braced together and tied at the ends with trimmer beams, delivered and erected as pairs.

Following installation the beams were mass filled with concrete and fitted with platforms, rail lines and canopies.

The main plate girder lengths (spans) were such that no longitudinal splices were required. After fabrication all components were placed in pairs together for a trial assembly to ensure perfect fit and alignment, de-risking the operation on-site. Upon completion of the trial erection, the deck was separated into component pairs ready for dispatch to London.

The main logistical challenges for the project were the severely restricted site access; a requirement to consider scheduling for follow-on trades, and the essential need to keep the station fully functional. The architect Grimshaw designed the station and complex staging process based on the concept of prefabrication and modular offsite construction. This reduced the pressure on the construction programme and again the use of steel was advantageous.
For the installation of the decks and canopy the project was split into six phases.

The possessions for working were 'Rules of the route' (very short windows when trains are not running) synchronised with restricted short possessions for delivery vehicle road closures. The entire project took place in a busy city centre location with narrow streets through which to move delivery vehicles, large plant and equipment.

The lifting schemes for all steelwork installations included the innovative use of heavy capacity scissor lifts mounted on the top of Self-Propelled Modular Transporters (SPMTs) to solve access problems.

The aim of Cleveland Bridge's work was to maximise the level of offsite fabrication and preparation to significantly reduce the on-site programme. As the station was operational throughout the project, health and safety was paramount and the overall project was delivered within budget and ahead of schedule, exceeding the client's expectations.

JUDGES' COMMENT

The project has produced a major upgrade to the existing station, which remained operational throughout. Collaborative offsite manufacture minimised disruption during the project. The use of steel has allowed the design team to create open concourse spaces beneath the tracks and elegant curves to the canopy structures above. The project is a great example of 'designing for construction'.

Knostrop Weir Foot and Cycle Bridge, Leeds

PROJECT TEAM

Architect:	Knight Architects
Structural Engineer:	Mott MacDonald
Steelwork Contractor:	S H Structures Ltd
Main Contractor:	BAM Nuttall
Clients:	Leeds City Council and Environment Agency

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The Leeds Flood Alleviation Scheme (FAS) is led by Leeds City Council in partnership with the Environment Agency. It will provide the city centre and over 3,000 homes and 500 businesses with protection against flood events from the River Aire, whilst enabling key regeneration opportunities in the South Bank area. Another objective of the scheme is the provision of new routes for walkers and cyclists, both along and across the River Aire. Knostrop Weir Foot and Cycle Bridge serves to reconnect the much-used Trans Pennine Trail, following the removal of a section of island between the River Aire and the Aire and Calder Navigation for flood risk reduction purposes.

As part of the FAS improvements a replacement weir would be constructed on the Knostrop site, and the clients wanted to explore the possible synergy between the new weir and the construction of a bridge across the river. The final design uses the new weir walls as pier foundations for the bridge above, providing significant savings in budget, time and resources.

Leeds City Council recognised the wider value for the design to be of high-quality and identifiable with its place. Despite the apparent complexity of the final design's appearance, it only requires a single curvature in the fabrication of the steel plate elements. This served to simplify fabrication and enabled the bridge to be delivered within budget and programme. In views along the river the appearance is simple and sympathetic to the natural context. A curved soffit combines with the changing deck width to translate the varying plan width into a rippling deck edge detail, producing a dynamic 'sinuous' quality to mirror the noise and movement of the falling water beneath. Another unique feature of the design is that in elevation the piers are only 50mm thick and almost invisible in long views, creating the illusion of a floating deck. When viewed on closer approach the appearance of the piers changes, emerging as dramatic projecting cantilevers springing from the weir below. Lookout points have been positioned above each pier enabling people on the bridge to stop and enjoy views over the weir and along the river.

Steel was the obvious material of choice to achieve the required aesthetic and minimise the significant construction challenges of working over water. The 70m long bridge was fabricated in S H Structures' facility, which is situated just 17 miles from the Knostrop site, and treated at a local facility, minimising the environmental impact of the works.

Construction over a river creates special challenges in order not to harm the waterway and its ecology. Minimising the time and extent of temporary works in the river was an essential aspect of the design. The prefabricated superstructure sections and piers were installed over two weeks using a crane. At the abutments special eel bypasses have been incorporated to allow for migration, whilst a dedicated fish bypass is included in the weir.

Given the accuracy required to successfully realise the complex steelwork geometry and installation, it was decided to embrace Building Information Modelling (BIM) from the outset. The Revit model of the bridge enabled every element to be accurately represented and positioned, including every steel plate in the bridge's curving geometry and all connection elements. This was particularly valuable when designing the highly complex bolted integral pier connection. During fabrication the BIM model was also utilised to allow every component to be spatially positioned and checked. The model was also used to assist in the design of the workshop temporary works as the complete length was fully assembled, allowing the critical interfaces to be set, checked and maintained during the fabrication process.

In a wet environment over a weir, careful detailing, specification and construction are essential to ensure a long-lasting and durable solution for a bridge. The bridge superstructure is predominantly constructed using weathering steel with a four-coat paint system normally only used for difficult access highway structures. A primary concern was for the durability of the bolted connections between assembled elements of the bridge. This required highly protective details and connections that far exceeded what was needed for structural requirements to minimise water ingress.

© SH Structures

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One of the key features of this elegant structure is the slim piers. To achieve the required aesthetic and structural performance this area required careful consideration. Once the concrete weir walls had been poured and the holding down bolts installed, a detailed as-built survey was carried out. The recess bolt holes in the curved pier base plates were drilled and machined to match the as-built layout of each bolt group. With this work done, each base plate was trial-fitted to check for fit before the piers were finally installed, surveyed and cast in place. This attention to detail is critical to the successful installation of this type of precision detailing.

JUDGES' COMMENT

This team solved an unusual bridge alignment by producing a thoroughly modern intervention in a post-industrial landscape whose unique qualities are derived from the constraints of the flood relief requirements. Using ingenious geometry and thorough attention to detail, the prefabricated sealed modular deck units appear to float on impossibly slender vertical supports. The result is an economic, robust and graceful solution. The overall rippling effect of the bridge is intriguing, yet it is rooted in logic; a seamless integration of architecture and engineering.

AWARD

Jaguar Land Rover Engine Manufacturing Centre

PROJECT TEAM

Architect:	Arup
Structural Engineer:	Arup
Steelwork Contractor:	Severfield
Main Contractor:	Interserve Construction Ltd
Client:	Jaguar Land Rover

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The BREEAM 'Excellent' Engine Manufacturing Centre comprises 165,000m^2 of production space, offices, social support spaces and a community educational centre, and is an exemplar of modern sustainable manufacturing.

Innovation, collaboration and the well-being of people at the facility have shaped the success of the building. A simple layout was derived from optimum operational adjacencies and designed for flexibility, providing both an efficient process flow for manufacturing and giving staff easy access to support facilities. Naturally-lit machine and assembly halls are flanked by supporting office and ancillary buildings. This approach optimised production performance and blurred the boundaries between production and offices through visual transparency, clear movement and social spaces, helping to break down the barriers of communication between staff.

A powerful architectural impression was achieved through the simple, repeating and discretely expressed façade modules, generated by the north lights. The skylights provide generously day-lit spaces throughout the complex, and continuous strips of glass along the ground floor allow the buildings to float, further humanising the scale of the spaces while providing views out to the landscaped surroundings.

With a firm date for starting production, programme was critical. The first phase of this world-class facility was handed over just 24 months after the design team's appointment. Subsequent phases followed in continuous sequence from 2013 to 2016.

Phase One was one of the first structures in the UK to be designed to the Eurocodes. Arup developed spreadsheets to automate member utilisation checks direct from analysis output, enabling all members to be rapidly optimised. Despite the intensive servicing loads on the roof, this reduced the roof tonnage to only 28kg/m^2, which is impressively light for 30m spans.

© Simon Kennedy

All the structures comprise braced steel frames, with grids set by the bay sizes of the production areas below. Concept studies explored grid size with the client and compared portal action, but the braced frames were considered the cheapest solution.

The north lights are formed using the primary 30m span trusses to minimise intrusion of the structure into the production spaces and thereby minimise building height. The Machine Hall uses a grid of 30m by 15m, matching the rhythm of the north lights. Assembly Halls have a grid of 30m by 30m, at twice the rhythm of the north lights, so primary support trusses are provided below the north lights on each 30m grid to support the intermediate primary trusses. Secondary trusses are provided at 7.5m centres. These grids provide for future reconfiguring of the assembly lines.

Columns were designed assuming some rotational fixity to minimise second-order effects. This was derived from a study of potential settlement of the pads and considering the need for them to stand without temporary works during erection.

