Structural Steel Design Awards 2021

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FOREWORD

"Although Trimble have been involved with the Structural Steel Design Awards for a relatively short time, we continue to be impressed with scale, scope and complexity of the projects submitted. The flexibility of steel shines through with the variety of the entrants and the use of advanced digitalisation that the structural steel industry has embraced as an enabler for the design, detail and manufacture of such impressive structures.

As we look to construction to be at the forefront of assisting in the drive to return the economy back to pre-coronavirus levels, healthy, innovative and diverse structural steel and structural engineering industries will together form a significant part of that recovery.

The entrants and winners of the SSDA in 2021 demonstrate that our industry is in a strong place and on behalf of Trimble I would like to congratulate the winning project teams."

Richard Fletcher, Regional Business Director, Trimble Buildings

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INTRODUCTION

"The SSDA judging process was this year again constrained by restrictions due to COVID-19 precautions, so we had to examine the entries online rather than 'in the flesh', and understand the shortlisted projects remotely within the constraints of 'MS Teams' meetings, with entries presented by the project teams.

This year there was a wide range of types of projects entered for the scheme. Scales of entry range from the largest prestige city office buildings to beautiful road bridges. The judges were particularly interested in projects that reflected a re-use of existing structures, and this year the commitment to examining the real impact of construction on carbon use by deep analysis by some practitioners was impressive and welcome.

The awards, commendations, merits and national finalists rewarded by the scheme reflect the achievements of the current steel construction industry. Everyone involved should be proud of what has been achieved. I believe that, notwithstanding the difficulties encountered this year, the Structural Steel Design Awards still reflect the quality of the achievement and look forward to a return to normal operations next year."

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

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 sustainability, cost-effectiveness, aesthetics and innovation"

100 Liverpool Street, London

PROJECT TEAM

Architect: **Hopkins Architects**
Structural engineer: **AKT II**
Steelwork contractor: **William Hare Ltd**
Main contractor: **Sir Robert McAlpine**
Client: **British Land**

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Two existing, steel-framed, 1980s office buildings were combined, extended and reconfigured to become a modern, flexible mixed-use commercial development. The scheme wraps over and above the massive Liverpool Street interchange station and forms a cornerstone of the new Broadgate campus within the historic City of London. Totalling 66,000m^2, the project achieves a 40% increase in leasable area while reusing 50% of the existing superstructure and 100% of the foundations: an industry-leading 'tour de force' of steel's unparalleled sustainable qualities.

The two buildings are structurally connected and integrated to serve the new spatial organisation, which totals 10 storeys. The new office spaces open onto new terraces and atria, while the station's western pedestrian artery becomes a dramatic, full-height retail mall. Many office floors are extended outwards, while the new upper levels progressively step back to preserve sunlight down to the adjacent Broadgate Circle plaza. The cores were also upgraded with new express-lifts installed.

The structural design was developed within propriety design software that allows structural performance and embodied carbon analysis directly from the shared model geometry. This has included generative parametric modelling, to rapidly iterate and verify design options for balancing the new and existing structure in terms of carbon, logistics, buildability, and flexibility.

It was imperative to retain maximum existing structure, in part to minimise the works and any potential disruption to the surrounding infrastructure. Ways to distribute the increased loads with minimal intervention were identified by assessing the buildings' designed capacity along with the consequent occupational, cladding and finishing loadings to date, and analysing the overall balancing to identify possible areas of opportunity. Through back-analysis of the existing structure, using 3D finite element modelling, several existing redundancies were affirmed.

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The original design incorporated a contingency, while its efficiencies of repetition and uniformity enhanced this further, as did the removal of the prior, outdated heavy flooring and cladding. Through this analysis, ways to distribute the overall load to these underused areas using grid manipulations and transfers were identified, and only then, once all mitigations were exhausted, were the remaining strengthening details added.

The retention of much of the existing superstructure and reuse of the existing substructure, and only reconstructing areas where this was most efficient for the new spatial programme; otherwise applying targeted, localised strengthening, with minimised demolition, saved 7,300 tonnes of CO_2.

Steel's lightweight nature allowed maximum new floor area with minimal required strengthening to the existing frame, while avoiding any strengthening to the existing foundations. The project shows the unique circular economy credentials of steel-framed construction. The steel industry's quality control processes and provenance enabled the retention of much of the existing frame, while the durability of steel has assured a design life far beyond these buildings' existing 40 years, and all elements removed could be reused or recycled.

The use of composite steel construction allowed new long-span, minimum-depth floor structures to provide high-quality office space, while redirecting the new loads into existing frame areas with inherent surplus capacity. The main floors are 130mm-thick and comprise metal decking with composite lightweight concrete slabs which are supported on new steel beams, while the additional levels comprise cellular composite beams that rest on steel columns. All elements were simply bolted together where possible. Where the existing floors are extended outwards, short steel beams moment-connect through the existing columns and into the existing beams beyond. These lateral extensions and the new upper levels embody a lightweight steel construction that helps to maximise the expanded floor area.

Steel's high strength was crucial for novel strengthening details to carry the additional loads with minimal new material nor waste, and facilitated shallow transfer beams and super-slim suspended floor structures that fit within the existing buildings' limited clearance zones.

A new reinforced-concrete core and steel-braced bays together provide the necessary lateral stability without need for further bracing within Network Rail's adjoined premises. While the two prior buildings are tied together with steel plates, they remain untied below level two, allowing the twin structures to thermally 'breathe'.

At the central core, an increased grid spacing avoided any strengthening to the existing ground level transfers, while a local increase in grid spacing above the bus station avoided any strengthening works to the existing trusses there. New transfers elsewhere create large new column-free areas, while non-composite, cellular fabricated steel transfer beams deliver the upper level set-backs; taking advantage of the upper levels' increased structural depth to reduce the tonnage.

A 'design for manufacture' review ensured the detailing was optimised to deliver an efficient structure that remained cognisant of the project's complex construction demands, while offsite fabrication and just-in-time deliveries played a crucial role in construction activities around the live transport interchange, maintaining the infrastructure's safe operation throughout. Fire engineering principles were adopted to optimise the fire protection throughout the building, which meant that many secondary beams did not require intumescent coatings.

Judges' comment

The re-working of two 1980s office buildings cleverly presents itself as a 'new' building. On an extremely constrained site, built over a main access into Liverpool Street station, the team have added floors and reworked the existing steel structure to create an elegant new City office with high sustainability credentials.

Hams Way Footbridge

PROJECT TEAM

Architect: **Moxon Architects**
Structural engineer: **COWI**
Steelwork contractor: **S H Structures Ltd**
Main contractor:
Alun Griffiths (Contractors) Ltd
Client: **Worcestershire County Council**

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Hams Way Footbridge is a new pedestrian and cycle bridge forming part of the strategically important Worcester Southern Link Road Phase 4 project. It replaces a signal-controlled pedestrian crossing across the A4440, one of Worcester's busiest roads, and improves National Cycle Network route 46 by separating cyclists and pedestrians from traffic at the busy Powick Roundabout.

The site has several important features which were addressed in the design. The area is prone to regular flooding, being located close to the confluence of the Rivers Teme and Severn, and is archaeologically sensitive as it was the location of the Battle of Worcester in 1651. The site is also bordered by a number of historically important pieces of infrastructure and the A4440 is a high load route, requiring a 6.45m clearance under the footbridge, which lengthens the 1:20 gradient approach ramps.

The focal point of the bridge is the elegant trussed-arch main span, supported on dramatic leaning concrete piers to achieve the client's aspiration for a recognisable 'gateway' structure with a lightweight 'floating' aesthetic, while being sensitive to its surroundings, given the historic nature of the area.

