Structural Steel Design Awards 2020

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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 2020 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 constrained by the national lockdown, as our usual visits to see, understand and experience shortlisted projects 'in the flesh', and to meet the project teams in person were not possible. So, for the first time in the 52 years of the award scheme, we relied on technology to examine the entries online, and understand the shortlisted projects with entries presented by the project teams remotely.

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 smaller educational projects, and beautiful footbridges.

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
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Julia Ratcliffe MEng CEng FIStructE PE
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 efficiency, cost-effectiveness, sustainability, aesthetics and innovation"

Tintagel Footbridge, Cornwall

PROJECT TEAM

Architect: **William Matthews Associates**
Structural Engineer: **Ney & Partners**
Steelwork Contractor:
Underhill Engineering Limited
Main Contractor: **American Bridge UK**
Client: **English Heritage**

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Tintagel Castle is one of the UK's most important historic sites - a Scheduled Ancient Monument, Site of Special Scientific Interest, Area of Outstanding Natural Beauty and a Special Area of Conservation. Managed by English Heritage on behalf of the Duchy of Cornwall it draws over 200,000 visitors a year and up to 3,000 a day in the peak summer season.

The Cornish name Din Tagell means literally the Fortress of the Narrow Entrance. An important trading port in the fifth to seventh centuries, it achieved international fame in the 12th Century when Geoffrey of Monmouth's History of the Kings of Britain described it as the place of the legendary King Arthur's conception. In 1230 this inspired Richard, Earl of Cornwall, to build a castle on the natural land bridge linking the headland (also known as the island) with the mainland. The land bridge has since eroded significantly and destroyed large parts of the castle which is now split into two and separated by a void 65m wide. For centuries visitors crossed a wooden bridge at the foot of the void and climbed a series of vertiginous steps onto the island. This restricted access for many people and caused significant congestion in the summer months, ruining the experience for many visitors.

In 2015 English Heritage held a design competition for a new bridge reconnecting the two halves of the castle allowing visitors to experience the historic approach and entrance to the castle's inner ward. From 135 entries six teams were shortlisted, and the winner was announced in early 2016.

The design is relatively simple - two 33m-long cantilevers which reach out from each abutment and don't quite meet in the middle. The central gap serves two functions; technically it allows each bridge half to expand and contract with variations in temperature; and poetically it creates a threshold between the mainland and the island. A series of 16m-long rock anchors tie the bridge halves into each cliff face.

The palette of materials is equally simple - painted mild steel for the main chords; duplex stainless steel for the cross bracing, deck trays and balustrading; Delabole slate laid on edge for the deck finish; and untreated English oak for the handrail. Each material was selected for its durability in an extremely harsh marine environment, and the manner in which it would weather with as little maintenance as possible. Architecturally, the aim was to create a bridge which was resolutely contemporary in its design and fabrication, but also timeless and complementary to its setting.

The steel element was chosen as a lightweight solution, and one that can be fabricated offsite into deliverable pieces. Getting the steel elements to site was just one of the challenges that needed to be overcome, as the gatehouse can only be accessed by one narrow lane. A multi-axle vehicle was used to deliver the steelwork and navigate the winding road.

Lifting the steel into place was another significant challenge, with no room or access for a crane in the gorge, which is more than 60m-deep. A cable crane was installed, more commonly used in mountainous regions such as the Alps, to supply materials and even personnel to otherwise inaccessible locations. The cable crane had a 5-tonne lifting capacity, could pick-up steel elements from a small holding area on the headland and subsequently fed the construction of the bridge's two cantilevers. None of the bridge's steel elements exceeded the cable crane's capacity, while the largest two pieces, each 10m-long × 4.5m-deep and installed at either end of the cantilevers where the structure meets the abutments, were within a size that was transportable on the access route.

All of the steel elements were fabricated into fully-assembled and erectable pieces, that included top and bottom chords, bracings and cross members. A total of six pieces were needed for each of the cantilevers. As the bridge is in a very aggressive environment with plenty of wind-borne sea salt around, mild steel was chosen for the parts which can be easily repainted and stainless steel, which is more resistant to corrosion, for the areas where painting would be more difficult.

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The connection points between each individual steel assemblage (two on each piece) are also fabricated from stainless steel and were welded to the main chord members during the fabrication stage. The connections consist of finger joints that interlock with opposite members on the adjoining section, similar to a woodwork dovetail joint. Once the individual sections were lifted and manoeuvred into place during the erection programme, the connections were then bolted up. The fabrication process required some precise engineering and each section was trial erected with its neighbouring piece to ensure the two cantilevers could be seamlessly erected on-site.

Construction started in September 2018 and was completed in August 2019.

Judges' comment

A highly crafted and timeless structure: daring in its concept yet modest and sympathetic to its historic and natural context. Every steel component has been carefully detailed for constructability and durability, elevating the graceful aesthetic. The project is a triumph: a credit to English Heritage's vision and the entire team which employed mostly local fabricators, supported by alpine construction specialists.

52 Lime Street, London

PROJECT TEAM
Architect: **Kohn Pedersen Fox**
Structural Engineer: **Arup**
Steelwork Contractor: **William Hare**
Main Contractor : **Skanska**
Client: **WRBC Development UK Limited**

Located in the heart of the City of London, 52 Lime Street is also known as The Scalpel, a moniker awarded due to the building's striking, iconic and sharp design.

The client developed 52 Lime Street as a location for their UK Headquarters, as well as providing lettable commercial office space for additional tenants. Their main objectives were to maximise the rental space on this key site; to create large uninterrupted floor spaces providing an efficient and collaborative working environment; and to deliver exemplary sustainability performance and building performance metrics that exceed British Council for Offices (BCO) standards.

The Scalpel is sleek and geometrical with a series of interesting reflective planes giving it a distinct identity which sets it apart from its neighbours. It features an inclined northern façade, which has a diagonal fold line running from top to bottom. This façade is formed by a series of cranked plate girder columns, spaced at 6m centres. For the double-height ground floor these columns are vertical, but from the first floor they are cranked and slope inwards all the way to the building's pointed top.

At 42 storeys, including 36,966m^2 of internal office space over 35 floors, 52 Lime Street is a tall, yet sympathetic addition to the City cluster, designed with particular regard to distant and local views.

The structural frame consists of a composite design with steelwork supporting metal decking and a concrete slab. All of the floor beams are 670mm-deep fabricated cellular plate girders to allow service integration within the structural floor zone.

Unlike many commercial buildings, the Scalpel's main core is offset and positioned along the south elevation which provides shade from solar gain. In this way, the structure's available floor space has been maximised and internal spans of up to 20m have been achieved. Having an offset core coupled with an inclined north elevation means that the loads on the building are eccentric from the main stability-giving core. To counteract this, the north elevation, as well as the east and west façades, were designed as large perimeter moment frames to add stiffness to the building. The frames also allowed erection to continue with minimal temporary works, reducing cost during construction.

As always, cost was a key driver of the project and the use of a BIM model on this scheme helped to ensure the steel frame is as efficient as possible. Considerable weight savings were made by using beams with varying flanges and webs depending on the relevant loadings, which was determined automatically using the BIM model.