Wind behaviour on saw-tooth roofs is directional relative to the saw-tooth, but large-scale roofs behave differently to small-scale roofs. So, comparing the peak wind effects from the roof geometry with peak wind directions for the site, sheltering benefits and size factors, the uplift loads were reduced by up to 70% for most of the roof.

Mezzanine floors provide support accommodation and plant spaces, using reinforced concrete slabs constructed on profiled metal decking, providing robust fire separation for plant spaces.

Primary services within the spaces distribute at roof level supported from the roof structure. This minimised the need for trenches and steps in the ground slabs, maximising future production flexibility. The roof had to be designed accordingly for intensive servicing and high point loads.

The support and spine buildings are typically two storeys high with accommodation below and plant at first floor level to feed directly into the adjacent halls. The office building uses precast hollowcore slabs to provide an exposed thermal inertia of the soffits to assist with the natural ventilation strategy.

Jaguar Land Rover's commitment to sustainable, low carbon, manufacturing was supported by Arup's ability to provide integrated and innovative low-energy design solutions, resulting in one of the largest buildings to achieve BREEAM 'Excellent'.

Sustainable measures include the UK's largest PV installation, zero operational waste, extensive grey water recycling, day-lit spaces, naturally-ventilated offices and a pioneering 'solar cladding' façade system.

The north lights' vents open to expel hot air in summer reducing extract energy. Responsive dimming controls for the lighting system help to capitalise on the generous daylighting in the space to save further energy.

The project was a trailblazer for applying level 2 BIM. The one-model approach was extended to embrace Jaguar Land Rover's own manufacturing designers, who integrated Arup's BIM model with their Process and Equipment 3D model to create a model of the entire facility, enabling unprecedented levels of coordination to be achieved. The model was also populated with specification and data tagging to enable adoption into Jaguar Land Rover's facilities management system.

The structural model was produced directly from the analysis model, exported to Tekla, saving the steelwork contractor weeks of modelling.

JUDGES' COMMENT

Drawing on traditional industrial forms, the team has updated these principles to deliver a stunning workplace to train and attract the best talent in the industry. The lightness of the framing, extensive roof-lights and perimeter windows deliver high levels of natural light. The steel is efficiently designed for current operations and adaptation for changes in engine design and technology.

AWARD

V&A's Exhibition Road Quarter, London

PROJECT TEAM

Architect:	AL_A
Structural Engineer:	Arup
Steelwork Contractor:	Bourne Steel Ltd
Main Contractor:	Wates Construction
Client:	Trustees of the V&A

© Paul Carstairs/Arup

The most significant intervention undertaken at the V&A's South Kensington campus for over 100 years, this major development provides a large column-free underground exhibition gallery with an oculus to allow the influx of natural daylight, an open courtyard and significantly improved street level entrance from Exhibition Road into the Museum.

The courtyard also acts as a venue for installations and events and is served by a glass-fronted café.

The Sainsbury Gallery, a new 1,100m² column-free space, will be one of the largest temporary exhibition spaces in the UK and allow the V&A to significantly improve the way it designs and presents its world-class exhibition programme.

Entry to the new Sackler Courtyard will be through the arches of the 19th Century screen designed by Sir Aston Webb.

From the courtyard, and from key internal locations through the glazed skylights, it is now possible to see previously hidden façades of the museum's original buildings, including the detailed sgraffito decoration on the Henry Cole Wing which has been revealed to the public for the first time since 1873.

Following an extensive international competition Amanda Levete Architects (AL_A), working with Arup, were appointed as the designers of this scheme. Key to the success of the competition was the use of structural steelwork for the concept design for the 'folded plate roof', a system of triangular steel trusses which span 38m across the gallery, support the courtyard, café, and crucially allow the changes of existing ground levels to be fully exploited to fit in a mezzanine floor. As well as the significant vertical loads that this structure supports, it is also resisting significant prop forces as it is the ground level structure of a 15m deep basement.

During the excavation of the basement, 800 tonnes of historic Grade I listed stonework stood on one 'mega-beam' formed of four individual steel beams. The 'mega-beam' was temporarily supported on steel needles, which were then replaced by four steel columns.

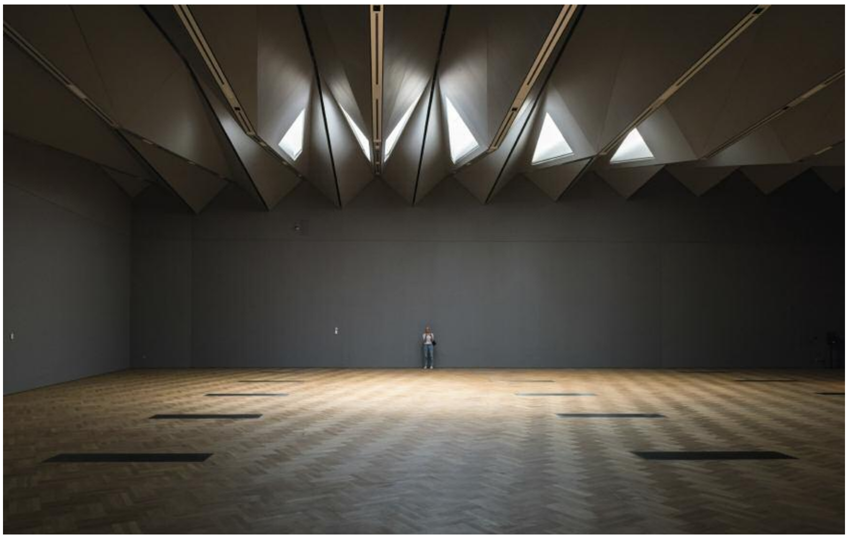
The beams and columns are expressed within the volume of the stairwell, so that as visitors pass from the entrance to the gallery they understand how the façade above is supported, and where they are in relation to the rest of the museum.

The 'folded plate' structure comprises 13 'Toblerone' trusses supported on an inclined storey-height mezzanine truss. Through optimising both the overall geometry and the geometry of the members making up the trusses, the design team was able to save 40% of the steel weight of the initial concept. Early engagement by Arup with Bourne, and the steel industry, during the design process meant that the design moved from needing extensive temporary support to erect it to one where the 'Toblerones' were self-stable for ease of erection.

Bourne was responsible for the connection design, fabrication and erection of the 13 'Toblerone' trusses, each up to 25m in length and weighing up to 14 tonnes. Transporting and delivering these trusses in London was a logistical minefield requiring careful planning and coordination with Highways England.

The unique geometry of each truss and the difficulty in positioning meant that the fabrication had to be precise in its execution. Due to the geometry and sheer size of the trusses, bespoke jigs needed to be made to aid fabrication, and much of the fabrication needed to be carried out with the use of mobile elevating working platforms (MEWPs).

The form of the structure presented several difficulties for the connection designers, with a combination of heavily loaded and multi-planar joints, nearly all of which were unique, with often a restricted envelope within which to achieve a viable connection. The connection designs had to incorporate allowances for erection and fabrication tolerances. The triangular trusses, which form the principal members of the roof, are an example of the geometric challenges encountered with typically two chord members and four internals intersecting at a point, with none of the members in a common plane, and the remaining members clashing well before they reached the intended connection zone.



Precision checks offsite and on-site showed that exceptional tolerances were achieved, which meant that each of the trusses was dropped into place on time, first time, every time.

The truss geometry and phasing were coordinated in an integrated 3D model between Wates and Bourne to ensure that there were no clashes between the steelwork and the heavy temporary props that laterally restrained the retaining walls before completion of the courtyard structure.

What had been viewed as a high-risk package due to the complex geometry of the steelwork, the critical structural performance requirements and the multiple challenging interfaces between it and follow-on trades, was delivered to an outstanding quality and attention to all details by a committed design, fabrication and site team.

JUDGES' COMMENT

The inverted 'Toblerone' shaped trusses form a neat arrangement to support a new public courtyard and entry from Exhibition Road above new basement level galleries. This array of steelwork was hugely refined through the design process to maximise the efficiency of each member. Good use of light and colour for wayfinding in the new extension is exemplified by the striking red steel columns that so appealed to the judges.

AWARD

Bloomberg London

PROJECT TEAM

Architect:	Foster + Partners
Structural Engineer:	AKT II
Steelwork Contractor:	William Hare
Main Contractor:	Sir Robert McAlpine
Client:	Bloomberg

Bloomberg London represents one of the largest, most notable developments to shape the post-Olympic landscape of London. Bloomberg's new European headquarters is respectful of its location in the heart of the City of London, close to the Bank of England, St Paul's Cathedral and the church of St Stephen's Walbrook. It is a true exemplar of sustainable development, with a BREEAM 'Outstanding' rating – the highest design-stage score ever achieved by any major office development in the UK.