The client expressed a preference for an arch-type main span for consistency with other footbridges in the region. Aware that 'traditional' steel arch bridges with vertical hangers can fall foul of the Eurocode pedestrian dynamics requirements, the design team proposed a 42m-long bowstring truss. The truss diagonals provide additional stiffness and push the resonant frequencies above the limits for pedestrian excitation. The 6m-high trusses lean inward by 7.5 degrees and are unbraced to give a dramatic user experience when crossing on foot.

The main span chords and diagonal members are formed from square hollow sections (SHS) rotated through 45 degrees. These diagonal sections are designed to catch light on their upper half with shadow cast on the lower, a visual effect which makes them appear pleasingly slender.

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The deck plate is 10mm-thick and is stiffened with flat plate stiffeners welded beneath, and two edge stiffeners above, formed by folding up the edges of the deck plate. Cross-beams are rolled universal beam sections at 3m centres, designed with stiffened connections to the truss chords to provide a degree of 'U-frame' stiffness, stabilising the unbraced top chord.

At the ends of the arches the top and bottom chords meet at a tight curve, hiding the supports and giving the impression that the bridge is floating above the piers. This element of the bridge is fabricated from conically-curved steel plate, stiffened internally. Early collaboration between the design and fabrication teams was key in achieving a detail that is efficient in both structural performance and fabrication effort. The finished product is seamless, giving no hint of the complicated engineering within.

The main span is reached via multi-span approach ramps, where economy and speed of construction were the main design drivers while matching the architectural success of the main span, as well as a staircase to the north. A modular approach was adopted using standardised 12m-long steel spans on single rectangular hollow section steel piers. The ramp edge beams feature the same rotated SHS form as the main span chords, but use simplified flat plate cross-beams for economy. The ramp edge beams mirror the tightly curved arch end segments at the junction between the ramps and the main span.

The steel piers were required to be relatively flexible in the longitudinal direction to accommodate thermal expansion in flexure, but stiff enough in the transverse direction to provide stiffness and restraint to eccentric loading. Pedestrian dynamics were carefully considered and achieving sufficient stiffness to avoid lateral vibration was found to be the governing design criteria for the rectangular hollow section (RHS) steel columns.

The whole main span exceeded road transportation limits and it was delivered to site in three pieces. An assembly 'jig' was constructed close to the main span's final position and the transport segments were site-welded together to complete the superstructure. To minimise disruption, the main span was installed using a self-propelled modular transporter during a two-hour closure of the A4440 on a Saturday morning prior to the peak traffic period.

The approach ramps were fabricated and transported in two-span sections with end-plate preloaded bolted connections. Access to tighten the edge beam bolts is from a hidden access hatch on the inner-lower face of the diamond edge beam, hiding any discontinuity the panels would have on the appearance of the edge beam.

Hams Way Footbridge is an excellent example of how an ordinary road span can be upgraded to a 'statement' bridge with a few carefully considered architectural enhancements. Complex steelwork detailing was delivered in a clear and buildable way through collaboration across the design and construction teams. Digital tools were utilised to effectively communicate design intent with the construction team as well as to the client and many stakeholders of the bridge.

Judges' comment

An excellent example of how inspired architectural details can create a 'statement' bridge. Simply rotating the square cords through 45 degrees has produced a dramatic shadow line. This, coupled with clever detailing at the supports, gives a pleasing slender floating expression to the bridge. Installation of the main span in just two hours minimised disruption to the busy junction below.

Glasgow Queen Street Station

PROJECT TEAM

Architects: **BDP and IDP**
Structural engineer: **Arup**
Main contractor: **Balfour Beatty**
Client: **Network Rail**

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Glasgow Queen Street station is Scotland's third busiest railway station, providing rail connections to and from the city to the wider Glasgow area as well as throughout the country.

Popular amongst commuter and leisure travellers, the station won the 2020 World Cup of Stations and the number of people using the station is set to increase by 40 per cent to reach 28 million by 2030. To manage this growth in passenger numbers, it was necessary to extend the existing platforms to accommodate longer trains and electrification of the lines as part of the larger Edinburgh Glasgow Improvement Programme (EGIP) scheme. With room for expansion to the north restricted by the width of the tunnel throat, it was necessary to also extend the platforms into the existing station concourse to the south. In order to make space for the platform extensions, a new concourse and station entrances, Network Rail compulsorily purchased and subsequently demolished the buildings between the station and Glasgow's George Square.

The new station concourse is housed in a striking contemporary glass-fronted building which wraps around the historic 1880s train shed and forms the centrepiece of the £120M station redevelopment.

Improving passenger experience was a key focus of the design and the concourse is shaped to respond to pedestrian movement, while the dramatic roof structure above floods the station with daylight and creates a gateway to the city. The concept creates new perspectives of the Category-A listed train shed, putting the fine Victorian structure at the heart of the design.

The station remained open throughout the redevelopment with careful and complex phasing allowing construction to proceed whilst minimising disruption to passengers.

A column-free concourse is achieved through a 54m-spanning 4.5m-deep steel box truss. Secondary trusses cantilever from this structural spine towards the train shed and the station frontage, which incorporates 15m-high RHS columns which restrain the curtain walled façade. The 80-tonne box truss was pre-cambered by over 60mm to remove dead load deflections, fabricated on the ground and lifted into place overnight with two 500-tonne cranes. The roof has a triangular form, and the sloping gold coloured aluminium soffit demands that the secondary trusses taper to create a thin leading edge where they meet the south and west façades.

© Arup

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The buildings demolished to make way for the new development provided lateral restraint to the base of the fan light of the historic train shed. During demolition, this was lateral propped and is now restrained by the new roof structure. This has been achieved without intermediate columns down to the concourse, by using a sliding universal joint, which provides lateral restraint but still permits vertical and rotational movement between the new and old structures. The connection occurs at the end of a 7m-long cantilever from the spine truss across the concourse. A cranked RHS is used to form the unpropped cantilever to minimise the number of members and maximise the available views of the train shed from concourse level.

Office accommodation for train station staff occupies the upper levels of the building on the west side. This area is constructed over the top of the existing underground low-level station which was created in the 1890s with minimal headroom below the already existing 1880s train shed. The existing bridge structure could not sustain the point loads from new columns, so a 38m-span storey-high truss was constructed to supporting the new office block. The truss is supported on pile caps behind the existing retaining wall to the low-level station.

The storey-high truss was lifted in sections overnight during station close, with daytime commuters protected from the elements and overhead works by passenger tunnels.

The western side of the office block floorplate is supported on 1050mm-deep plate girders which span 22m over the low-level station, supported on new pile caps at platform level. Suspended floors to concourse and upper levels are formed from concrete slabs on metal decking acting compositely with steel beams.

For security reasons, the structure incorporates a good level of redundancy, whilst still providing minimal obstruction to the passenger concourses. Despite an irregular column grid and multiple transfers, the structural design has been able to allow for dynamic column removal with ductile connection design forming a key part of the robustness strategy. Similarly, cladding has been designed with blast resistance, whilst still maintaining a slender appearance with clean lines and careful detailing.

Energy use is kept to a minimum by leaving concourse areas unheated and maximising the use of daylight provided by the south facing curtain walling.

Fire protection is provided through intumescent paint to the primary steelwork. To minimise the use of intumescent, studies were carried out to prove that intumescent could be omitted from secondary steelwork and that one-hour protection of primary steelwork would achieve adequate performance compared to the initially specified two-hour protection.