Another key driver on 52 Lime Street was a complex construction sequence, which involved optimised connection and main member designs, the installation of damper systems and a trial erection of an iconic 10-storey triangular attic at the peak of the building, which houses the plant and maintenance walkways. To ensure the smooth erection of the attic structure on-site, this portion of the building was trial erected in the fabrication yard where the complex fabrication and tight tolerances were tested and proven.

Following the trial assembly, the structure was dismantled and transported to London in the largest possible pieces to reduce the piece count and allow for erection on-site by tower cranes. The use of a complex pre-set strategy ensured the final position of the structure was within design tolerances. The attic was designed to be erected floor-by-floor, with each floor level immediately stable upon erection. Designing the attic in this way was vital as there was no core this high up the building to provide lateral stability and no internal floors to provide horizontal diaphragm action.

The triangular shape of The Scalpel and the prevailing south-westerly winds that hit the structure's narrowest point, meant that a total of seven viscous dampers were needed to be installed within the north elevation of the steelwork. These hydraulic devices dissipate the kinetic energy of the building and stop the build-up of uncomfortable side-to-side accelerations in high winds, improving user experience and the durability of the building as a whole. By building the viscous dampers into the stability system of the structure they provide damping at a fraction of the cost and use less space than more traditional 'Tuned Mass Dampers'.

The environmental successes demonstrated by 52 Lime Street, acknowledged by the first ever Design Stage Certificate under the BREEAM UK New Construction 2014 Scheme, were a direct result of the strong collaboration between the architect, main contractor and structural engineer from the outset. Examples include a 25% operational carbon reduction, a Green Guide rating A+ for embodied impacts, a 45% reduction in potable water use, a biodiverse green roof and support for sustainable commuting with the incorporation of secure, covered storage in the building for almost 400 bicycles, along with extensive locker and shower facilities.

Judges' comment

Taking its place within the cluster of prestigious tall buildings in London's financial centre, the distinct inclined outlines of 'The Scalpel' complement the surrounding profiles. Ground-breaking savings in both costs and embodied carbon have been achieved by innovative solutions including integral damping and advanced digital design. Advanced use of BIM, along with full-scale trials enabled compact integration, maximising letting areas.

The Curragh Racecourse Redevelopment, Kildare

PROJECT TEAM

Architect: **Grimshaw Architects**
Structural Engineer: **AECOM**
Steelwork Contractor:
Kiernan Structural Steel Ltd
Main Contractor: **John Sisk & Son**
Client: **The Curragh Racecourse Ltd**

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Located in the heart of the protected grasslands of the Curragh plains in County Kildare, Ireland, The Curragh racecourse is steeped in history and tradition. It is internationally recognised as one of the best racecourses in the world, as well as the spiritual home of flat racing in Ireland. However, to maintain its competitive position, a full redevelopment of the site was needed to meet the demands of the future.

The brief required a new racecourse grandstand with supporting infrastructure facilities for 6,000 people, within a masterplan that was designed to accommodate a crowd flux of up to 30,000 within the wider grounds.

The design responds to the site's unique context in an elegant, yet unobtrusive manner that embraces a spirit of place. The new grandstand comprises stacked horizontal forms, crowned with a dramatic soaring roof that recognises the planar landscape in which it is set. The copper colour of the roof references the rural, Irish vernacular and agricultural heritage of Kildare, whilst the contemporary panelled roof structure, comprised of aluminium sinusoidal panels, provides a striking yet empathetic appearance amidst the rolling countryside.

In the world of sports structures, it the scale and sense of drama that usually impresses. Up close, the structures can appear somewhat utilitarian. The Curragh is different. Through meticulous attention to detail both in the design and construction, there is a sense of exquisite quality at every scale, a rare combination of grace and grandiose, a place where structural artistry meets architectural vision.

The dramatic 7,200m^2 cantilever roof design was key to creating the architectural vision of a "planar building in a planar landscape", with the envelope surfaces tuned to mask the depth of the structure and create a gravity-defying illusion with cantilever spans ranging from 27m in the central area to 45m in the double-cantilevered corners.

This vision has been delivered by focusing on structural elegance and simplicity. The roof structure, supported on the exposed precast concrete grandstand frame below, consists of a regular arrangement of steel cantilever trusses tapering into open plated sections at the tips to create the razor-sharp leading edge as well as simplifying fabrication. Additional spine trusses follow the diagonal hip line of the roof corners, creating a two-way lattice frame with optimised planar geometry.

Adopting very shallow steel trusses would have yielded a very heavy and uneconomical structure, but it was found that the illusion of the sharp edges and super-thin roof surface could be achieved using relatively modest span-to-depth ratios for the vast majority of the trusses, because the double-clad top and bottom surfaces would never be viewed together. This also allowed the MEP plant to be concealed within the roof space with no detriment to the overall form. The result is a total steelwork mass of approximately 115kg/m^2 for the majority of the roof area, a fine achievement for an environment with dominant wind loads and the need for compatibility with the fully clad surface and the glazed box suites that are suspended over the main grandstand from the roof structure.

Integrating the structural solution with the building envelope was key to the success of realising the design team's mutual vision. For the long-span double-clad roof the structural engineers and façade engineers worked hand-in-hand to deliver a holistic design solution, minimising the overall quantities of structural steelwork by ensuring all steel surfaces were fully coordinated with the cladding fixing requirements. This included integrating with the MEP, lighting and rainwater collection systems without compromising the structural or visual integrity, which allowed the overall depth of the structure and envelope to be minimised whilst also delivering an economic solution.

The extensive use of bespoke digital modelling tools throughout the design and delivery process allowed for the MEP building services and architectural finishes to be efficiently integrated with the structure. Regular exchange of digital models and visualisations combined with continuous dialogue and interaction between all parties was key to the success of the project.

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The parametric model of the structure informed early discussions with the client and later the main contractor in relation to crane siting, lifting capacities, splice details, locked-in stresses and movements and tolerances between the adjacent frames. By pre-empting these issues, the design team could react quickly, having a detailed knowledge of the constraints and options available from the outset. In particular, a detailed construction stage study of the cantilever roof pre-setting was critical to achieve a seamless and crisp roof profile upon completion of the cladding installation.

The collaboration between all parties during both design and construction phases, and the development of the original concept design into the completed building through creative and innovative structural design, is an exemplar of bringing best value to a scheme without losing the essence of the original vision.

The completed project opened to the public in Spring 2019.

Judges' comment

A blade like aerofoil roof is now the dramatic centrepiece to this open landscape and world-famous sporting venue. Behind this bold architectural statement lies a highly accomplished level of detailed design, precise fabrication, and accurate construction to the most demanding of tolerance requirements. A great team effort.

Bath Schools of Art and Design

PROJECT TEAM

Architect: **Grimshaw Architects**
Structural Engineer: **Mann Williams**
Steelwork Contractor: **Littleton Steel**
Main Contractor: **Willmott Dixon**
Client: **Bath Spa University**

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The existing building, designed by the Farrell/Grimshaw Partnership, was completed in 1976 as Herman Miller's primary furniture factory in the United Kingdom, as it remained until 2015. Bath Spa University purchased the building in 2016, by which time it was Grade II-listed, in order to relocate the Bath School of Art and Design. The re-purposing builds on the original design ethos: allowing for the ongoing flexibility of the building, it will continue to adapt to the changing needs of the building users and engage with the wider community.