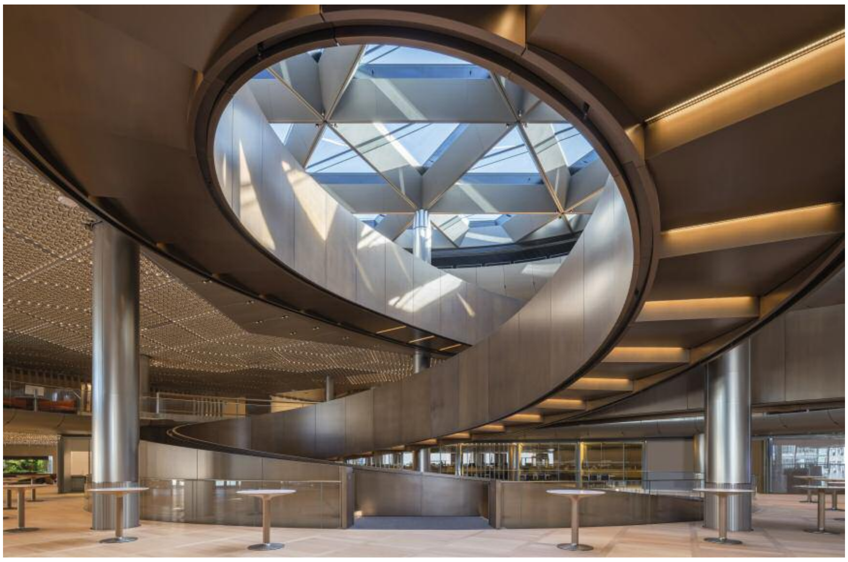
The architect's vision consisted of two adjacent 10-storey buildings with a pedestrian access path cutting diagonally through.
A steel frame with composite concrete floors is clad with sandstone and metal fins to produce a solid, understated elegance set to last within a hostile city environment.

The structure's sensitive island location meant that physical limitations were set by the adjacent roads, as well as the remains of London Wall running close by. Constructing close to an existing sewer, the adjacent Waterloo & City line tunnel and the new direct link to Bank Underground station all required third party agreements and considerably affected programming.
In two such immensely complex 10-storey structures adding value through design has been key, and AKT II was able to do this from the basement upwards. The location was previously home to Bucklersbury House, a disused 1950s structure demolished prior to start on-site. However, the slab-and-pile foundations were retained following a radar survey which confirmed that the vast majority could remain, with additional piles introduced only in the south-west corner.

On plan, the form and setting out of the north and south buildings respond to the angular nature of the site and the alignment of the new arcade with Watling Street.
To achieve this both buildings use a unique structural grid set out on a 13.85m equilateral triangle that maximises open floorplates. The form of construction is similar to that found in orthogonal steel-framed City office buildings. All cores are formed from insitu reinforced concrete but, in contrast to traditional building forms, have been pushed to the perimeter to increase the extent of uninterrupted floor space and improve visual connectivity.
To further enhance this, lift shafts have been opened up to animate the façade and act as light wells. The two buildings are also connected at high level with a series of link bridges above the arcade. The scale and precision of the stone and bronze façade is achieved with an independent primary frame which connects to the main columns and eliminates the larger movements in traditional edge beam solutions.

The structural grid is interrupted in several locations with transfer structures to create the unique spaces within the building. The most significant of these occurs above the pantry level which involves a storey deep truss within the level 9 plant floor spanning up to 26m between columns. This allows the suspension of level 8 and the removal of four main internal columns to create a two-storey high vast communal space within the pantry with spectacular views of St Paul's Cathedral.

Within the centre of the north building is the feature ramp which provides access between floors from level 2 to level 8. The steel ramp structure is 1.5m wide and spans 30m between floors measured along its centreline. The elliptical oculus within the floorplates through which the ramp passes also rotates 120 degrees at each floor level following the plan transcribed by the ramp.



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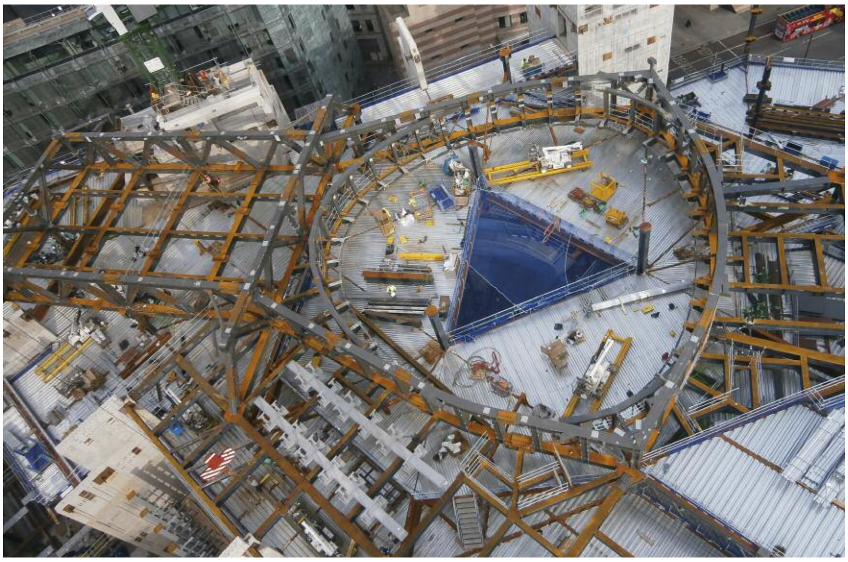

The main reception carves a column-free space under the ramp between ground and level 2, introducing a three-dimensional structural vortex form that spans, displays, announces and integrates architecture and structure for a spectacular experience before revealing the ramp as a structural force majeure.

The benefits of using steel construction for Bloomberg London included providing long-span uninterrupted floorplates and small structural zones relative to the span, with fully integrated services within the structural depth. Complex transfer structures could be incorporated within the building, saving space when compared with other materials. The project showcased skill and workmanship through the creativity of the devised structural solutions that achieved architectural design intent within this modern office environment.
Stability was provided to the north and south 10-storey steel-framed buildings by concrete cores which were on the perimeter of the buildings.

The peak site of erection was the north and south buildings running in parallel with each other, which required approximately 600 tonnes of steelwork to be produced per week.

Thanks to 4D BIM planning and offsite manufacture on-site risks were reduced, William Hare worked with the project team to ensure delivery was on time and error free.

JUDGES' COMMENT

The elegant exterior of this major building, a polite addition to the City, conceals a fabulous interior supported by a highly innovative design in steel. The unique triangular column grid and roof transfer system create the large open spaces required by the client, whilst the vortex transfer structure and atrium ramp produce effective yet stimulating circulation routes. The attention to detail throughout the project sets the highest standard for commercial office accommodation.

AWARD

The Ordsall Chord Viaduct

PROJECT TEAM

Architect:	BDP
Structural Engineers:	AECOM Mott MacDonald JV
Specialist Designer:	Knight Architects
Steelwork Contractor:	Severfield
Main Contractors:	Skanska BAM JV
Client:	Network Rail

The Ordsall Chord Viaduct is the iconic centrepiece at the heart of the Ordsall Chord, a new elevated railway connecting Manchester and Salford. The project reduces railway congestion, allows new passenger services to run, and creates wide economic benefits across the north west of England.

The viaduct carries the new two-track railway across both the River Irwell and the dual carriageway Trinity Way. It sits next to major heritage structures, part of the historic 1830 Liverpool to Manchester Railway, the world's first inter-city railway.

The context required a design which was of the highest architectural quality, with a structure that would act as a landmark without dominating surrounding buildings.

An 89m span network arch structure was chosen for the main river span, combining great strength and stiffness with a relatively low profile. A 100m long twin girder bridge was selected for the spans over the roadway. All parts of the viaduct are integrated visually to appear like a single ribbon of weathering steel.

This is the first network arch bridge to be built in the UK, and the first asymmetric (tapering) network arch anywhere in the world.

The preliminary design concept illustrated box girder structures throughout the length of the viaduct. The design was modified during the design-and-build phase, adopting box girders for the arch ribs but stiffened plate I-girders for the spans over the highway. This reduced construction costs and simplified future maintenance requirements.

The network arch is visually merged with the girder spans above Trinity Way by the inclusion of steel ‘cascades’ in between. These transition pieces negotiate complex changes in vertical and lateral geometry, and give the impression of a smooth transformation from the hexagonal box to the ribbed I-section.