Judges' comment

Providing a 90% increase in passenger capacity this major redevelopment above the low-level platforms was completed whilst the station remained fully functional. It has transformed a drab, unpopular station into one which restores the Victorian train shed and provides an impressive contemporary frontage onto Glasgow's principal square. An exceptional achievement.

Pooley New Bridge

PROJECT TEAM

Architect: **Knight Architects**
Structural engineer: **GHD**
Main contractor: **Eric Wright Civil Engineering**
Client: **Cumbria County Council**

© Tom McNally

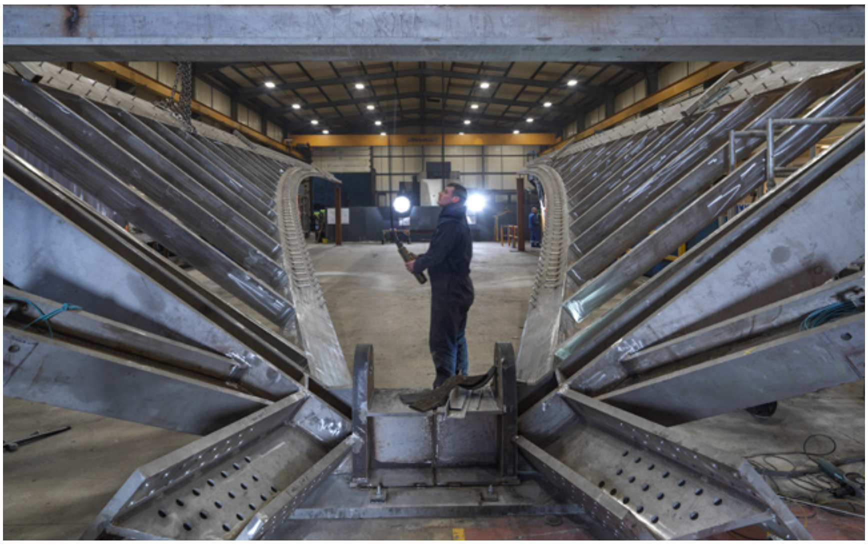
Pooley Bridge is the north-eastern gate into the Lake District National Park, a UNESCO World Heritage Site with a uniquely beautiful landscape in north-west England. The village provided a crossing over the River Eamont for more than 250 years through a Grade-II listed three-span stone arch bridge, built in 1764, which served as a critical link in the daily life of the area. The shock after its abrupt removal in the floods of December 2015 was partially relieved by the installation of a temporary bridge three months later to avoid a 16km detour, but its ongoing presence was also a daily reminder of loss and vulnerability.

The first stage in the project for a permanent replacement required the development of a concept design for the new bridge and stakeholder engagement. The objective was to conceive a flood-resilient and future-proof bridge, complying with the current technical standards and the Environment Agency (EA) regulations, that met the local community's common aspiration for a high-quality new crossing.

The new bridge is an exceptionally slender 40m-span open-spandrel arch with an innovative composite stainless steel and high strength concrete structure that emerges from local sandstone-clad reinforced concrete abutments. The single clear span minimises environmental impact and flood risk.

Being the first stainless steel road bridge in the UK, it is unique in terms of the materials used, how they are combined, and the structural layout, with 7.5m-long hidden back-spans within the abutments to transfer the horizontal component of the arch compression to the deck. This provides a traditional deck-arch appearance, but without transferring horizontal reactions to a low-capacity ground. Other innovative solutions used in the design and construction included a movement joint system that allowed movements in three different directions, very large 2.8-tonne link bearings, casting Converge sensors into the concrete for monitoring strength gain, which was a critical parameter before lifting, and laser scanning of the steelwork after site assembly to make sure it would fit perfectly.

© Eric Wright Civil Engineering and Cumbria County Council



The use of lean duplex stainless steel made it possible to deliver a bridge that: whilst looking contemporary, will age naturally as the historic bridge; has excellent durability without maintenance; and has 25% more structural capacity than conventional steel, allowing the bridge to be lighter both for construction and in terms of slenderness. The choice of material was also based on whole life cost, having been considered by the client a cost-effective solution when taking maintenance savings into account.

The slender design made possible by the high strength stainless steel minimized the amount material used and the associated embodied CO_2 content. The specific type of steel used has 20% of the embodied carbon of the global average of stainless steel, due to using 85% recycled content and low-carbon energy at production sites.

The construction of the bridge was constrained by environmental and economic aspects: it should happen out of the salmon spawning season to fulfil the EA requirements, but without interfering with the tourist season to avoid impacting local businesses. These constraints left no appropriate window for construction, prevented the building of temporary supports in the riverbed, required a temporary crossing for pedestrians and services to maintain access to the village, and encouraged maximising offsite construction. Using steel as part of the structure was fundamental to the solution.

The 110-tonne steelwork, all made up of bespoke sections, was fabricated in four quarters, taking approximately 22,000 man-hours and considerable expertise to complete. A jig was created to mount the sections, allowing work to be completed simultaneously throughout different areas of the structure. 1,920 shear studs were machined from stainless steel bars and welded to the inner surfaces of arch and deck to form the steel-concrete composite connection.

The bridge steelwork was assembled onsite, using a temporary support structure on the riverbank. Subsequently, the concrete part of the arch was cast in the temporary location, and the stainless steel part of the deck welded, before installing the resulting partial structure in place in a single lift. Tie-bars linking the arch springings were used to create a stable system in the temporary situation, and a longitudinal restraint frame within the abutments transferred loads from these bars to the back-spans when installed.

The installation of the 290-tonne main span of the bridge required a 1,350-tonne mobile crane, one of the largest in the UK. Transport of its parts through the narrow Lakeland roads and assembly in a very limited working area were additional challenges. After the lift, the back-spans were installed inside the abutments, the temporary ties linking the arch springings were removed, and the concrete part of the deck was poured to complete the permanent structural system. Finishes include sandstone pavers, granite Trief kerbs, and a stainless steel and Cumaru timber railing. Ducts were placed within the pavement section, so services along the bridge are invisible.

Judges' comment

Ingenuity, innovation and beauty combine in this remarkable replacement for the Grade-II listed stone bridge swept away by floods in 2015. The UK's first structural stainless steel road bridge, the solution utilises expertly fabricated high strength low nickel alloys to achieve a low maintenance and highly efficient structure. Striking contemporary design in the heart of the National Park.

Commendation

Structural Steel Design Awards 2021

100 Bishopsgate, London

PROJECT TEAM

Architect: **Allies and Morrison**
Structural engineer: **Robert Bird Group**
Steelwork contractor: **William Hare Ltd**
Main contractor:
Multiplex Construction Europe Ltd
Client: **Brookfield Properties**

© Charles Hosea Photography

100 Bishopsgate is a 40-storey office tower providing highly efficient and flexible floor space in the heart of the City, panoramic views across London, and a half-acre public realm to activate and enrich the environment adjacent to the double-height reception.

The brief was to create 'best in class' offices that are 'designed from the inside out', to contribute to the matrix of the city fabric and be firmly embedded within it. Responding to the geometries of the site and adjacent buildings, its form transitions from a parallelogram at its base to a rectangle crown.

The Tower features a striking 8m-high ground floor lobby and 26 passenger lifts serving the 36 column-free office floors from a central concrete core. The perimeter columns are spaced at 9m centres, and a reduced depth plated edge beam enables the ceiling margin to be recessed, offering minimal interruption to the full-height glazing that surrounds the entire floorplate.

It was clear that the tower was ideally suited to a steel frame solution. With a maximum clear floor span of 23m, coupled with the large MEP distribution requirements, bespoke fabricated plate girders were the obvious section of choice with offsite intumescent coatings providing the fire protection.