It was a key ambition to retain as much of the existing building as possible. The steel façade frame remains, which supports a flexible modular system of glazed and solid panels, as well the primary structure of continuous secondary roof beams at 2.5m centres which span the three main 20m bays, and are supported on primary beams on a 10m grid of columns. Beyond the challenges of retaining and refurbishing the existing, new steel structure raises the roof by 1m, supports a new roof deck for extensive plant, supports a rooftop extension above the existing building and encloses two wings of flexible workshops and studios, as well as providing a substantial new mezzanine level.

Reflective areas encourage students to distance from their practice enabling discourse outside of disciplines. Communal open spaces encourage 'bumping into' of staff, students, professionals and visitors, providing unknown opportunities. While spaces such as the Gallery, Art Shop, rooftop pavilion, a publicly accessible café and riverside landscape, are designed to actively engage enterprise activities and the local community.

With an emphasis on 'thinking through making' the students and their creative practice were placed central to the overall design. The immense workshop facilities were located in the centre of the building to enable focused support from specialist technicians, and the ability for students to move seamlessly between materials and processes, whilst then allowing the mezzanine to be open and highly flexible.

It was well known that the courses taught at the building will evolve over time in an unpredictable way. To facilitate this the new roof is raised by new Vierendeel steel trusses, allowing a flexible network of 'plug & play' services to run at high level. This allows the spaces below to be reconfigured as required. The modular façade system also allows the elevation to be easily reconfigured to respond to changing internal requirements.

The mezzanine floor beams have additional web openings to allow for future servicing and both the mezzanine and rooftop pavilion are designed to allow the internal layout to be reconfigured to suit future needs. All structures are framed to be independent of the existing to allow for future removal or adaption without detriment to the original.

More than retaining significant embodied carbon within the building, a key outcome for the project was to ensure that the energy performance was brought up to modern standards and beyond, safeguarding its long-term future. The entire envelope was upgraded to provide dramatically improved thermal performance through new double glazing, additional insulation and much improved air-tightness. The new roof provides over 100 rooflights, reducing the reliance on artificial daylighting, and photovoltaic (PV) solar panels providing over 10% of the building's energy consumption.

The steel structure allowed the 20m spans to be retained, leaving a flexible volume below with minimal interference from structural columns. It was also in-keeping with the ethos and industrial character of the listed building. The efficiency of the structure also allowed space for the services to run between it at high level.

The new raised roof structure spans above the existing beams, moving the load of the roof closer to the columns. This maximised the capacity of the existing structure so the roof could support the increased insulation, PVs and rooflights.

The new Vierendeel steel trusses were fabricated offsite in two parts, and craned into position, before being bolted together. The majority of the structural steel relies on bolted connections, to both facilitate future deconstruction and to protect the integrity of the existing listed structure. To this end the new rooftop extension is supported on steel columns and cantilevered trusses that thread between the existing steel beams, as an independent structure, with half the columns making use of existing pad foundations that were provided to allow for a future extension. The new rooftop plant deck structure also follows this same ethos.

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The project posed many unique challenges in restoring, enhancing and extending an existing building. Its structure, servicing and architecture all work together to deliver an outcome that safeguards the future of this listed building, whilst significantly enhancing the environment for the current users and the energy performance. It has been a true collaboration, from designers to constructors and client, and in maintaining its flexible principles, the building will be enjoyed by generations to come.

Judges' comment

This project involved a major re-purposing of a Grade II-listed industrial building, thus validating key concepts of the original 1970s design - adaptability and sustainability. Structural additions were separated from the existing, requiring careful installation and the façade sensitively upgraded to improve performance. The result is a building of exceptional quality ideally suited to its new use.

Award

A14 Cambridge to Huntingdon Improvement Scheme

PROJECT TEAM

Structural Engineer:
Atkins, CH2M Hill Joint Venture
Steelwork Contractor: **Cleveland Bridge**
Main Contractor:
A14 Integrated Delivery team
Client: **Highways England**

The £1.5 billion scheme to improve the A14 trunk road between Cambridge and Huntingdon required a number of new bridges along the new route. These included the scheme's showpiece bridge; a 750m-long viaduct over the River Great Ouse, and two identical 1,050-tonne bridges to carry a major roundabout at Bar Hill Junction over the new A14. Weathering steel was used for all three structures to provide the required durability with minimal future maintenance.

The River Great Ouse viaduct required 6,000 tonnes of steel, comprising 76 separate main girders and 800 cross girders. The ladder deck bridge spans the river itself and a large area of floodplain on either side. Supported on 16 pairs of piers, most of the main girders required were 40m-long, 2m-deep and weighed 50 tonnes. The section of bridge that crosses the river has a longer span requiring more complex girders, with larger, deeper haunches to carry the greater load.

In order to produce the cross girders more efficiently, a new welding procedure was devised that involved modifying the T & I machine with two welding heads on each arm, instead of the usual one, allowing twice the amount of weld metal to be placed per metre per minute.

A time-saving construction method adopted on this viaduct was the use of precast concrete slabs for the deck rather than the more traditional insitu concrete deck slab. This meant that the concrete deck units could be installed simultaneously while steelwork erection was still in progress further along the bridge. This construction sequence demanded close coordination and also meant that every piece of steelwork had to be fabricated to extremely tight tolerances to ensure a precise interface with the precast concrete slabs.

A temporary platform on the floodplain under the length of the bridge provided a solid base for cranes and lorries, but a different crane was offered to the one originally specified. By using a 600-tonne capacity crawler crane in place of a 300-tonne capacity crawler crane, the installation team could install all girders from one position at each 'bay', as well as being able to install all the heavy girders at the river span section. By minimising the crane movements, an installation rate of one bay per week could be maintained and even accelerated during periods of good weather.

The viaduct was completed on budget and ahead of schedule.

The installation of the twin bridges at Bar Hill Junction over the new A14 maximised the advantages of offsite steel fabrication and rapid assembly to improve programme times, reduce environmental impacts and minimise disruption to road users.

The multi-girder bridge decks, each measuring 47.5m in length comprise three pairs of braced main girders supporting GRP permanent formwork and an insitu concrete deck slab. Overall, each deck contains 330 tonnes of steel and 720 tonnes of concrete.

The original plan was to erect the bridges piece-by-piece using a crane. This would have involved closing the A14 for a number of weekends, causing significant disruption. However, a more cost-effective scheme was developed that allowed both bridges to be constructed offline prior to installation, and then installed using self-propelled modular transporters (SPMTs).

Following unforeseen programme delays, the site erection scheme was modified to reduce the time required on site even further. Instead of delivering the bridges as part-length paired-girders, they were delivered as 12 full-length single girders. This removed the need for main girder joints to be welded on site, which reduced the overall programme by three weeks. This also significantly reduced the number of deliveries to site from 18 to 12, minimising environmental impacts from transportation.

All steel components were fully trial assembled at the factory prior to delivery to ensure accurate fit-up. The girders were then delivered to a large temporary set-down area that was created close to the bridge site. Upon delivery, the single girders were placed onto specially constructed trestles and braced together. GRP permanent formwork and cantilever edge formwork were then added and the insitu concrete deck slab cast. The offline deck slab construction significantly reduced the overall construction programme.