The river and highway spans of the viaduct both employ steel primary girders, with steel cross girders supporting a composite concrete deck slab. The main span’s hanger network comprises 2 x 46 solid steel hangers each 85mm in diameter.

Steel was the most cost-effective solution to satisfy the client’s structural performance requirements and the desire for an elegant, iconic structure. Steel was ideal for the offsite manufacture of a highly geometrically complex structure and allowed an efficient construction methodology to be developed.

Adoption of weathering steel for the viaduct provides a unifying visual identity and minimises future maintenance requirements.

The network arch was the biggest structural challenge. An existing road bridge had to be demolished before construction could proceed. Steel support trestles were assembled by driving tubular steel piles through its deck, and they were used to prop the structure during demolition. The supports served a dual role; they were then reused as the supports for the network arch span’s during its erection.

The deck girders were installed piecemeal onto the abutments and temporary supports, welded together, and cross girders bolted in place. The arch sections were brought to site in segments and welded together lying on their sides near the river bank. Both arches were then rotated on end pivots to their correct inclination (6 degrees from vertical), overhead bracing installed, and temporary tie cables and struts inserted. The dual-arch assembly weighed nearly 600 tonnes and was erected onto the end nodes of the tie girders with a tandem crane lift using a 750-tonne crawler crane, along with the UK’s largest 1,300-tonne crawler crane.

Hanger stressing was the most complex construction stage, with a total of 136 stages of stressing completed. Two independent load monitoring systems were used in every hanger during construction, with one monitoring system left in place for in-service structural health monitoring. Although the structure behaved generally as predicted, close cooperation was required between the construction and design teams to allow small divergences in hanger load to be corrected.

© Matthew Nichol Photography

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The box girder elements of the structure were specified as Execution Class 4, one step above normal UK bridgeworks requirements, due to the impossibility of future examination of welds within the highly constrained box sections.

The bridge was fully designed and detailed using BIM, adopting a highly innovative arrangement to reduce programme, increase confidence in the buildability of the design, and allow early ordering of steel plate before the full design was complete. The steelwork contractor’s BIM technicians were ‘loaned’ to the design engineers, embedded in their team, to help produce the BIM model, design drawings, and ensure the design data was simple for the steelwork contractor to re-use in its own processes. This approach is believed to be a first for the UK bridge industry.

Key parts of the design were delivered using a ‘3D-model-only’ approach, minimising the cost and time required to produce conventional 2D structural steelwork design drawings, and improving confidence in the quality of the information shared.

JUDGES’ COMMENT

The Ordsall Chord project is a major piece of new railway infrastructure that has a truly civic presence. The project combines a new network arch railway bridge and approach viaducts with integrated public realm. Weathering steel is used as a strong unifying element that flows through from the viaduct and bridge approach upstands into the main arches of the railway bridge, giving the scheme a strong architectural identity within its urban setting.

COMMENDATION

Two St. Peter's Square, Manchester

PROJECT TEAM

Architect:	SimpsonHaugh
Structural Engineer:	BuroHappold
Steelwork Contractor:	William Hare
Main Contractor:	Laing O'Rourke
Client:	Mosley Street Ventures Ltd

© Daniel Hopkinson

Two St. Peter's Square is a new build, Grade A office space in the heart of Manchester city centre. It faces the Grade I listed Town Hall and Grade II listed Central Library. The building is 12 storeys above ground with a two-storey basement.

The key driver for the structural design has been to provide highly flexible column-free accommodation that is attractive to potential tenants. The typical beams are 730mm deep and, over the 18m span, vibration was a key criterion governing many of the section sizes.

At ground level the architectural intent was to provide a colonnade with columns at 12m centres and cantilevers of 6m at either end. Continuing this wide spaced grid on the typical floors above was not economical so a transfer structure at the lower level was utilised.

To maximise the spatial experience of the colonnade at ground floor level the columns are double-height with the first-floor floorplate set-back from the perimeter. Long-span transfer beams at level 2 achieve this with the first floor hung from above. A similar arrangement is adopted at level 10 with transfer beams that support the set-back columns above. This arrangement provides a high value terrace space overlooking the civic heart of Manchester, whilst also responding to the planners' concerns on massing.

Vertical access for the building, both for people and services, is via the core. Positioned offset on the building floor plan this maximises the available floor area and the length of premium elevations facing the square. Building stability is provided by the reinforced concrete core which acts as a cantilever from the raft foundation at basement level under the lateral loading imposed on it.

Supporting the façade presented several engineering challenges. Each unit was constructed in 6m wide by 4m high mega-panels.

The extent of movement of the frame under the significant façade loading was meticulously calculated during the different phases of the build. This involved pre-setting the steel frame, so it could settle incrementally as the mega-panels were installed.

Long-span beams form the typical floors giving column-free flexible spaces. Economy was achieved by integrating the structural and service zones, utilising composite action between the steel beams and concrete slabs and adopting asymmetric sections.

Two St. Peters Square has regenerated a prime site in central Manchester providing a positive contribution to the city and enhancing the adjacent public realm.

JUDGES' COMMENT

This scheme of new Grade A offices in the heart of Manchester's civic centre responds to the challenge of this site of prime importance. Not only does the glazed stone tracery respond appropriately to the location, but the elegant steel framed building with 18m clear spans provides flexible accommodation highly attractive to tenants.

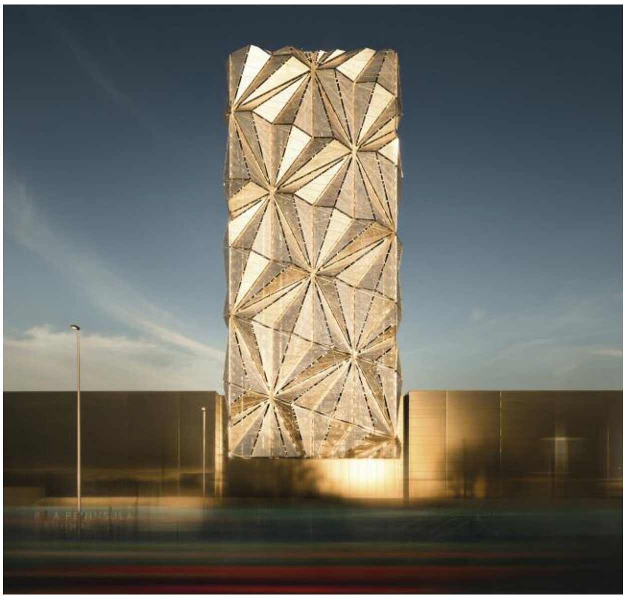
COMMENDATION

50TH ANNIVERSARY

The Greenwich Peninsula Low Carbon Energy Centre

PROJECT TEAM

Architect:	C. F. Møller
Artist:	Conrad Shawcross RA
Structural Engineer:	Price & Myers
Steelwork Contractor:	Billington Structures Ltd
Main Contractor:	Kier Group
Client:	Knight Dragon



© Mark Hadden

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From conception the Energy Centre was developed with innovation and creativity to ensure the structure was a stand-out piece of artwork on the newly-forming Greenwich Peninsula.

Central in the structure is the highly distinctive flue tower, measuring 3m by 18m on plan and 49m tall.

The cladding of the flue tower unites sophisticated engineering and complex optic research to create an impressive sculptural concept on a huge scale. The unique cladding is formed of hundreds of triangular panels, each the height of a London bus, that fold and flow across the surface of the tower. The resulting complex geometric patterns visually break up the elevations to create an uneven sculpted surface that plays with the vanishing points and perspective.

The panels are perforated to exploit the phenomena of the Moiré Effect, and at night an integrated lighting design produces a shifting series of 'compositions' lit from within the structure.

The main building and tower are structurally independent to avoid the effects of cyclic loading and fatigue on the tower affecting the main building.

A series of wind tunnel tests were carried out on the tower structure as the cladding design progressed to assess the detailed loads on the structure and the dynamic sensitivity of the tower. A BRE study was also carried out to provide design data for assessing cyclical fatigue loads.

The tensile strength and ductility of steel made it the obvious choice to cope with the effects of high wind loading on the tall slim structure. The industrial aesthetic of steel lent itself to the historical context of Greenwich Peninsula, whilst the cross bracing of the structure echoes the neighbouring gas holder dating from 1886.

345 tonnes of galvanized steel were erected for the flue tower, which consisted of five main cantilever latticed girders, each formed from three 16m high by 3.15m wide sections spliced at third points on-site and placed 4.5m apart. These were connected with interleaving diagonal secondary members fixed to both chords on the main east and west façades.