To achieve the dramatic form, a mixture of fabricated H-section and box section columns were required to kick out from vertical to rake and then to kick back to vertical at various levels. The longest of these rakes is over 23 storeys, meeting ground level at an angle of eight degrees to the vertical. This geometry raised some key design challenges. Enormous lateral forces are generated where the columns change between vertical and raking, which are transferred into the core through complex embedment plates.

Two tower columns are shorter than the rest, terminating at level 16, giving rise to uneven shortening during construction. This required an innovative de-jacking sequence to be developed, in order to shorten the columns as the frame was erected, keeping the floors even at completion and preventing distortion of the façade.

With a BREEAM 'Excellent' rating, 100 Bishopsgate is operated at the highest standards of energy efficiency, productivity and comfort for its occupiers. Environmentally conscious systems and materials have been included within the building's design to maximise sustainability and reduce the carbon footprint over the lifetime of the building. The use of long-span steel has provided column-free floorplates, future flexibility and a long building lifetime is anticipated.

Judges' comment

This city tower is a fine example of good Chicago style commercial architecture. The simplicity and refinement of design and execution conceal the considerable site and logistical complexities that this project had to overcome. With 'strong bones', this impressive building will no doubt offer high quality flexible space well into the future. A great team effort.

Commendation

Structural Steel Design Awards 2021

Brentford Community Stadium

PROJECT TEAM

Architect: **AFL Architects**
Structural engineer: **Arup**
Main contractor:
Buckingham Group Contracting Ltd
Client: **Lionel Road Developments Ltd**

© Arup

Innovative steelwork construction has been at the heart of realising Brentford Football Club's dream of a new 17,250 seat Premier League-ready home. Advanced steelwork optimisation approaches were employed in the design enabling major reductions in material use. With the structure accounting for a high proportion of the total cost compared with typical buildings (45% in the case of Brentford), these savings ultimately made the project financially viable.

The benefits of the optimised steelwork design were not only apparent in the cost-effectiveness of the scheme but also in its environmental credentials. Whole life carbon assessment of the building shows the optimised steelwork design delivered savings of 8,400 tonnes of CO_2 and represents a compelling benchmark for materially efficient stadia at 370kgCO_2e/seat.

Delivery in a rapid timeframe was also a crucial aspect of ensuring readiness for the 2020/21 season. The use of state-of-the-art design tools and just-in-time erection processes enabled delivery from concept design to completion in just over three years, despite COVID-19 restrictions.

The design responds to a site bounded closely by three railway lines which truncates two corners of the typical stadium footprint. This posed the challenge of integrating the taller south stand with the three remaining lower height stands. By sloping the gable ends of the south stand the design achieves a continuous plane, dynamically connecting the cantilevering tips of the roofs. This not only achieves the client's ambition for a continuous seating bowl, but it also symbolically frames the view of the historic Kew Bridge Standpipe tower.

The scheme was considered in the wider context of the community and for future-proofing of the club's ambitious plans. This included designing for joint tenancy with London Irish Rugby Club, developing expansion studies including an option to increase future capacity, and enhancing the vibration performance of the bowl to enable provision for future safe-standing areas.

Given the lightweight and potentially dynamic nature of the roof, wind loading was a key factor in the design. Stability restraint systems were developed to deal with load reversal and wind tunnel testing was undertaken at a relatively early stage. This brought reductions to peak pressures and enabled the steelwork member sizing to be refined, further reducing tonnage.

Brentford Community Stadium showcases the inherent benefits of steel construction for a long span structure where low cost, rapid construction and robustness were key factors in making the project viable and ensuring a high-quality project was delivered in an ambitious timeframe.

Judges' comment

This simple wrap-around stadium has a clean uncluttered appearance, with no tension bracing despite some long, cantilevered sections. Careful design and planning resulted in significant savings, in both cost and carbon, and smart erection all but eliminated the need for temporary works. Constructed on a very difficult urban site, the project represents excellent value.

Commendation

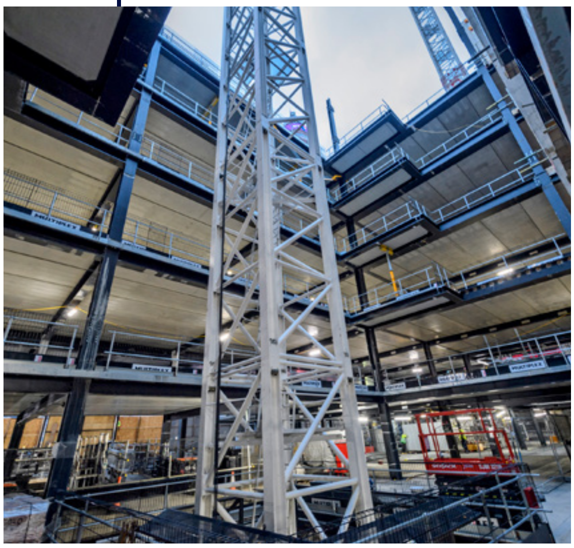
Structural Steel Design Awards 2021

80 Charlotte Street, London

PROJECT TEAM

Architect: **Make**
Structural engineer: **Arup**
Steelwork contractor: **Bourne Group Ltd**
Main contractor:
Multiplex Construction Europe Ltd
Client: **Derwent London**

© Jack Hobhouse



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Occupying a prime central London plot between the BT Tower and Tottenham Court Road, in the heart of Fitzrovia, 80 Charlotte Street offers high-quality offices, residential apartments (including affordable housing) and ground floor retail units along with a new south-facing public space, Poets Park. The 35,300m^2 scheme comprises three separate buildings: the main 80 Charlotte Street part (a 10-storey new build that infills a rectangular block), as well as the adjacent 65 and 67 Whitfield Street.

80 Charlotte Street has a simple steel frame with lateral stability provided by concrete cores. The simplicity of the steelwork and the holistic innovative 'lean' floor solution provided the client with a maximum desired floor-to-ceiling height and an extra storey of accommodation. The structural floor system comprises bespoke prestressed 100mm-thick precast planks, with fair faced soffits and a 50mm topping, supported on shelf plates welded to the webs of 450mm-deep primary steel plate girder beams. The exposed steelwork, combined with the 9m × 6m column grid pattern and simple, clean, elegant detailing of the connections, creates a contemporary and spacious office environment.

Fire protection requirements for beams which pass through compartment walls, and for beams with top flanges at floor level, were optimised using computational heat transfer modelling and finite element analysis. This enabled board fire protection to be designed out of the scheme, saving critical programme and embodied carbon. The structure has a 90-minute fire resistance period and is provided with intumescent paint, pigmented with a dark grey, highly decorated finish to add to the industrial feel of the space. Adding to the scheme's industrial look, all of the services, which are accommodated within bespoke cells cut into the plate girder beams, are also exposed within the completed building.

80 Charlotte Street challenged the design team to create a building that would accelerate progress to a low carbon future. The all-electric building uses air source heat pumps for all heating and cooling, and is powered by renewable electricity to ensure the building is net-zero carbon. Embodied carbon was also reduced during design development. With an estimated embodied carbon of 850kgCO_2e/m^2, it is 28% lower than the RICS Building Carbon Database (offices) average benchmark of 1177kgCO_2e/m^2. Further sustainability ratings include a BREEAM 'Excellent' at the design stage and the project is on target to achieve BREEAM 'Excellent' post construction, LEED Gold and Energy Performance Certificate (EPC) B ratings.