Civil engineering works on site, including the construction of the concrete abutments, were undertaken in parallel with girder fabrication, so close collaboration was essential to ensure that both elements interfaced perfectly.

The A14 was closed to traffic at 9pm on a Friday to allow the sections of the existing A14 carriageway to be infilled and surfaced. The fully concreted bridge decks were then lifted from the trestles onto the SPMTs, and manoeuvred at less than 1mph onto and along the carriageway. The decks were positioned by the SPMTs and lowered precisely onto the concrete abutments.

Both bridges were installed during a single 11-hour period and the road was clear for reopening at noon on Sunday, an incredible 18 hours ahead of schedule.

Judges' comment

One of England's largest road improvements included a 750m long viaduct over the River Great Ouse and two new bridges at Bar Hill interchange, incorporating over 9,000 tonnes of weathering steel. The judges were impressed with the innovative solutions the design team employed to minimise disruption and optimise the programme. Flawless execution on site included installing two bridges, each weighing over 1,000 tonnes, in just 11 hours.

Brunel Building, London

PROJECT TEAM

Architect: **Fletcher Priest Architects**
Structural Engineer: **Arup**
Steelwork Contractor: **Severfield**
Main Contractor: **Laing O'Rourke**
Client: **Derwent London**

The architectural brief was to create a landmark building which provided high-quality, innovative, people-centred workspace and which would re-engage the site with the canal. The site faces Brunel's Paddington Station and this legacy of engineering inspired the building's design. Carefully refined and consistent structural steel details are a key aspect of the aesthetic of the project.

The structure and services are exposed internally to maximise flexibility and workspace volume. This logic is continued externally with an exoskeleton positioned outside the façade, which extends beyond roof level to create glazed, wind-sheltered gardens on the 15th and 17th floor levels. The exoskeleton also shades the large expanses of glazing, affording scenic panoramic views across the city skyline. This approach brings many benefits to the building, including tall, open column-free workspace, 25% solar shading and a dynamic appearance.

Despite the bespoke nature of the building, a regular 6m floor beam spacing was used with precast lattice slabs set down into the web zone of the supporting steel plate girders. The services and structure are seamlessly integrated, thus enabling a more efficient use of the available structural depth and maximising floor-to-ceiling heights.

A semi-unitised curtain-wall cladding with an insulated strong-back system provided a considerable amount of repetition together with flexibility where required.

The benefit of this adaptability can be seen in the fact that the building had been pre-let by the time of practical completion, with eight different tenants who all do different things and who have all fit-out their spaces in different ways.

This adaptability and high architectural quality should also allow the structural design life to be met and exceeded. A detailed whole-life carbon assessment forecast a 71% operational energy improvement over a typical office fit-out and a 7.5% embodied carbon reduction against a typical new-build office building.


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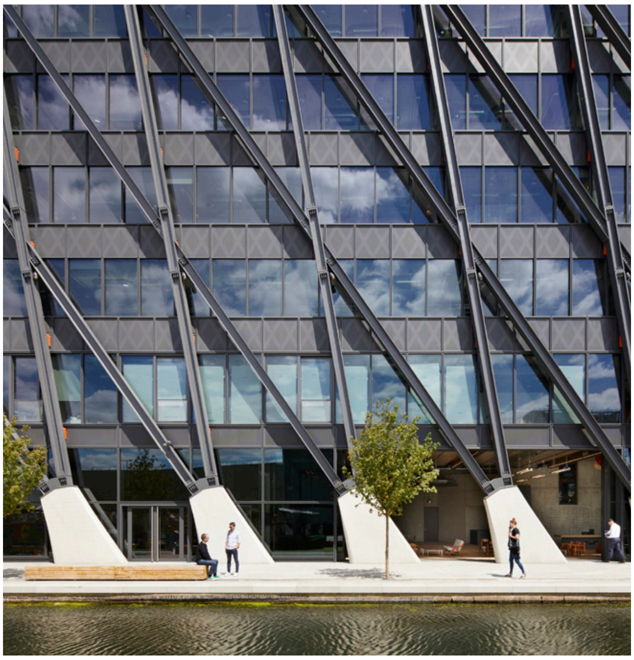
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Generally, floor beams span directly from the core wall out to the exoskeleton. One consequence of this is that the location of the floor beams on each level varies so as to meet the exoskeleton support, which also means that beam spans and service opening locations vary on each floor. This pushed the project team to use digital workflows to optimise and communicate plate thicknesses, weld sizes, connection designs, precambers, movements and fabrication and installation information. For example, close collaboration between all parties allowed the various stiffnesses, tolerances and construction sequence impacts to be considered and individual precamber values agreed for each beam in the building.

This also provided a challenge for the contractor and MEP sub-contractors which they solved, in part, by projecting the MEP sub-contractor information onto the relevant ceilings whilst the operatives installed the relevant equipment and service runs.

Where floor beams pass through the façade, they are haunched so that the head of the glazing can be raised, increasing daylight penetration. At the core end, they are haunched to allow air distribution ducts to pass beneath. This notch was unstiffened at the request of the architect, and justified by using plastic design including non-linear finite element modelling. The beams meet the external structure with a thermally broken connection encased in an insulated stub collar, which is removable to allow for future inspections.

The exoskeleton defines the character of the building and is a visual focal point, with the inclined columns and braces carrying the gravity loads at the perimeter of the building and bridging over constraints below ground level - the development is adjacent to the canal and sits atop two London Underground tunnels. However, the conscious design decision to incline the perimeter structure and make it external leads to inevitable complexity and risk, which was mitigated in several ways.

Full use was made of the latent structural capacity in the concrete core, which allowed freedom in the diagrid topology with minimal impact on structural tonnage. Tuning the diagrid structure and connection releases controlled the load-paths and optimised the diagrid tonnage. Some elements which are slotted and 'inactive' in the permanent design were 'locked' during construction by the use of specially machined shoulder bolts which were then replaced with standard bolts.

Highly advanced modelling of key connections (both structural and thermal) achieved compactness and purity of detailing.

Generally, for fire protection, the steel structure is either insulated by concrete or protected with intumescent paint. The typical floor build-up includes lattice planks and topping sitting flush with the steel floor beams. This meant that the top flanges would be exposed during construction. Significant time and cost savings were achieved by not coating the exposed top flange with intumescent paint in most locations. This was assessed and justified using 2D computational heat transfer analysis.

The realised project could only have been achieved with a steel frame, which facilitated long spans, integral MEP service runs, optimisation of the exoskeleton and floor beams, and the overall design aesthetic of the building.

Judges' comment

This project shows how a proactive client working with a talented team can produce a commercial office building of the highest integrity. Expressed structural steelwork in the external frame and floor structures is dramatic and dynamic; all is detailed with great care and attention. A roof garden overlooking Paddington station and the canal basin provide a welcome extension to the public domain.

Commendation

Structural Steel Design Awards 2020

Mary Elmes Bridge, Cork City

PROJECT TEAM

Architect: **WilkinsonEyre**
Structural Engineer: **Arup**
Main Contractor: **Keating**
Client: **Cork City Council**

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In September 2016, a design competition was held for a pedestrian bridge crossing the River Lee, located in the heart of Cork city. The requirements were for a single span, sympathetic with the local city architecture while providing a minimum walking width of 4.5m, unimpeded views of the river while having minimal impact on the existing flooding regime.