Close coordination with the cladding sub-contractor was fundamental to achieving the correct setting out and detailing for the hundreds of fixing brackets; each fabricated as part of the steel frame with sufficient tolerance to allow seamless connection and adjustment of the cladding panels throughout the build.

JUDGES' COMMENT

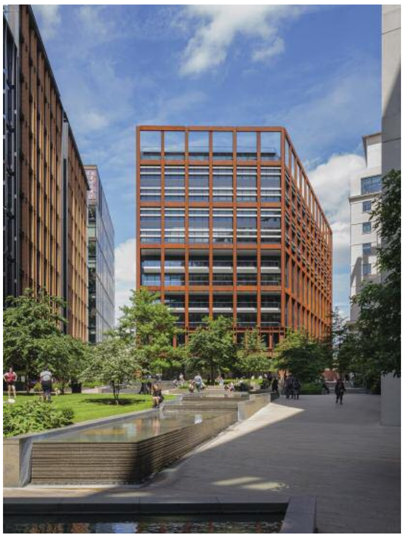
This project forms the gateway to a new and rapidly developing quarter to the east of London and is a remarkable addition to the heavily urban landscape, both during the day and at night. Steel is used with grace and with flexibility for the future in mind. The collaboration between artist, designers, steelwork contractor and this enlightened client has resulted in a holistically coherent and notable project.

COMMENDATION

Four Pancras Square, London

PROJECT TEAM

Architect:	Eric Parry Architects
Structural Engineers:	AKT II and BAM Design
Steelwork Contractor:	Severfield
Main Contractor:	BAM Construction
Client:	King's Cross Central Limited Partnership



© Dirk Lindner/Eric Parry Architects

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Four Pancras Square is the last of six new commercial buildings within King's Cross Central Zone B, located adjacent to St Pancras and King's Cross stations.

As the square's prominent 'keystone', Four Pancras Square demanded a strong identity that resonates with the site's industrial heritage. This is encapsulated in Eric Parry Architects' competition-winning design via an expressive exposed weathering steel frame.

The building was designed as a speculative office, aspiring to exceed the British Council for Offices specification and be the first office to achieve a BREEAM 2014 rating of 'Outstanding', succeeding in both.

The building is 57m wide on the north elevation, 27m on the south and 54m on the west, producing a 60 degree angle on the east.

These proportions, combined with the concept, resulted in a regular 4.5m column grid on the upper levels and larger spans around the ground floor retail, typically 13.5m, but up to 27m clear span on the south face. The façade structure continues beyond the set-back 10th floor and the landscaped roof terrace above to crown the building.

The key challenges to the design and detailing of the external steel exoskeleton included:

- forming the full width transfer creating the dramatic southern entrance onto Pancras Square.
- control of thermal movements of the external primary frame relative to the internal structure.
- detailing the structure and finishes to accommodate the movements.
- providing the necessary fire resistance to the unprotected steel exoskeleton.
- ensuring the exposed components of the steel exoskeleton and the junction with the internal structure are designed and detailed to provide the required durability.

A Vierendeel truss wrapping the first floor is a key architectural feature. On the southern elevation to the square it forms the transfer structure creating the column-free open entrance onto Pancras Square. The storey-high truss continues to wrap the remaining elevations of the first floor, resolving the different grids required for the office levels and the public realm.
Where the steel exoskeleton interfaces with the façade at the perimeter columns the floor slab sits on steel shelves, 'hods', which cantilever off the external columns through the façade. These 'hods' are tied into the slab and in turn cantilever out to restrain the columns in both directions.

These 'hods' result in structural penetrations through the thermal line of the cladding at 4.5m centres across all floors and were a critical connection detail.

JUDGES' COMMENT

The judges recognised the strong technical collaboration of the entire team to deliver the architect's vision of an expressed weathering steel exoskeleton without compromise. This was achieved through creative development of key technical details to address thermal bridging, differential thermal movements, fire performance and weathering. The building's elevations are a celebration of steel.

COMMENDATION

Brooklands Museum Aircraft Factory and Racetrack Revival

PROJECT TEAM

Architect:	Thomas Ford & Partners
Structural Engineer:	Alan Baxter Ltd
Steelwork Contractor:	Ainscough Industrial
Main Contractor:	Brymor Construction Ltd
Client:	Brooklands Museum

© David Lankester


© David Lankester

Brooklands is the birthplace of British motorsport and aviation, and the home of many remarkable engineering and technological achievements throughout the 20th Century. Over the past three years, Brooklands has seen another unique engineering achievement – the successful relocation and refurbishment of the 78-year-old, Grade II listed, Bellman Hangar to reinstate key surviving elements of the original motor racetrack.

The project also included the construction of a new Flight Shed building to house some of the Museum's expanding aircraft collection, together with workshops and archive facilities. The hangar was re-clad with new profiled steel cladding that matched the original profile externally, but incorporated insulation to provide enhanced environmental conditions inside. As part of the project, a major new exhibition celebrating the history of aircraft manufacture was created within it.

Analysis of the structure showed that there was a weakness in the haunch connection, which could be overstressed in high winds particularly when the hangar doors were open, creating a dominant opening. Low key strengthening works to the haunches were developed, which did not fundamentally affect the nature or appearance of the structure. The repairs are expressed through the use of different section profiles and colours to distinguish new from original elements.

Careful dismantling was undertaken to avoid damaging the existing components of the building. The components were then individually tagged to define their location and orientation to make sure that all the components would fit back together again in the same locations. Once transported to the steelwork contractor's factory, each element was sand blasted to remove the many layers of old paint and reveal the extent of any damage or corrosion. Where major damage or corrosion was found, elements were repaired to match the original structure. The steelwork was then re-painted and carefully transported back to site for re-erection.

In addition to the re-erection of the hangar, a free-standing mezzanine was designed within the hangar to increase the exhibition space. This mezzanine also included a bridge across to the adjacent Flight Shed, linking the two buildings without the need for extensive alterations to the Bellman Hangar.

The project was successfully completed and opened in November 2017. It is a resounding testament to the flexibility and durability of steel design, both in its original concept and in how it can be sustainably and sympathetically adapted and re-used many years after its original design life has been exceeded.

JUDGES' COMMENT

This project is a testament to the adaptability of steel construction and the care with which the project team managed the task of dismantling the old hangar, refurbishing individual components and re-assembling the structure on a nearby site, providing the ideal accommodation for the museum display.

COMMENDATION

Belfast Waterfront Conference & Exhibition Centre

PROJECT TEAM

Architect:	Todd Architects
Structural Engineer:	Doran Consulting Ltd
Steelwork Contractor:	Walter Watson Ltd
Main Contractor:	McLaughlin & Harvey Ltd
Client:	Belfast City Council

© GOC Photography

© GOC Photography

The new steel-framed extension to the Belfast Waterfront stretches from the existing building out to the edge of the River Lagan and provides an additional 7,000m² of floor space which can facilitate up to 5,000 guests at any one time. There is an 1,800m² main hall and a 700m² minor hall, each of which can be sub-divided to allow flexible layouts. These large clear span spaces were most cost-effectively achieved with a steel frame.

The facility has been designed to fit in with its surroundings, wrapping around the existing building and connecting to the existing facilities at multiple levels, though remaining an independent structure. The extension spans over the existing services yard and service building on the riverside. Public access to the river has been maintained. The congested location proved challenging, being extremely restricted in terms of access and by surrounding structures and its proximity to the river.

The use of steel meant the construction works could be accelerated given the opportunity to prefabricate the frame offsite in advance.

The complex primary structure was influenced by several factors. The spatial requirements for the extension involved column-free spaces, a combination of single and double-height spaces and partial intermediate floors, and the need to build over and around retained structure. This led to several framing solutions being employed, using 1,400 tonnes of steel.

Pre-cambered cellular beams were used along with metal deck composite concrete flooring. The degree of pre-cambering was calculated to provide level steelwork after dead load deflection.

Extra levels were squeezed in as the building's footprint gave very limited floor space. To give this intermediate floor sufficient ceiling height 'Slimflor' construction was adopted, using plated UC sections within the floor depth.

'Cellform' beams were used to form the main hall roof; this allowed services to pass through the beams and thus maximise ceiling heights. These 'cellform' beams had a tapered section to provide integral roof falls (and provide a level soffit for rigging steelwork).

For the accommodation built over the service yard, cantilevered plate girders were used as their supporting columns were offset to maintain clear height for HGV access.

This project was Belfast City's Council's first use of BIM on a major project. It was delivered using advanced modelling techniques, which minimised on-site clashes and maximised the efficiency of design and construction.