Judges' comment

The team have achieved the surprisingly difficult task of making a complex building look simple. The attention to detail, especially in the steel connections, achieves the industrial feel that the team aimed for. Optimising beam spans reduces embodied carbon and an all-electric power system that uses renewable electricity ensures the building is net-zero carbon.

Commendation

Structural Steel Design Awards 2021

Murdoch's Connection

PROJECT TEAM

Architect: **Matter Architects**
Structural engineer: **Arup**
Steelwork contractor: **S H Structures Ltd**
Main contractor: **Tilbury Douglas Construction**
Client: **Highways England**

Murdoch's Connection, named after Dr Mary Murdoch (Hull's first female GP) is perhaps the most important connection in Hull City Council's masterplan for joining the north of the city centre to the vibrant southern waterfront, improving connectivity and providing an expanse of attractive public realm. In combination with the wider improvements to the A63, this transformational project relieves traffic congestion through the city centre and consequently improves air quality in the area. Key receptors are located close to the bridge site, so the impact is tangible particularly from the reduction of nitrous dioxide.

Customer experience was the main priority for project. The design of the landing spaces, widths of routes and location of access points were designed based on user desire lines and in consultation with the Hull Accessibility Improvements Group, who guided the project team around the site to highlight the challenges faced by their members daily. Construction methods were chosen to minimize the impact on the public. For instance, the bridge structure was driven into place on specialist transporters rather than craned in to avoid road closures affecting the travelling public. This move was completed 16 hours ahead of schedule without any complaints from the public.

The bridge and approaches have been designed to fulfil dual functions of providing a crossing point but also as places to connect with the historic parts of the city. The bridge deck is over-widened and viewing platforms are provided at both ends of the deck overlooking the docks. The landscaped approaches incorporate seating and spaces for reflection and recreation.

The bridge span of 40m (54m-long including cantilever ends) has been influenced by its location. Its organic curves are evocative of the endangered lamprey in the Humber Estuary, as well as the prows of the ships docked nearby. The steel structure has a hybrid double-curved shell form with a conventional tied arch formed of steel circular hollow sections and an integrated structural canopy acting compositely with the perimeter tubes. Below deck, the perimeter tubes transition through 'arch-feet' units which gather the arch forces and transfer them through to the substructure on piled foundations

Digital rehearsals in the design office, early engagement of the construction team and the use of templating of 'as-built' positions ensured a seamless sequence of works. Where necessary, physical scale models were also built to prove accessibility for maintenance, such as of the integrated drainage hoppers over the archway opening of the structure.

Judges' comment

This new bridge provides a welcome crossing over a busy inner-city road. The unusual, sculpted form uses pressed steel plates that connect the tubular structure together resulting in a complex geometric 'roof' to the bridge. This is not just a bridge but an integral part of a new urban public space.

Commendation

Structural Steel Design Awards 2021

60 London Wall

PROJECT TEAM

Architect: **EPR Architects**
Structural engineer: **Heyne Tillett Steel**
Steelwork contractor: **Severfield**
Main contractor: **Skanska**
Client: **La Salle Investment Management**

© Max Brook

© Gareth Gardner 2019

Located in the City of London, 60 London Wall is a complex redevelopment of an existing post-modern office block. Previously a tired and outdated steel-framed building, the seven-storey structure has been partially retained, strengthened and redeveloped. The structure has been re-cored and re-centred, creating adaptable upper floorplates with a new communal atrium running through the heart of the building. The use of new steelwork to refurbish and extend the existing building has provided a cost-effective structural solution for the client, delivering a modern, high-quality office with prime retail accommodation at ground level.

To gain a comprehensive understanding of the existing structure and pre-existing steel framing, the project team undertook rigorous archive research using drawings, maps and photos. The initial works involved a detailed programme of demolition and enabling works. The building's fabric was removed and stripped back to the original steel frame. The top floor was then removed and replaced with a five-storey steel-framed extension, increasing the structure to 11-storeys and the overall floor area by 50%.

Internally, much of the new and existing steelwork has been left exposed, giving the lettable floor area a modern, industrial aesthetic. The character of the building has been carefully reconsidered. At the heart of the building, a dramatic glazed atrium has been installed, opening up sightlines and increasing natural light levels while the two remaining pre-existing atria have been infilled, increasing the floor area.

The new curvilinear glazed façades are elegantly finished with a contemporary palette responding to the rich, historical context of the City of London. Increased glazing greatly improves natural light onto the floorplates whilst vertical stone brise soleil creates a solidity when viewed along London Wall, reducing solar gain. Forming a series of new greened terraces, the floorplates step back from the façade line above the fifth floor. These planted terraces provide sky gardens for the wellbeing and enjoyment of the office occupants in addition to establishing a diverse and enhanced ecology.

In terms of environmental performance, the building's embodied carbon was accurately measured and lowered on each phase of the works. This encompassed the existing structure, connection design, demolition, temporary and proposed works. Through a holistic approach to the reuse of the existing structure, 8,600 tonnes of CO_2 have been saved, and the embodied carbon of the structural elements has been measured at 193kgCO_2e/m^2, which is comparable with both the LETI 2030 and RIBA 2030 targets.

Judges' comment

Through careful analysis of the existing structure, this redevelopment has provided a 50% increase in floor area, including the addition of five new floors. The existing areas have been significantly improved with the steel structure exposed and a new atrium added, resulting in major savings in carbon. An excellent achievement.

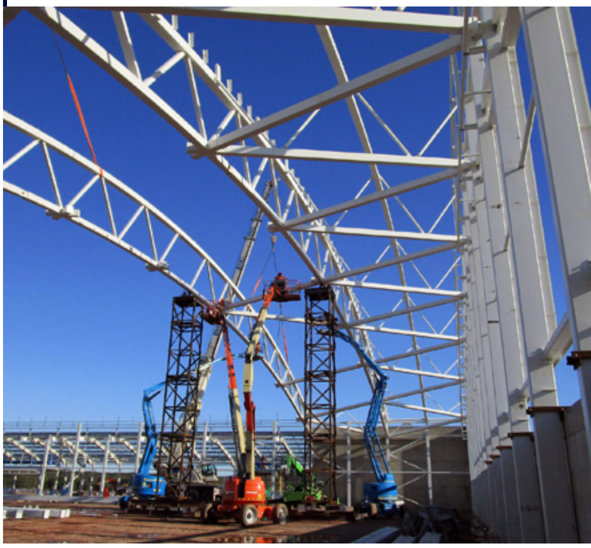
Commendation

Structural Steel Design Awards 2021

Leicester City FC Training Ground

PROJECT TEAM

Architect: **KSS Group Ltd**
Structural engineer: **TRP Consulting**
Steelwork contractor: **BHC Ltd**
Main contractor: **McLaren**
Client: **Leicester City Football Club**



Leicester City Football Club is home to one of the most advanced training centres within Europe. The King Power Centre is the site's most prominent structure. The spectacular dome, built into the landscape, houses an air-conditioned, artificial pitch and a media centre including a press conference room, broadcast facilities and hospitality space. The steel-framed building is set within a gently sloping earth embankment that blends seamlessly into the surrounding landscape. Structural steelwork played a leading role in the project, not just in the construction programme, but also in its design aspect.

The large domed structure that houses the indoor pitch offers clear spans of 74m x 122m. This was achieved by using a series of 13 arched steel trusses, set at approximately 9.3m centres, supporting a box section steel diagrid and a series of intermediate arched rafters set at 4.65m centres. The arches are approximately 3.6m-deep at mid-span, reducing to 1.9m at the eaves. The arches are restrained laterally by a steel diagrid on the bottom boom constructed of 300mm x 300mm box sections. The intermediate arched rafters are supported off the diagrid and propped up on circular hollow section struts.