The initial concept developed by the winning design team focused on a structure with a central spine beam, aiming to conceal the structural depth within the railing height. With a 66m span between quays, it was identified early in the design phase that a significant depth was required; a 1.8m-deep beam at midspan was suggested with the beam going to 2.2m-deep at the supports.

Transitioning the central spine beam from below to above the deck along the span introduced a small arch effect which, along with fully integral abutments, resulted in increased stiffness in bending, thus increasing the slender appearance of the bridge. To further increase the structural efficiency, the pedestrian walkway is integrated into the structural system with the position of the walkway favourable relative to the position of the neutral axis of the main spine beam at both midspan and at supports.

Combining the shallow slender arch with transparent mesh parapets delivers an understated but visually appealing design with uninterrupted views of the river and cityscape and embedded benches on either side of the central beam has resulted in the bridge becoming part of the urban realm. The widening at midspan creates a natural meeting point.

Extensive modelling was used to optimise the geometry of the bridge and deliver the most efficient shape to minimise the amount of steel required. The 3D models of this lightweight structure were also used for virtual design reviews to ensure full alignment and coordination throughout the project.

The bridge was fabricated offsite in nine sections before assemblage at a shipyard downriver from its eventual home. In May 2019, the completed structure was transported up the River Lee on a custom-made barge. It was then lifted into position by cranes located on each quay during an overnight road closure in a tandem lift of 160 tonnes.

Honouring Mary Elmes, known as Ireland's Oskar Schindler, this transformative bridge link is part of Cork's drive to become a more accessible, sustainable city and is a sympathetic companion to the surrounding quays, buildings and urban realm.

Judges' comment

The elegant and deceptively simple design of this bridge has turned a new pedestrian and cycle city centre river crossing into something of a destination in its own right. In addition to the celebrated appearance, particularly at night, the judges were impressed by the daring success of the barge delivery and overnight installation of the bridge.

Commendation

Structural Steel Design Awards 2020

The Post Building, London

PROJECT TEAM

Architect: **Allford Hall Monaghan Morris**
Structural Engineer: **Arup**
Steelwork Contractor: **BHC Ltd**
Main Contractor: **Laing O'Rourke**
Clients: **Brockton Capital LLP and Oxford Properties**

A former 1960's Royal Mail Sorting Office, The Post Building has been redeveloped into a modern, mixed-use development with considerable amounts of the original steel structure being retained. In total, the redevelopment has created 44,000m² of floor space, with eight floors of offices and seven floors of adjacent residential above two floors and a basement containing a variety of public uses including shops, cafés, galleries, and a GP surgery.

After a large-scale demolition programme, a horseshoe-shaped section of the original steel frame was left containing the ground, first and second floor. Keeping some of the original steel frame fitted into the overall design aesthetic, which has exposed steel beams and columns creating a modern 'white collar factory' office building.

Retaining a large steel frame required the use of more than 200 tonnes of temporary steel propping and bracing, as the frame's original stability system had been demolished. The stability system was completely remodelled to remove the existing cores from the key corner areas and create a new steel core in the central part of the site.

The site's basement and raft foundations have both been reused and a lighter steel core helped avoid the need for new piles. It was also deemed to be in keeping with the desired overall design aesthetic of exposed steelwork throughout the building.

The original grid pattern for The Post Building's ground floors was 12m × 20m to suit post office vehicle movements and required a series of deep transfer beams, which concentrated the original building loads into widely-spaced points on the raft foundation. As these long spans were no longer necessary, new columns were added to reduce the spans and spread the increased overall building mass more evenly on the existing foundations.

The now redundant transfer beams have been slimmed down from 2.0m-deep to 600mm-deep members to allow mezzanine floors to be inserted and maximize the available headroom within the existing floor-to-floor heights.

An entirely new steel frame was erected around the retained portion completing the lower three floors and filling up the entire site's footprint. Sizeable transfer structures were included at level five to allow the upper floors to have a long span suitable for modern office spaces. The floor-to-ceiling height changes again on level eight, to include a mezzanine, and the roof profile steps back to minimise visual intrusion.

The Post Building achieved sustainability ratings of BREEAM 'Excellent' and LEED Gold.

Judges' comment

This is a great example of a steel-framed building being adapted to give a new life for a different use. The existing steel frame was retained wherever possible to produce impressive and unusually generous commercial spaces. New steelwork was added to increase the floor area without overloading the existing foundations and the architecture is enhanced with careful detailing. Maximising the re-use of the existing structure resulted in a build with a much smaller carbon footprint.

Commendation

Structural Steel Design Awards 2020

Centre Building, London School of Economics

PROJECT TEAM

Architect: **Rogers Stirk Harbour + Partners**
Structural Engineer: **AKT II**
Steelwork Contractor:
Billington Structures Ltd
Main Contractor: **Mace**
Client: **London School of Economics**

© Mark Gorton, RSHP

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Situated at the heart of London School of Economics' (LSE) campus, the new Centre Building offers spectacular views across London's skyline. Built in two sections, six-storey and 13-storey structures interlinked by an atrium, the Centre Building replaces four previous buildings that were demolished. With a gross internal floor area of 15,507m^2, the scheme also includes a new landscaped public square.

The overall superstructure system of steel beams and columns, concrete cores and precast concrete floor slabs facilitates simple and flexible floorplates which can easily be adapted to suit LSE's current and future academic needs. The careful location of service cores and expressed ceiling services also gives the client flexibility to adapt spaces or enhance facilities with minimal impact on the existing building fabric.

The expression of the superstructure, the exposed steelwork internally and externally, seeks to give the building a distinct and contemporary appearance. Shallow floor construction maximises available space and comprises RHS or plated floor beams featuring bottom plates to support long span precast floor units, which sit within the depth of the beams.

Over 1,000 tonnes of decorative finish, fire-protected structural steel was used with many of the steel members having internal bolted connections, hidden from view and accessed via a pre-formed aperture in each box section beam. Flush plates, flush welds and shadow gaps were present in many details, all of which had to be manufactured with a high degree of accuracy in order to achieve the correct fit-up.

The main steel frame of the superstructure was erected entirely by tower crane, apart from two girders, measuring 17m-long which needed a 400 tonne-capacity mobile crane. Full stability of the structure was only achieved once the entire frame was erected and all the precast flooring was installed. Until that point, a temporary bracing system was required, which was only removed once each level was fully complete. At either end of each block, exposed SHS bracings bookend the project and form another highly visible exposed steelwork element. This exoskeleton bracing, which sits approximately 300mm outside of the building envelope, provides stability along with two concrete cores.

For this complex and challenging project on a confined inner-city site, collaboration was key to the project's success. The project achieved a BREEAM 'Outstanding' rating and a bespoke sustainability tool was developed to help reduce the building's carbon footprint. The high-performance façade helps to reduce overheating and provides a naturally-ventilated working environment for inhabitants.

Judges' comment

Carefully crafted, exposed steel frame building, worked into an extremely constrained university campus site. Close collaboration between the design team and steelwork contractor has produced a high-quality appearance to the steelwork with careful attention paid to the connection details and paint finish. Exposed external bracing, with expressed connection details, bookends the lean steel frame of each block.