JUDGES' COMMENT

New conference halls, banqueting and break-out spaces extend the Belfast Waterfront Conference Centre right up to the quay of the River Lagan. The resulting multiple challenges, both physical and financial, were met by a sequence of appropriate and pragmatic structural steel and architectural solutions.

COMMENDATION

Approach Viaduct South, Queensferry Crossing

PROJECT TEAM

Structural Engineer:	Ramboll
Steelwork Contractor:	Cleveland Bridge UK Ltd
Main Contractor:	Forth Crossing Bridge Constructors
Client:	Transport Scotland

© Transport Scotland

© Transport Scotland

Opened in August 2017, Transport Scotland's Queensferry Crossing is one of the most striking engineering icons of the 21st Century.

On the south side of the crossing the approach viaduct (AVS) is 545m long and comprises two composite steel box girders, set 21.75m apart, supported on six V-shaped piers with spans of 64m + 80m + 90m + (3 x 87m). These are directly connected to the main span cable-stayed single box section of the Crossing.

Each approach viaduct is 17.5m wide, accommodating two main carriageways and a hard shoulder. Consideration has been given to future usage, allowing it to be adapted to light rapid transport systems in the future.

The AVS was pre-assembled before being progressively launched into place. Assembly took place in an efficient and controlled environment, keeping work out on the estuary to a minimum. However, this created significant engineering challenges.

The steel twin box girders of the viaduct were fabricated and pre-assembled by Cleveland Bridge in Darlington. The completed girders were transported by road in halves due to the width of the boxes.

Behind the southern approach a 160m long assembly platform work area was prepared. The east and west girders were launched independently and alternately in six stages, proceeding span-by-span. This facilitated a rolling programme of fabrication, segment delivery, site assembly and a staged launch with east and west girders alternating.

The active viaduct launch solution comprised a vertical 'king post' and temporary stays. The temporary stay system counteracted girder deflection as the tip reached the next pier, also reducing bending effects during cantilevering. The pulling system consisted of cables anchored to the rear part of the girders. Hydraulic jacks transferred the pulling load to the permanent abutment bearing plinths. The decks were pulled at an average speed of 10m/hr.

Construction of the concrete deck slab and cantilevers was undertaken in phases.

The bridge has low level deck lighting which reduces costs, improves safety and minimises external light pollution. The wind shield provides weather protection for all vehicles for wind speeds up to 115mph, minimising crossing closures.

Maintenance requirements have been kept low. The viaduct box has a dehumidification system, removing any need to repaint the internal steelwork. Externally, a permanent maintenance gantry system has been installed to facilitate access to all faces of the boxes. The use of high-quality paint systems will ensure longevity and will extend the life of maintenance repainting to over 25 years.

JUDGES' COMMENT

In a landscape comprising the Forth Bridge and the Forth Road Bridge, the new Queensferry Crossing, Britain's tallest bridge, cannot fail to impress. This scheme for the southern approach viaduct embodies the knowledge in design, fabrication and long-term maintenance, in the launching and finishing the twin box viaducts, from some of the world's most accomplished bridge builders.

COMMENDATION

The Beacon of Light, Sunderland

PROJECT TEAM

Architect:	FaulknerBrowns
Structural Engineer:	s h e d
Steelwork Contractor:	Harry Marsh (Engineers) Ltd
Main Contractor:	Tolent Construction
Client:	The Foundation of Light

The Beacon of Light is a unique landmark in Sunderland providing educational aspiration through the power of sport. It is a combination of a school, offices, a 12-court sports hall that doubles as a 3,000-seat performance venue and an indoor football pitch on the roof. In total over 10,500m^2 of accommodation is provided, built to a very high quality, for only £17M. Architecturally it is a significant feature on the Sunderland skyline and a beacon for the Foundation of Light.

Early in the design concept it was decided that a steel frame would provide a flexible solution that would allow the design to develop right up to the start on site. Without the steel frame the project would not have been affordable, nor would it have been as dramatic and elegant, from the sports and leisure venue right through to the indoor rooftop football pitch under a 60m by 60m clear span fabric roof.

The use of a steel frame was fundamental to:

- keep the amount of piling to a minimum thus reducing environmental impact.
- allow the M&E flexibility by creating clear soffits in the main service run directions keeping coordination simple and fabrication modifications, such as holes in beams, to a minimum.
- create a 60m by 32m clear span sports hall that can be converted into a 3,000-4,000 seat performance venue that has a football pitch over it. It has five different possible uses planned and is designed to be so flexible that the adjacent main accommodation at the upper levels is supported by super trusses to accommodate extra viewing and seating zones with uninterrupted views.
- design a very lightweight and very shallow two-way spanning fabric roof structure and a feature 'Beacon' polycarbonate façade that can come alive at night with lighting.
- create a building that fits the superb architecture, within the tight budget, to a very high aesthetic standard.

The project provides a superb community facility for the people of Sunderland. Its amazing column-free spaces and structural forms inside will themselves be an inspiration to those who use the building throughout its lifespan, in particular the two-way spanning 60m by 60m roof which has a design weight of 44kg/m^2. It is particularly shallow and required a detailed erection sequence and temporary works to make it possible. The whole roof and polycarbonate frame is in an unheated space and is thermally isolated from the main warm frame underneath.

JUDGES' COMMENT

A new landmark in regenerating Sunderland, this glowing cube of a building, a home for the Foundation of Light, is a community-supported combination of school, sports halls and 3,000-seater performance venue. It even includes a covered football pitch on the roof. The steel frame economically resolves structural challenges from foundations to its 60m by 60m clear span fabric roof.

COMMENDATION

Somers Town Bridge, London

PROJECT TEAM

Architect:	Moxon Architects
Structural Engineer:	Ove Arup & Partners Ltd
Steelwork Contractor:	S H Structures Ltd
Client:	King's Cross Central Limited Partnership

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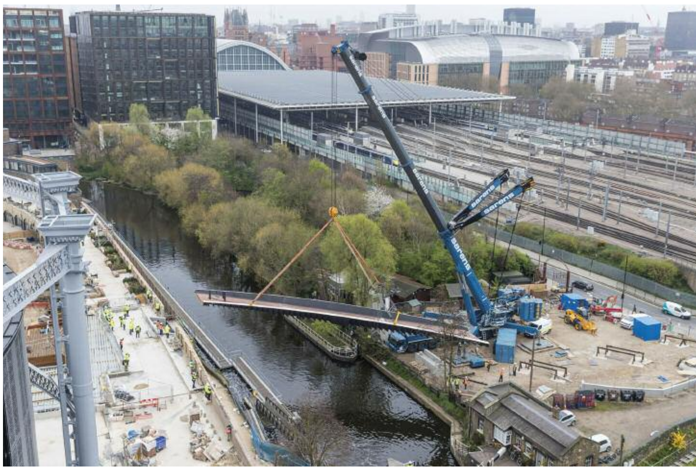


© John Sturrock

Designed for cyclists and pedestrians to cross from Camley Street into King's Cross Central, a landmark redevelopment project, the bridge spans 38m, weighs 52 tonnes and is only 1,100mm deep at mid-span and 400mm deep at the ends. In keeping with the Victorian heritage of the area, the bridge is unadorned and streamlined, focusing attention on extremely detailed and precise craftsmanship and high-quality materials.

A sweeping ramp leads people up to the bridge and over the water with an elegant parapet transitioning from planed hardwood to stainless steel.

By locating the structural depth above deck level, the design maintains a clear view of the canal south from St Pancras Lock.

One of the planning design drivers was that this should be a 'green bridge', taking minimum material use to the extreme that it becomes the defining feature of architectural simplicity. With the use of steel, and its high recycled material content, this has resulted in a low carbon solution.

Power and communications cables run concealed behind the top flanges of the bridge. Whole-life energy-efficient LED strip luminaires light up the footway within the handrails. This arrangement reduces the amount of light required to illuminate the footpath, as well as minimising light pollution.

The use of steel construction facilitated both offsite fabrication and single piece lifting that were required to avoid disruptive construction methods on this heavily trafficked section of canal. This also enabled the offsite and on-site construction activities to run in parallel with associated programme benefits. A lightweight deck also minimised foundation works.

The bridge was optimised to meet the architect's aspiration for a slender structure that would minimise the shade on the canal. Non-linear analysis of the slender deck ensured that the slenderness would not compromise safety and would provide maximum comfort for users of the bridge. Particular care was placed on satisfying the user comfort criteria, which led to the use of bespoke tuned mass dampers at mid-span to supress vertical and torsional dynamic modes of the deck.

Every single element of the bridge had a structural meaning and function. For instance, it was designed so no longitudinal stiffeners would be needed, simplifying the structure as well as reducing fabrication complexity and cost.