Each truss was fabricated in four parts, which were transported to the site and bolted together in two halves. The two halves were erected into place using a tandem lift with two 80-tonne mobile cranes, bolted together and connected to their supporting perimeter columns. The splice connections take the form of concealed bolted connections with cover plates.

The site also features a three-storey 'S' shaped Training Centre to accommodate the first team and academy squads. The main structure is a steel frame supporting 130mm-thick composite slabs cast on profiled steel decking. The structural grid across the width of the building provides an offset column aligned with the corridor wall giving a grid spacing of 10.15m and 7.8m across the width. The grid spacing along the length of the building varies according to the curve, ranging from 7.3m to 8.4m.

Other steel-framed buildings onsite include the two-storey sports turf academy and a 499-seat grandstand for the junior pitch. Designed with steel columns and beams, supporting precast terrace units, the stand will allow under 23 and under 18 teams to play in front of a crowd and experience a match environment. A steel-framed machine store was also erected to house maintenance vehicles and a boiler house that will power the centre's undersoil heating.

Judges' comment

This new indoor training pitch covered with 13 primary arched steel trusses, braced by a striking steel diagrid, showed how using all the structural elements to prop the secondary arches avoided the need for these to also be trusses. The design was changed to a full steel frame saving valuable programme time and resulting in an efficient and economic solution.

Commendation

Structural Steel Design Awards 2021

The Catalyst, Newcastle upon Tyne

PROJECT TEAM

Architect: **GSSArchitecture**
Structural engineer: **s h e d**
Main contractor: **Bowmer and Kirkland Ltd**
Client: **Newcastle University**

© Andrew Heptinstall Photography Ltd

© Bowmer and Kirkland 2018

The Catalyst is the new home of the National Innovation Centre for Ageing and National Innovation Centre for Data. By combining the two into one home, the building provides an inspiring and collaborative set of spaces for both users and visitors. The building required a much smaller area on the lower floors, that are combined visitor and user spaces, than the upper floors, hence the striking form of the building. By simply sloping the façade, the architects were able to create a building that has minimal façade area, but also a unique finish. The triangular site shape was softened by simply curving the three corners. The architecture also created very large column-free zones which, alongside flexible M&E systems and high load capacity in the structural frame, provides flexibility for future changes from day one.

The structural frame is highlighted by the expressed sloping diagrid façades and the triple-storey diagrid trusses that span the open landscaping area at the front of the building. The frame's honest expression of form facilitated the creation of a complex, yet simple and elegant structure. Utilising a different framing material would not have been possible without increasing the programme, cost, and environmental impact.

The coordination of façade diagrid setting out and floor slab design allowed beams to intersect on all node points, creating efficient structural arrangements and very effective vibration limitation. This also simplified the construction sequence and meant that the frame could be stable during erection by building out from the three steel-framed vertical cores to the diagrid façade. These factors in combination reduced steel member numbers, provided repetitive, simple and elegant detailing for the façade connections and also created the shallowest floor structure and building mass possible.

The building achieved a BREEAM 'Outstanding' certification and is very well received by users and visitors alike. It was £4M under budget as a result of many efficiencies during construction. In use, this efficiency continues with the building being connected to the local Helix Energy Centre, which minimises running costs. Additionally, even the sloping façade only needs to be cleaned once every 11-12 months because of its form.

The embodied carbon of the frame (including all concrete throughout) was only 224kgCO_2e/m^2, which compares very well to comparator projects that are all over 300kgCO_2e/m^2. Using a concrete core solution for this building would have raised the figure to over 280kgCO_2e/m^2 and a concrete frame would have been over 400kgCO_2e/m^2.

Judges' comment

This new steel-framed building for Newcastle University combines two centres on a triangular site. A steel truss in the façade over the entrance provides the required long clear span and the diagonal members are a feature that is highlighted to make a striking façade. The sloping out and curved corners added complexity to the fabrication, needing subtle faceted members.

Merit

Structural Steel Design Awards 2021

Heron Quay Pavilion

PROJECT TEAM

Architect: **Adamson Associates**
Structural engineer: **Arup**
Steelwork contractor:
Elland Steel Structures Ltd
Main contractor: **Canary Wharf Contractors**
Client: **Canary Wharf Group**

© Peter Matthews

Situated in the heart of London's Canary Wharf, Heron Quay Pavilion stands out for its striking design, mirroring its location over the water in Middle Dock. The unique building façade is designed to reflect the ripples of the water below and comprises curved solid and perforated aluminum panels with a metallic finish and double-curved mirror glass. Other notable features include the main colonnade entrance, accessible by footbridges granting views over the docks.

The five-storey building is a mixed-use building housing restaurants, guest rooms and leisure spaces including a gym and spa. Its 6,000m^2 internal floor area includes open terraces at every level and a roof terrace from which visitors enjoy views across the Wharf. Despite standing small beneath surrounding high-rise blocks, the building offers a spectacular aesthetic, appearing to float on the dock. Having replaced an underwhelming three-storey, 1980s office building, the new structure is already an iconic landmark in the area, recognised for its artistic statement.

The building's challenging waterside location not only stood on pre-existing marine piles, but also lacked 360-degree land access. While working with the piles placed significant constraints on the construction, retaining and reinforcing the foundations minimised the carbon footprint of the project from the very start. This was the first of a number of techniques employed for resource and energy efficiency, ultimately earning a BREEAM 'Excellent' rating

Steel was the obvious choice to deliver the ambitious design, achieve additional height on pre-existing foundations, work to limitations of the location and create the desired flexible, open-plan interior.

The steel frame with composite lightweight concrete slabs is supported on transfer beams placed above the piles, allowing columns to sit at the centre of the spans and spread the load more evenly between the foundations. Steel bracing is kept to the external walls, providing future flexibility across the whole floorplate, and the shallow floor construction is flexible enough to enable extra voids in the floorplate if required. Service integration was facilitated with generous openings created within steel beams throughout the building. For efficiency, all structural beam depths were made the same, to align service openings and simplify fit-out.

A variety of corrosion protection techniques were adopted across the structure. At deck level, immediately above the dock, the exposed steel transfer deck is entirely weathering steel, while exposed steelwork at roof level is galvanized. Much of the interior steelwork did not require additional protection, which minimised cost.

Judges' comment

Clever analysis and reuse of the marine piles and grillages retained from an earlier Dockland development allows this substantial club building to sit above the water of Middle Dock without affecting the Grade-I listed dock wall structure beneath, and yet enables the desired high tolerance, glossy cladding to be achieved.

Merit

Structural Steel Design Awards 2021

PROJECT TEAM

Architect: **DSDHA**
Structural engineer: **Heyne Tillett Steel**
Steelwork contractor: **Hillcrest Structural Ltd**
Main contractor: **Ellmer Construction**
Client: **Great Portland Estates plc**

The Hickman

© Zishan Khan

© Zishan Khan

The Hickman is a complex refurbishment of a commercial building within the Whitechapel High Street Conservation Area, a neighbourhood with a rich industrial past. The existing site comprised six buildings patched together and reconstructed over time, each with varying structures, the earliest of which dates back to the 1800s. No record of the original structural information was available for the existing building. Such details had to be pieced together by studying historical maps, photographs and carrying out extensive onsite surveys alongside intrusive investigations.

The approach from the outset was to unify and extend the poorly connected building retaining as much of the existing structure as possible. This was beneficial from a sustainability standpoint, in terms of reducing waste and minimising carbon, but also afforded the opportunity to repurpose the original building to provide a high-quality contemporary workplace, making creative use of the building's character.