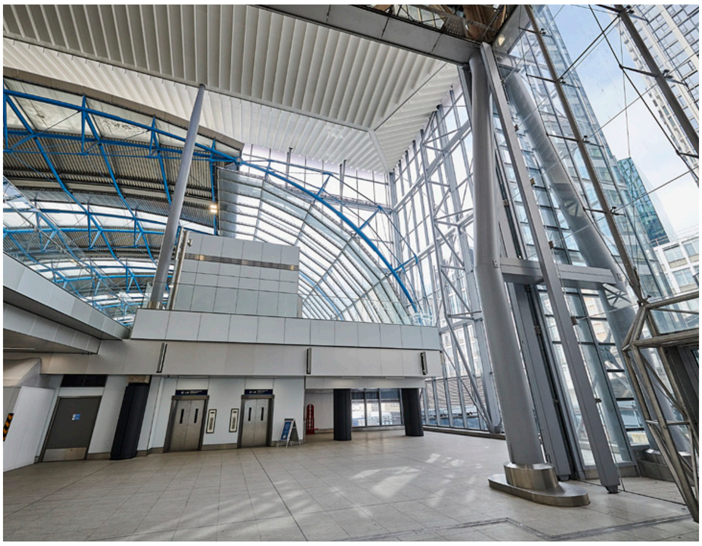
Commendation

Structural Steel Design Awards 2020

Waterloo Station Roof Infill

PROJECT TEAM

Architect: **AECOM**
Structural Engineer: **Mott MacDonald**
Steelwork Contractor: **Bourne Group Ltd**
Main Contractor: **Wessex Capacity Alliance**
Client: **Network Rail**



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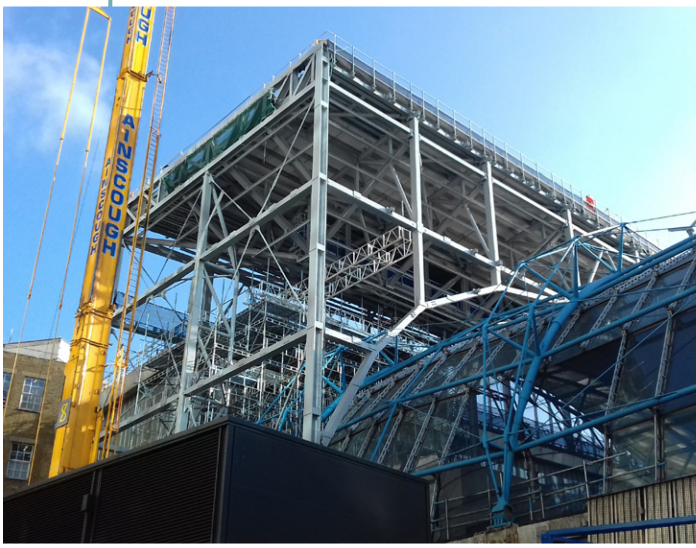


Waterloo Station has been transformed by a programme of works, rebuilding the former Waterloo International Terminal (WIT), allowing platforms 20-24 to be brought back into use with modern facilities, new track, signalling and a new layout.

As part of this programme, a roof infill structure was required to bridge the gap between the three-pin arch roof of the Grimshaw-designed WIT, and the trussed 1920s steel roofs forming the main station concourse. Given the contrasting architectural forms, the design concept was based on a simple glazed box, linking two contrasting structures, showcasing the curved International roof, rather than seeking a strong visual identity of its own.

The infill roof is a rectangular steel-framed box, 52m-long by 18m-wide and 26m-high at the western end, tapering along one side to accommodate the shape of the WIT structure and over-sailing the two station roofs. It is 21m-high at the eastern end and supported at either end by steel-framed and glazed gable walls. The eastern gable wall is supported by Waterloo's 1840s-built masonry walls, but otherwise, the new structure is self-supporting, sitting closely over the two roofs without touching either existing structure.

The greatest challenge was the development of a suitable foundation system to support the new structure, as it sits directly above four London Underground lines. Consequently, structural concepts focused on opportunities to re-use existing support structures. The entire roof structure including glazing weighs only 400 tonnes and the solution required two new tapered 508mm-diameter circular hollow section (CHS) columns to help support it in the middle.

Forming the main span of the roof is a 4.2m-deep 52m-long spine truss, weighing 27 tonnes. Brought to site in three sections, the longest element, which spans between the CHS columns, weighed 13.5 tonnes. The central spine truss supports eight pairs of gullwing trusses sitting perpendicular to the main structure, forming overhangs on either side. Steelwork for the project was erected by a 300 tonne-capacity mobile crane. Keeping the frame stable during erection was critical and the structure was erected on substantial temporary works.

Hidden connection details were developed allowing coordination of architecture, structure and services distribution. This allowed concealment of the building services providing a clean and unobstructed aesthetic. Utilising tapered circular columns meant the steelwork is less harsh on the eye, and importantly, located to not hinder the views in the station concourse, which was an important part of the architectural brief.

Judges' comment

The major challenges for this infill roof included foundation conditions requiring the use of existing supports and restricted site access. The solution is a steel frame sympathetically designed to reflect the detailing of the existing structure, and ingeniously erected in a live station, facilitating a huge increase in station capacity.

One Bartholomew, Barts Square, London

PROJECT TEAM

Architect: **Sheppard Robson**
Structural Engineer: **Waterman**
Steelwork Contractor: **William Hare**
Main Contractor: **Mace**
Client: **Helical**

One Bartholomew is the latest element of Bart's Square to be completed, a new mixed-used quarter in Farringdon, London. The 19,920m^2 Grade A office building offers 1,820m^2 floorplates and is designed to benefit from high levels of natural light.

Architecturally, One Bartholomew is a simple but finely detailed form that marks the step change between the edge of the Smithfield conservation area and the larger developments of the City. It is distinctly modern in both form and materiality, with metal screens, and floor-to-ceiling glazing to reflect and embrace the scale of the modern City of London. The design integrates the building into the extensive public realm improvements which turn Bartholomew Close into a pedestrian-friendly environment, enlivened by a café and restaurant on the ground floor.

The building is highly adaptable to the changing requirements of its users with generous floor-to-ceiling heights and a highly-efficient and adaptable floorplate design. The fully-glazed, active, double-skin façade system is linked to the building's management system via sensors which allow the façade to adjust the level of solar shading in response to changing external conditions.

In addition to meeting the latest environmental performance and occupier requirements, the scheme includes an ecological roof, combining both extensive and intensive green roofs, with PV panels incorporated into plant areas at roof level. The environmental credentials of the building are demonstrated with a BREEAM 'Excellent' rating.

One Bartholomew has been designed with tenant-focused amenities in mind. One example is fitting the structure with world-leading digital capability, which has been awarded Wired Certified Platinum for its connectivity infrastructure.

The building's aesthetic and ability to integrate services was important to the development of One Bartholomew meaning that a steel construction scheme was the best option. Steel also suited the long spans required for fit-out flexibility, and provided an efficient construction method for the busy city centre location. In total, 2,350 tonnes of steel were used across the 12 storeys, basement, roof and plant levels.