The bridge was installed using a 750-tonne mobile crane. The lift had to be carefully controlled due to the proximity of the canal and the operational railway lines in and out of St Pancras Station.

JUDGES' COMMENT

A sweeping ramp leads up to this almost impossibly slender steel bridge. Designed for pedestrians and cyclists, the bridge improves access into King's Cross Central, a landmark redevelopment project. The simplicity of its unadorned and streamlined form focuses attention onto the bridge's high-quality materials and precise craftsmanship.

MERIT

Thirty Broadwick, London

PROJECT TEAM

Architect:	Emrys Architects
Structural Engineer:	Heyne Tillett Steel
Steelwork Contractor:	Severfield
Main Contractor:	BAM Construction
Client:	Great Portland Estates plc

© Andy Stagg Photography

Thirty Broadwick is a new 120,000ft^2 building that offers optimised lettable floor areas within Soho's tight streetscape and replaces a tired building with one that reflects the district's character. It now offers exemplar West End office space, with large flexible floorplates, that meets the client's exacting sustainability standards. The upper floors step back creating large outdoor terraces which provide valuable outdoor amenity space.

The wellness of occupants was a primary design objective, reflected in generous and well-appointed spaces, incorporating a natural ventilation strategy that has helped to make Thirty Broadwick an exemplar sustainable building with an EPC 'A' and BREEAM 'Excellent' rating.

JUDGES' COMMENT

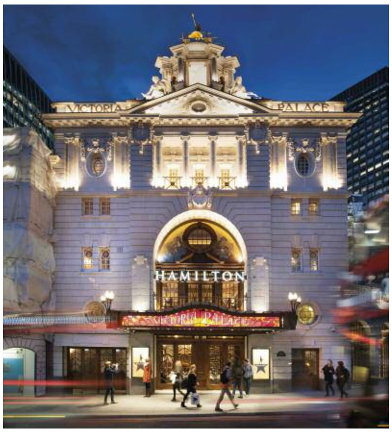
A deceptively simple project where structural steel is showcased as the 'go to' system for maximising the development potential on such heavily constrained sites. Long-span, column-free interiors and additional floor area are achieved within planning height constraints determined by a previous consent through innovative deflection control during construction and the inventive integration of structure and services.

MERIT

Victoria Palace Theatre Refurbishment, London

PROJECT TEAM

Architect:	Aedas Arts Team
Structural Engineer:	Conisbee
Steelwork Contractor:	SDM Fabrication Ltd
Main Contractor:	8Build Ltd
Client:	Delfont Mackintosh



© Philip Vile

The Grade II listed Victoria Palace Theatre has been remodelled and refurbished to ensure that it remains a prominent part of London's West End theatre scene for years to come.

The main objectives were to maximise the potential of the stage and fly tower, extend the back-of-house facilities, improve the comfort of the auditorium to seat 1,528 and maximise the amount of front-of-house areas, whilst maintaining the building's historic features.

The structural works included installing a 6m wide by 26m high extension to the fly tower, extending the east wing, and strengthening works throughout the existing building.

JUDGES' COMMENT

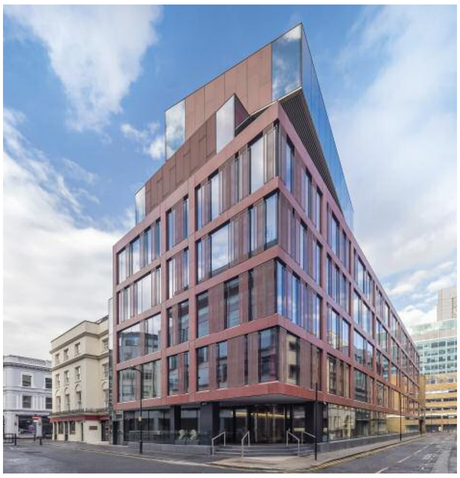
The remodelling of the theatre has been extremely challenging, ensuring that it will remain a prominent venue for years to come. The whole team has worked in a truly collaborative manner, that was essential due to the evolving design. Steelwork was key to dealing with the many logistical construction challenges due to limited space and access.

MERIT

Seventy Wilson, London

PROJECT TEAM

Architect:	astudio
Structural Engineer:	Heyne Tillett Steel
Steelwork Contractor:	TSI Structures Ltd
Main Contractor:	Willmott Dixon
Client:	Stanhope



A 1980s office building has been fully refurbished and now benefits from a 25% increase in floor area. The space has been rationalised and two new storeys have been added, all with an efficient structural design dramatically reducing the carbon footprint.

The works involved extending the height of the building from five to seven storeys, building a four-storey addition to one elevation and remodelling the circulation cores to provide more office space and an additional lift.

The exposed steel frame in this modern 'raw' building is painted bright red to emphasize and celebrate the structure.

JUDGES' COMMENT

The team cleverly added 25% floor area to this 1980s office without needing to strengthen the existing steel structure. The original steelwork, previously encased in concrete, was exposed to make it a statement of the building. This two-storey extension is a fine example of how testing and good engineering can give a steel building new life.

MERIT

Walthamstow Wetlands

PROJECT TEAM

Architects:	Witherford Watson Mann and Kinnear Landscape Architects
Structural Engineer:	Entuitive
Steelwork Contractor:	Gorge Fabrications Ltd
Main Contractor:	Rooff Ltd
Client:	London Borough of Waltham Forest

© Heini Schneebeli

Walthamstow Wetlands is Europe's largest urban wetlands and expects to host 250,000 visitors in its first year. As part of the project to provide the facilities necessary for opening the site to free public access, two disused infrastructure buildings, the locally listed Engine House and the Grade II listed Coppermill Tower, have been adapted for visitor use, providing an exhibition space, an education room, café, toilets and a viewing platform.

The structural works included a boardwalk entrance, new first floor and spiral escape stair in the Engine House, and a new viewing platform and staircase in the Coppermill Tower.

JUDGES' COMMENT

The team has successfully given a nod to the former industrial heritage of the building through the use of steel in many manifestations to highlight wayfinding and new interventions throughout this sensitive conversion. The balustrading, made from simple welded plate elements, proves an effective unifying element to the balconies and external spaces.

MERIT

1 & 2 London Wall Place

PROJECT TEAM

Architect:	make
Structural Engineer:	WSP UK Ltd
Steelwork Contractor:	William Hare
Main Contractor:	Multiplex Construction Europe
Client:	London Wall Place Limited Partnership

London Wall Place is one of the most important recent developments in the City of London comprising two strikingly contemporary landmark commercial buildings providing 500,000m² of Grade A office space.

Steel lies at the heart of the development, over 7,000 tonnes of it. Its use throughout is both impressive and dramatic; both buildings feature extensive cantilevered steelwork and deep transfer structures at Level 2 which allow them to extend well beyond the boundary of the two-storey common basement.

The two buildings rise to 12 storeys and 16 storeys with their steel superstructures laterally stabilised by concrete cores.

JUDGES' COMMENT

The large scheme, comprising two new office buildings combined with carefully integrated public realm, provides a new setting along 250m of London Wall. The use of steel has been instrumental in enabling the two buildings to cantilever out over the existing road. A 5m deep mega truss at Level 2, with enormous steel members passing through it, offers the opportunity for a highly unusual new dining space.

MERIT

Manchester Victoria Redevelopment

PROJECT TEAM

Architect:	BDP
Structural Engineer:	Arcadis Consulting (UK) Ltd
Steelwork Contractor:	Severfield
Main Contractor:	Morgan Sindall - Manchester (Construction)
Client:	Network Rail

© Martine Hamilton Knight

Manchester's Victoria Station has been transformed to increase passenger capacity. The redevelopment was a challenging project within an existing live railway station around several Grade II listed features, with possessions limited from 1.00am to 4.30am daily. As well as the ETFE roof over the refurbished concourse, the project also included a 60m Arena walkway over the live train platforms.

The 1,800t, 8,500m² ETFE roof is supported by 15 steel ribs, the largest spanning 95m. The lifts for this project were challenging; the largest rib weighed 84 tonnes and required a crane with a 74m radius.

JUDGES' COMMENT

The tubular steel ribs forming the new roof create an effective transition between the curving railway tracks and the adjacent buildings. Despite severe constraints the steelwork was erected on schedule with the station remaining operational throughout. The result is a completely transformed space, with the exposed steelwork a dominant feature.

MERIT

50TH ANNIVERSARY

101 The Embankment, Salford

PROJECT TEAM

Architect:	Flanagan Lawrence
Structural Engineer:	Ramboll
Steelwork Contractor:	Elland Steel Structures Ltd
Client:	Ask Real Estate

© Hufton + Crow

This project is situated on a plot once occupied by Exchange Station that closed in 1969. The Grade II listed sandstone façade viaduct that once supported the station has been retained to form a grand base for a new office building, which sits at plinth level 9m above a significant new area of public realm.