The main existing structure comprised a steel frame encased in concrete, supporting early reinforced concrete (RC) slabs. The older structures included load-bearing masonry, filler-joist slabs and wrought iron beams.

As part of the new scheme, the building now rises to level seven having added three further storeys. The original lift and stair cores have been removed, tidying up the floorplate which now surrounds a new central RC core on a new foundation. Overall, the floor area has been increased by 50%.

The new floors comprise a grid of 450mm-deep fabricated steel primary beams with rectangular openings and a re-entrant composite deck that spans 3m between 203UC secondary beams. This allows for flexible services distribution and provides a pleasing exposed soffit. Above the original building line, the new extension steps in to create a series of external terraces. Internally, to express the industrial past of the building, the structure is left exposed. On the original floors, the concrete encasement to the columns has also been stripped back exposing the riveted plates.

Around 50% of the existing structure has been retained, resulting in a significant saving of 2,983 tonnes of CO_2. The structural embodied carbon of 289kgCO_2e/m^2 is comparable with the LETI 2030 carbon target. The project has achieved a BREEAM 'Excellent' rating and EPC rating 'A'.

The Hickman epitomises the principles of a retrofit development. A collection of structures, with no archive or record information available, have been modified, extended and improved to create a development that is more than the sum of its parts.

Judges' comment

With an almost total absence of base building information, through an exemplary level of investigation, an intensely forensic analysis of Fire Insurance Documents and a highly responsive approach to 'as found' construction which included innovative digital modelling of the completed work, this project showcases the potential of structural steel in repurposing and adding value to even the most challenging projects.

Merit

Structural Steel Design Awards 2021

Brundholme and Low Pearson Bridges

PROJECT TEAM

Architect: **Capita**
Structural engineer: **Beaver Bridges Ltd**
Steelwork contractor:
Jamestown Manufacturing Ltd
Main contractor: **Cubby Construction Ltd**
Client: **Lake District National Park Authority**

These steel truss bridges over the Greta River in the Lake District at two sites, Brundholme and Low Pearson, form part of the reconstruction of the Railway Trail connecting Keswick to Threlkeld following the winter flooding of 2015.

Access to the bridge sites for construction plant and a mobile crane was problematic. The bridges were to be built 'in-line', the Brundholme site had to be crossed in order to access the Low Pearson site, and it was uneconomic to design the permanent structure at Brundholme to support the construction traffic loading. In addition, any works in the river carried a number of risks to the environment, programme, safety and cost as the area was subject to flooding.

The solution was based on using a modular temporary steel bridge, adapted to fit on the permanent foundations at the Brundholme site, but designed to accommodate 44-tonne construction traffic. This temporary bridge, which was launched into position, gave the construction team access to the Low Pearson site and facilitated construction of the paths and roadway to the second site, as well as the bridge itself.

The Low Pearson bridge was fabricated in three sections, delivered to a compound adjacent to the Brundholme temporary bridge, loaded on temporary vehicle bogies and moved to site by tractor. Once onsite, the sections were bolted together, fitted with a unique temporary launch nose adapter, temporary launch frame and lower boom launch runway beams, which enabled the bridge to be launched into final position without damaging the permanent works. Once the bridge was in its final position, the launch rollers, launch nose adapter, launch frame and lower boom runway beams were all removed.

The same innovative system was used for the Brundholme Bridge, with the permanent structure being assembled on the far bank of the temporary bridge. Again, this structure was fitted with the same temporary lower boom runway beams and frame as at Low Pearson, but was spliced to the end of the Brundholme temporary bridge. This enabled the same launching operation to both launch the new permanent bridge, and de-launch the temporary access bridge, improving programme and eliminating further risk. Once the permanent bridge was in its final position, the temporary launch frame and lower boom runway beams were removed and recovered for recycling. The steel temporary bridge, launch nose and rollers were all returned to the supplier to be reused on other projects.

Judges' comment

These new bridges replace ones that were washed away during storm Desmond in 2015. The team cleverly adapted existing erection techniques to address the inaccessibility of the two sites, reducing the installation cost and minimising any detrimental impact on the surrounding area which is inside the Lake District National Park.

Structural Steel Design Awards 2021

Wenlock Works

PROJECT TEAM

Architect: **Buckley Gray Yeoman**
Structural engineer: **Heyne Tillett Steel**
Steelwork contractor: **Billington Structures Ltd**
Main contractor: **Sir Robert McAlpine**
Client: **Stanhope PLC**

© Beth Davis

Wenlock Works, an existing 1980s post-modern office building has been transformed into a modern and contemporary workplace in the heart of Shoreditch. The retained concrete building was previously split into two halves, to accommodate both offices and a printing press. To unify the two elements, a dividing wall has been removed, while a new two-storey steel-framed structure has been added at roof level. Along with a new rear extension, this has increased the floor area by almost 40%.

To suit the new layout, the building's existing cores were remodelled and repositioned, providing a single primary core for the unified building and creating open-plan spaces suited to a range of new tenants. The existing mansard roof provided poor office space, with limited natural daylight due to small windows, so this was removed to facilitate the new two-storey vertical extension, which has created fully functioning, modern upper floor space. The impact on the streetscape has been reduced by setting the floors back from Shepherdess Walk and the northern and western elevations.

The new lightweight steel frame minimised the strengthening works required on the original structure and existing foundations to carry the loads from the additional storeys.

The design celebrates the building's industrial heritage through exposing the existing reinforced concrete (RC) slabs and columns on the lower floors, along with the steelwork in the new areas. Occupiers can see first-hand how the historic building structure has been opened out using steel. The framing has an honesty to it; columns and beams are placed where needed to suit the history of the building, resulting in a more sustainable offering than could have been achieved through demolition. Sustainability was a key aspect of the building's redevelopment. Reusing the existing RC frame has saved approximately 2,450 tonnes of CO_2.

To create a cohesive relationship between the building's internal spaces and its surrounding context, the façade has been extensively redesigned. Works to the façade include large openings on the lower levels, with the openings filled with a factory-style aluminium window system with integral spacers and applied astragal bars. This has created a vibrant street scene, referencing the area's industrial heritage and increased the building's presence locally. The existing brick on the middle storeys has been retained and painted white to give greater vertical emphasis across the building. The new top levels use a grey, lightweight Zinc Rainscreen Cladding to mimic the brick bonding and mediate increased massing.

Judges' comment

A good example of sustainable construction. By using steel to open up an existing building, extend it upwards and outwards with a lightweight frame, this 1980s concrete office building has been repurposed with a 40% increase in floor area and greater flexibility. Reusing the existing frame and foundations saved 2,450 tonnes of embodied carbon compared with building new.

National Finalist

Structural Steel Design Awards 2021

Majestic, Leeds

PROJECT TEAM

Architect: **DLA Architecture**
Structural engineer: **Buro Happold**
Main contractor: **Sir Robert McAlpine**
Client: **City Square Developments Ltd**

© Duncan Lomax

The Majestic refurbishment project stands as testament to what can be achieved with steelwork in construction to return an historic building to its former glory.

The structural arrangement comprises cellular beams spanning the whole width between a central core and steel columns around the building's perimeter, creating column-free floorplates which minimise structural intrusion into lettable floor areas. To the rear of the building, Palm Court is a full-height circular lightwell with curved, cantilevering staircases and glazed bridges, which mirror the circulation core within the original building. At the front of the building a triple-height atrium is framed by steel columns and structural glazing.