The steelwork gains its stability from a reinforced concrete core and the diaphragm action of the floor slabs. The ground floor features a 225mm-thick composite slab with transfer beams ranging from 600mm to 1200mm-deep and up to 15 tonnes in weight. The varying sizes and weights of the beams required were determined following a value engineering exercise using BIM modelling. A typical floor comprises a 140mm-thick composite slab spanning 3m between 610mm deep cellular plate girders.

Judges' comment

The project showcases how steel can deliver a highly flexible long-span commercial building within an urban context. The nine-metre corner cantilever of the upper floors over the entrance enhances the presence of the building in the public realm. The progressive procurement approach meant that the steelwork contractors were appointed early, supporting the design team to maximise efficiency of design and fabrication.

Commendation

Structural Steel Design Awards 2020

The Standard Hotel, London

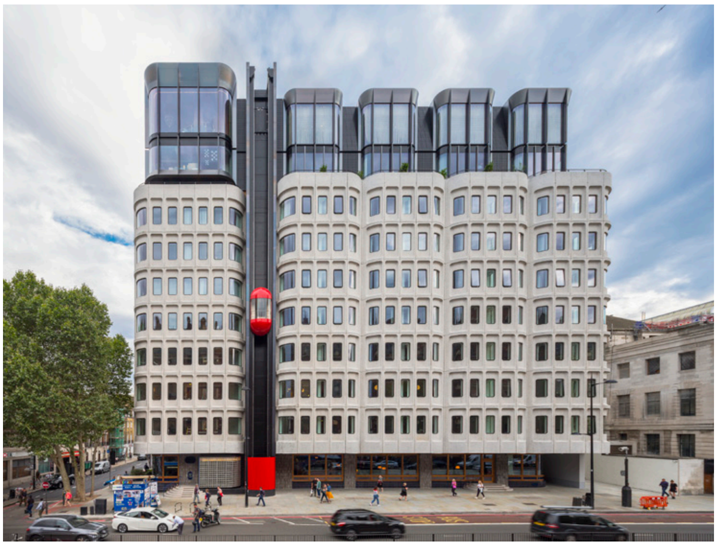
PROJECT TEAM

Architect: **Orms**

Structural Engineer: **Heyne Tillett Steel**

Main Contractor: **McLaren Construction**

Client: **Crosstree Real Estate Partners LLP**



© Timothy Soar

A former Camden Council office building has been transformed into The Standard, London, a contemporary, boutique 266 key hotel with sustainability and low carbon at the heart of its conversion.

The initial brief was to analyse the development potential of the 1970s building and assist the client in preparing their bid to purchase the site. A full Revit model of the existing building was created from archive drawings to understand the risks and opportunities within the existing structure, and the potential benefits of retention rather than a rebuild. The conclusion reached was that the building could be retained, refurbished and enhanced as a hotel.

Extensive research into the existing structure was undertaken along with intrusive and extensive testing of the capacity of the structure, foundations and ground to reveal their spare capacity. The result was that the concrete frame and under-reamed piles would allow the conversion of the building and the addition of a three-story extension.

The design solution to support the new ninth to 11th floors was to provide new steel perimeter columns from the first-floor transfer slab. This was the simplest structure with a direct load path and reused the existing foundation capacity. Adding the three storeys, a 30% increase to the weight of the building, only required discrete strengthening to four existing columns.

The new floors comprise 150mm-thick composite slabs supported by, and acting compositely with, steel beams. In order to limit beam depths, UC sections were used as beams for most spans.

The steel beams are supported by steel columns, with sway frames above the eighth floor providing stability to the extension. Perimeter steel columns installed through the existing building from the first to eighth floors continue through the additional floors to the 11th floor. These were threaded like needles through the existing waffle slabs to the first-floor transfer slab.

The use of steel enabled the new floors to be lightweight and shallow depth while adhering to tight hotel vibration criteria and a long span existing office column grid below.

The existing façade is constructed of highly durable load bearing precast concrete units which were restored and thermally improved, reducing capital costs and providing significant embodied carbon savings. The top three storeys of the building are clad in PVD coated stainless steel over aluminium framing with double glazed units, which are lightweight, durable and can be disassembled, making them flexible for future use.

Judges' comment

Through forensic analysis of the existing building and highly intelligent design responses, this project showcases the role of structural steel in repurposing and enlarging this existing building, maximizing the retention of embodied carbon and creating a new landmark at the end of one of the capital's principal arteries.

Merit

Structural Steel Design Awards 2020

The Gravity Bar, Guinness Storehouse, Dublin

PROJECT TEAM

Architect: **RKD**
Structural Engineer: **Arup**
Steelwork Contractor:
Steel & Roofing Systems
Main Contractor: **P.J. Hegarty & Sons**
Client: **Diageo**

The Guinness Storehouse is Ireland's number one tourist attraction and one of the most visited in Europe, with approximately 1.7 million visitors per year. The original storehouse structure dates back to 1902, with the circular Gravity Bar itself being built in 2000.

This project comprised the expansion of the Gravity Bar, to more than double the original size, together with strengthening works to the existing Storehouse and the development of a new three-storey Hub building providing office space for Diageo staff.

The Gravity Bar is located at seventh floor level with the existing roof of the Storehouse at fifth floor level. A series of strengthening works had to be carried out throughout the structure below before the new structure could be erected. A crash deck at sixth floor level over the full footprint of the new structure allowed construction to be safely carried out above, while the Storehouse remained open below, and provided a working platform for steel erection.

The steel frame for the new Gravity Bar is supported on four CHS columns which are located directly above existing columns in the Storehouse structure below. The floor structure is formed from a grillage of box girder beams and UB section infills. All UB infills and several of the box girders were detailed with service penetrations to coordinate exactly with the MEP requirements. The downpipes from the roof were also integrated inside the CHS perimeter columns in several locations where required.

Nine box girders totalling approximately 110 tonnes formed the bulk of the steelwork for the Gravity Bar and were fabricated with 75mm-thick top and bottom flanges and 30mm-thick webs. A full trial erection of the box girders was completed offsite to ensure accuracy and avoid any issues during site erection.

The perimeter of the building at the seventh floor is formed from a curved PFC section, which was erected in discrete lengths and welded, with the welds ground flush, to produce one continuous member around the full bar. This was joined in with the existing bar's PFC to form one seamless band around the bottom of the glazing. The roof level perimeter steelwork is also formed from curved PFC sections with a curved CHS welded to this all the way around the structure.

The Gravity Bar has been doubled in size, transformed into a figure of eight and is designed to give visitors maximum views across Dublin's city skyline.

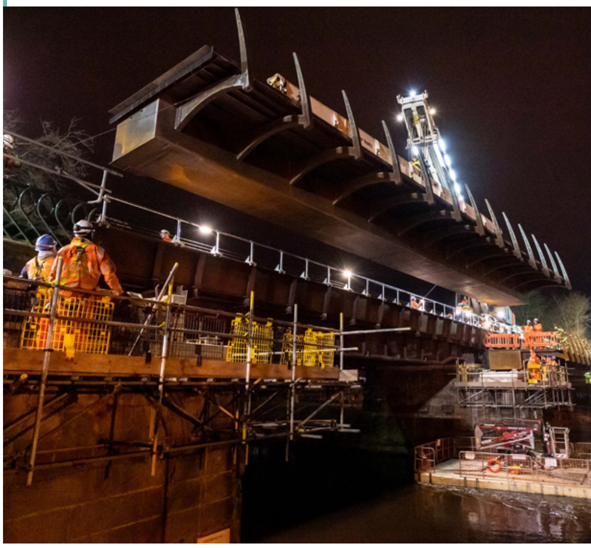
Judges' comment

This popular bar sits above Dublin's most visited tourist attraction and the works were carried out with the building remaining operational throughout. The challenging installation forms an extension to an existing rooftop structure that sits above the 1904 'Protected' building. The new bar is supported on four steel columns that connect through the roof to the strengthened historic structure below.