In contrast to the viaduct, the modern steel and glass office building appears as a lightweight, highly polished jewel offering over 165,000ft^2 of Grade A offices on 10 floors above a 442-space car park podium over three floors.

JUDGES' COMMENT

This steel and glass 11-storey office building contains a substantial high-spec multi-storey car park, together with retail and workspace units, tied together with an innovative 'hub' circulation building. This is a complex structure, but the judges were impressed with the overall economy of the building, taking into account the need to incorporate existing façades, together with the complexities of the transition between the car park and office levels.

MERIT

Walkway Bridges, London Wall Place

PROJECT TEAM

Architect:	make
Structural Engineer:	WSP UK Ltd
Steelwork Contractor:	William Hare
Main Contractor:	Multiplex Construction Europe
Client:	London Wall Place Limited Partnership

During the construction of London Wall Place, some of the existing heavy 1960s Barbican Highwalks had to be removed as part of the demolition and enabling works. These have now been reinstated by stylish walkways fabricated in weathering steel.

The six new footbridges suspended from the new buildings are an aesthetic and functional response to the problem of pedestrian movement in an overcrowded urban realm. In terms of their slimmer, more sculptural form, material and colour, they provide a vivid contrast with the surrounding buildings and enhance the contemporary styling of London Wall Place.

JUDGES' COMMENT

Individually the six bridges that form this walkway may not catch the eye. However, even though structurally different, through uniform language they cleverly work as one. The weathered steel gives a warmth, which combined with the different structural forms, creates an urban landscape that works with the surroundings to produce lovely public spaces above and below.

The Structural Steel Design Awards Scheme

2019 ENTRY CRITERIA

The British Constructional Steelwork Association Ltd and Trimble Solutions (UK) Ltd have pleasure in inviting entries for the 2019 Structural Steel Design Awards Scheme.

The objective is to celebrate the excellence of the United Kingdom and the Republic of Ireland in the field of steel construction, particularly demonstrating its potential in terms of efficiency, cost-effectiveness, aesthetics and innovation.

1. Operation of The Awards

The Awards are open to steel-based structures situated in the United Kingdom or overseas that have been built by UK or Irish steelwork contractors. They must have been completed and be ready for occupation or use during the calendar years 2017-2018; previous entries are not eligible.

2. The Panel of Judges

A panel of independent judges who are leading representatives of Architecture, Structural Engineering and Civil Engineering assess the entries. The judging panel selects award winners after assessing all entries against the following key criteria:

Planning and Architecture

- Satisfaction of client's brief, particularly cost-effectiveness
- Environmental impact
- Architectural excellence
- Durability
- Adaptability for changing requirements through its life
- Efficiency of the use and provision of services
- Conservation of energy

Structural Engineering

- Benefits achieved by using steel construction
- Efficiency of design, fabrication and erection
- Skill and workmanship
- Integration of structure and services to meet architectural requirements
- Efficiency and effectiveness of fire and corrosion protection
- Innovation of design, build and manufacturing technique

3. Submission of Entries

Entries, exhibiting a predominant use of steel and satisfying the conditions above, may be submitted by any member of the design team using the appropriate form. The declaration of compliance with the award requirements must be completed by the entrant.

Entrants should ensure that all parties of the design team have been informed of the entry.

CLOSING DATE FOR ENTRIES
Friday 22nd February 2019

4. General

The structures entered must be made available for inspection by the judges if they so request. All entrants will be bound by the decision of the judges, whose discretion to make or withhold any award or awards is absolute. No discussion or correspondence regarding their decision will be entered into by the judges or by the sponsors. The decision of the sponsors in all matters relating to the Scheme is final.

A shortlist of projects will be announced and the project teams notified directly. The results of the Scheme will be announced in the autumn – no advance notification will be given to the project teams as to which structures will receive Awards.

5. Awards

Each firm of architects and structural engineers responsible for the design receive an award as do the steelwork contractor (see note 7 below), main contractor and client.

6. Publicity

The sponsors assume the right to publish the drawings, photographs, design information and descriptive matter submitted with the entry to publicise the award-winning structures in relation to the Structural Steel Design Awards Scheme.

Any party involved in a project that is no longer in business for whatever reason will not receive any recognition in the Structural Steel Design Awards.

7. Membership of BCSA Ltd

Where the steelwork contractor on any project entered into the Structural Steel Design Awards is a not a member of BCSA Ltd as at the closing date for entries, the steelwork contractor shall not receive any award or public recognition whether at the Awards event, in any promotional literature before the event nor in any booklet or other communication published after or in support of the Structural Steel Design Awards.

Further Details

All correspondence regarding the submission of entries should be addressed to:

Chris Dolling, BCSA, Unit 4 Hayfield Business Park,
Field Lane, Auckley, Doncaster DN9 3FL
Tel: 020 7747 8133 Email: chris.dolling@steelconstruction.org

Sponsored by The British Constructional Steelwork Association Ltd and Trimble Solutions (UK) Ltd.

2019 ENTRY FORM

PLEASE COMPLETE ALL SECTIONS BELOW IN FULL (including email addresses)

Name of building/structure: ....

....

Location: ....

....

Programme of construction: ....

Completion date: ....

Total tonnage: ....

Approximate total cost (£): ....

Cost of steelwork (£): ....

Declaration of Eligibility

As the representative of the organisation entering this structure in the Structural Steel Design Awards 2019, I declare that this steel-based structure has been fabricated by a UK or Irish steelwork contractor. It was completed during the calendar years 2017-2018. It has not been previously entered for this Awards Scheme.

Signed: .... Date: ....

On behalf of: ....

Person Submitting this Entry

Name: ....

Tel: ....

Email: ....

Submission Material

The submission material which should be hard copies, should include:

- Completed entry form
- Description of the outstanding features of the structure (c 1,000 words), addressing the key criteria listed opposite, together with the relevant cost data if available
- Architectural site plan
- Not more than six unmounted drawings (eg. plans, sections, elevations, isometrics) illustrating the essential features of significance in relation to the use of steel
- Eight different unmounted colour photographs which should include both construction phase and finished images
- Memory stick containing the images submitted as digital JPEG files at 300dpi A5 size minimum and an electronic copy of description text in Word (not pdf format)

Architect

Company Name: ....

Address: ....

....

Contact: .... Tel: ....

Email: ....

Structural Engineer responsible for design

Company Name: ....

Address: ....

....

Contact: .... Tel: ....

Email: ....

Steelwork Contractor (see note 7 opposite page)

Company Name: ....

Address: ....

....

Contact: .... Tel: ....

Email: ....

Main Contractor

Company Name: ....

Address: ....

....

Contact: .... Tel: ....

Email: ....

Client

Company Name: ....

Address: ....

....

Contact: .... Tel: ....

Email: ....

Entry material should be posted to:

Chris Dolling, BCSA, Unit 4 Hayfield Business Park,
Field Lane, Auckley, Doncaster DN9 3FL
to arrive by not later than 22nd February 2019

ABOUT BCSA

BCSA Limited is the national organisation for the steel construction industry. Its Member companies undertake the design, fabrication and erection of steelwork for all forms of construction in building and civil engineering. Industry Members are those principal companies involved in the direct supply to all or some Members of components, materials or products. Corporate Members are clients, main contractors, professional offices, educational establishments etc which support the development of national specifications, quality, fabrication and erection techniques, overall industry efficiency and good practice.

The principal objectives of the Association are to promote the use of structural steelwork; to assist specifiers and clients; to ensure that the capabilities and activities of the industry are widely understood and to provide members with professional services in technical, commercial, contractual, certification and health and safety matters.

For further information please visit www.steelconstruction.org

ABOUT TRIMBLE SOLUTIONS (UK) LTD

Trimble is transforming the way the world works by delivering products and services that connect the physical and digital worlds. Core technologies in positioning, modeling, connectivity and data analytics enable customers to improve productivity, quality, safety and sustainability. From purpose-built products to enterprise lifecycle solutions, Trimble software, hardware and services are transforming a broad range of industries such as agriculture, construction, geospatial and transportation and logistics.

Tekla software solutions for advanced BIM and structural engineering are produced by Trimble. Trimble's construction offering ranges from total stations to advanced software, giving the industry tools to transform planning, design, construction and operation of buildings. Tekla software is at the heart of the design and construction workflow, building on the free flow of information, constructible models and collaboration. Information on Tekla software can be found at www.tekla.com/uk

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