Judges' comment

The refurbishment of the Majestic, Leeds, following a catastrophic fire, secures a sustainable future for the historic 1920s cinema building as high specification commercial space. The construction of a new seven-storey steel-framed building within the retained shell of the Grade-II* listed terracotta façade offers a stylistic nod to the decorative character of the original.

National Finalist

Structural Steel Design Awards 2021

Manchester Airport Terminal 2 Transformation

PROJECT TEAM

Architect: **Pascall + Watson**
Structural engineer: **Buro Happold**
Steelwork contractor: **William Hare Ltd**
Main contractor: **Laing O'Rourke**
Client: **Manchester Airports Group**

The scope for the major Terminal 2 upgrade included new baggage handling facilities, alterations and extension of the existing terminal, new piers and multi-storey car parks.

As a showpiece of the entire transformation development, the new 85,000m^2 Terminal 2 extension boasts a series of generous double-height spaces and floor-to-ceiling glazed facades, ensuring a bright, airy interior awash with natural light. A careful selection of materials and attention to detail helped to create a modern, calm environment for the traveller.

The use of steelwork was key to delivering high quality, cost-effective solutions to a demanding programme, within the project constraints.

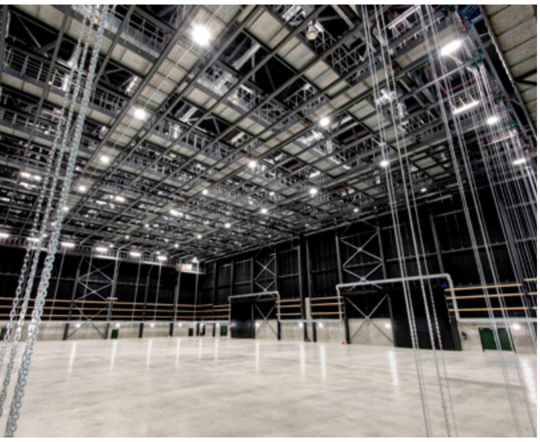
Judges' comment

This huge project comprises the extension of the Terminal 2 building, a new pier and a number of link bridges, requiring over 15,000 tonnes of structural steelwork. Generous double-height spaces with floor-to-ceiling glazing create a bright and calming interior. Meticulous engineering minimised piece-count, reduced the number of movement joints, and facilitated seamless integration with the existing terminal building.

National Finalist

Structural Steel Design Awards 2021

Pinewood Studios Phase II


© Billington Structures Ltd

Pinewood's £200M three phase expansion project is set to make it the biggest studio in the UK with 12 new stages in total. The studio expansion will take it from 112,000m^2 to 208,000m^2, broadly doubling the size of the facility. The second phase of the expansion included the construction of three sound stages with high-level walkways and runway beams, a sound effects workshop, workshops, offices and ancillary facilities, including a new backlot for the construction of external film sets.

A modular approach of using large steel components manufactured offsite provided many benefits and minimised disruption to neighbours due to reduced onsite working.

PROJECT TEAM

Architect: **McAlpine Design Group**
Structural engineer: **McAlpine Design Group**
Steelwork contractor: **Billington Structures Ltd**
Main contractor: **Sir Robert McAlpine**
Client: **Pinewood Group**

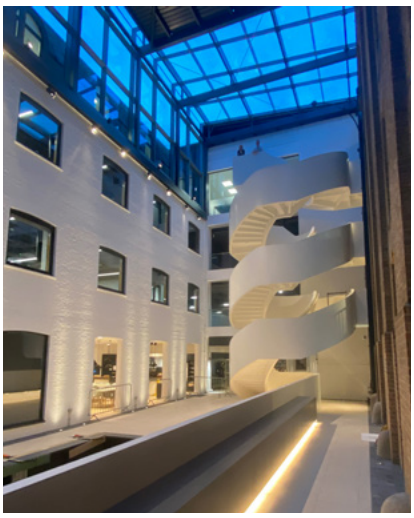
Judges' comment

The new sound stage buildings provide a welcome addition to the studio complex at Pinewood and are a product of the current demand in the UK film industry. The buildings have been well engineered and extensive input from the steelwork contractor on multiple offsite and onsite manufacturing issues has been instrumental in the success of the project.

National Finalist

Structural Steel Design Awards 2021

Royal College of Obstetricians and Gynaecologists, Union Street


© Bennetts Associates

RCOG had acquired a site on Union Street in London with two existing but unconnected buildings with different floor levels. The key to unlocking the potential of the two buildings was to address this lack of connectivity.

The solution to enclose the courtyard to form an atrium and house a new stair, designed to provide access to every floor in both buildings, avoided loss of useable space within the existing buildings and generated new space in the atrium for a café and events space, exceeding the client's expectations. This adaption rather than reconstruction saved circa £6.5M and considerable embodied carbon.

PROJECT TEAM

Architect: **Bennetts Associates**
Structural engineer:
Integral Engineering Design
Main contractor: **8build Ltd**
Client: **The Royal College of Obstetricians and Gynaecologists**

Judges' comment

The project conjoins two existing buildings with different floor levels to provide flexible office space and a suite of conferencing facilities for the college. Rather than demolish and rebuild, structural steel was used to insert an elegant sculptural stair and atrium to link the two retained buildings together and transform their use.

National Finalist

Structural Steel Design Awards 2021

The University of Winchester, West Downs Campus

PROJECT TEAM

Architect : **Design Engine Architects**
Structural engineer: **Heyne Tillett Steel**
Steelwork contractor: **Hillcrest Structural Ltd**
Main contractor: **Osborne**
Client: **The University of Winchester**

© Peter Landgdown

The new West Downs Education Campus has delivered state-of-the-art teaching and learning facilities for the University of Winchester. The campus comprises three interconnecting buildings including a 250-seat auditorium, library and Digital Technology Department as well as a series of teaching rooms, social spaces, a café and a public art gallery.

Flexibility and adaptation are at the heart of the design. The use of slender beams, and long-span steel structures throughout both the auditorium and library spaces were critical in creating the open-plan learning facilities, which can easily be adapted in the future to suit a range of uses throughout the building's lifetime.

Judges' comment

The new campus provides an elegant collection of buildings arranged to create an entrance piazza, which allows a pedestrian route and creates a central garden. Each building uses steel to create a variety of column-free spaces giving flexibility to the building's users. The intricate fretwork of the sunshades announces the important role structural steel has played in this project.

2022 Entry Criteria

The Structural Steel Design Awards Scheme

The British Constructional Steelwork Association Ltd and Trimble Solutions (UK) Ltd have pleasure in inviting entries for the 2022 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 sustainability, 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 2020-2021; 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.

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.

Closing date for entries - Friday 25th February 2022

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
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2022 Entry Criteria

Structural Steel Design Awards

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 2022, I declare that this steel-based structure has been fabricated by a UK or Irish steelwork contractor. It was completed during the calendar years 2020-2021. 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 should include:

- Completed entry form (PDF file)
- Description of the outstanding features of the structure (c 1,000 words), addressing the key criteria – see note 2 (MSWord file)
- Architectural site plan (PDF file)
- Six drawings (e.g. plans, sections, elevations, isometrics) illustrating the essential features of significance in relation to the use of steel (PDF files)
- Eight different high resolution colour photographs which should include both construction phase and finished images (JPEG files at 300dpi A5 size minimum)

Architect

Company Name: . . . .

Address: . . . .

. . . .

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

Email: . . . .

Structural Engineer responsible for design

Company Name: . . . .

Address: . . . .

. . . .

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

Email: . . . .

Steelwork Contractor (see note 7)

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 sent via a file transfer service to chris.dolling@steelconstruction.org no later than 25th February 2022