Scarborough Footbridge, York

PROJECT TEAM

Architect: **Network Rail**
Structural Engineer: **AECOM**
Main Contractor: **AmcoGiffen**
Client: **City of York Council**



Scarborough Footbridge provides a new pedestrian and cycle shared-use facility which spans the River Ouse approximately 50m north of York Station. The existing narrow lattice U-frame superstructure and steep step access has been replaced with a widened architectural weathering steel pedestrian bridge with step-free approaches. The new crossing has greatly improved access for all users, promoting sustainable travel between the station and key parts of the city centre, and is now attracting approximately 4,000 users per day.

The overall structural form and approach parapets are reminiscent of Viking longships, providing a fitting aesthetic appearance for the centre of York. The bridge comprises two main river spans of 22m, formed of prefabricated box girders with integral curved parapets and cantilevered deck plates. The west side of the deck also incorporates an ornate painted parapet to match the existing. The two 10m side spans spanning over the existing river footpath are formed of prefabricated U-troughs with integral parapets and deck plate to match the main river spans.

Stability of the cantilevered main spans was met by provision of mechanical uplift bearings. Tensioned straining wires run through integral eyelets on the parapets and are anchored into masonry-clad anchor blocks at either end of the structure. The approach ramps and stairs at either end of the structure are flanked by bespoke fabricated painted steel curved parapet panels with a stainless steel top rail and integrated handrail lighting. The steelwork elements of the scheme are complemented by masonry blocks and stone cladding providing a mix of modern and historic elements enhancing the local conservation area.

The main river spans were erected from the adjacent rail bridge using a rail-mounted crane. Use of finite element analysis was incorporated into the steelwork design from an early stage to refine steelwork plate sizes and provide a cost-effective and lightweight solution to ensure stability of the lifting plant and existing substructure. This ensured the main river spans could be erected in one lift per span, under the 24-tonne weight limit imposed on the crane. The FE analysis also provided an accurate centre of gravity for the lifted spans giving the contractor confidence in erection of complex unsymmetrical girders within a geometrically constrained site and limited rail possession time.

The replacement Scarborough Footbridge is unique in its appearance and structural form and wholly fulfils the brief to promote sustainable transport for all users and improve access through the City of York.

Judges' comment

The replacement footbridge expands pedestrian and cycle access between York Station and key parts of the City addressing existing access and capacity issues. The project used its location, adjacent to Scarborough Rail Bridge, to enable delivery and installation of large preassembled units using the railway. The bridge wholly fulfils the brief, promoting sustainable transport for all users through the City.

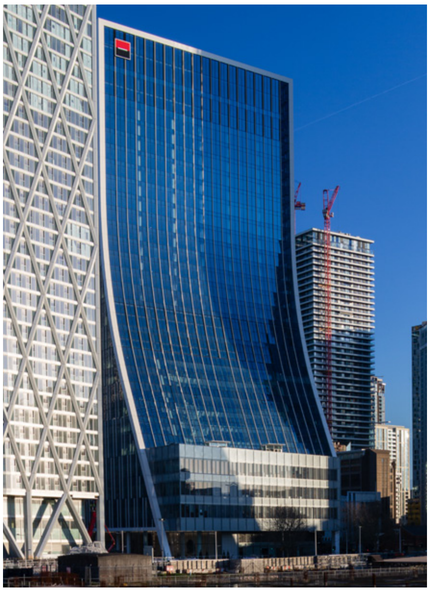
National Finalist

Structural Steel Design Awards 2020

One Bank Street, Canary Wharf

PROJECT TEAM

Architect: **Kohn Pedersen Fox**
Structural Engineer: **Arup**
Steelwork Contractor: **William Hare**
Main Contractor: **Canary Wharf Contractors**
Client: **Canary Wharf Group**



One Bank Street is a striking 27-storey commercial building on the prestigious Canary Wharf estate offering 60,000m² of high-quality office space including three levels of state-of-the-art trading floors, a retail unit at ground level, public realm, and basement car and cycle parking.

Designed to achieve a BREEAM 'Outstanding' rating, the steel-framed structure sits atop a triple 16m-deep basement and gains its stability from a large centrally-positioned core. Sustainability was a key design element of One Bank Street which includes measures to save approximately 352 tonnes of carbon annually and a 55% reduction in water compared to a typical office building.

Judges' comment

This major development in the heart of London's Docklands posed some significant construction challenges due to the complex geometry on the lower levels. These required some heavy cantilevers, bespoke detailing for the steelwork, and close cooperation between steelwork and cladding contractors, resulting in an eye-catching structure providing high quality office space.

National Finalist

Structural Steel Design Awards 2020

Barton Square, intu Trafford Centre, Manchester

PROJECT TEAM

Architects: **Corstorphine + Wright, Leach Rhodes Walker**
Structural Engineers: **Mott MacDonald, Cameron Darroch Associates**
Steelwork Contractor: **S H Structures Ltd**
Main Contractor: **VINCI Construction UK**
Client: **Intu Properties plc**

The refurbishment of Barton Square includes the addition of two 36m-wide glazed barrel vault roofs over the main malls, providing a more user-friendly experience for shoppers, and a 32m-diameter central dome that creates a stunning focal point towering above an ornate water feature. The upper levels of the centre have additional steelwork framing and stairs along with four smaller roof structures to extend the available retail space.

The critical interface between the steelwork and the glazing system called for strict tolerances to be achieved, and construction was carried out outside normal trading hours to allow the centre to remain open throughout.

Judges' comment

Safely installing a new central dome and glazed barrel-vaulted roofs over this section of the Trafford Centre, while it was kept open to the public throughout, was a formidable logistical challenge. This was met by delivering and installing most of the steelwork, including the 36m vaulted beams, in constrained night-time operations.

National Finalist

Structural Steel Design Awards 2020

Boeing GoldCare Aircraft Hangar, Gatwick Airport

PROJECT TEAM

Architect: **D5 Architects LLP**
Structural Engineer: **Mott MacDonald**
Main Contractor: **John Sisk & Son**
Client: **Boeing United Kingdom Limited**

This new maintenance hangar provides servicing facilities for Boeing's current and future fleet of aircraft at Gatwick Airport. Comprising more than 3,000 tonnes of structural steelwork, the hangar provides a 15,000m^2 dual-bay wide body facility and 3,000m^2 of support offices, storage and plant space.

Rooflights, to reduce reliance on artificial light, and 900m^2 of photovoltaic (PV) solar panels on the roof contributed to achieving a BREEAM 'Excellent' rating for the hangar, while design development saved an estimated 635 tonnes of steel. This in addition to savings in temporary works and foundations equated to a carbon reduction of 1,045 tonnes.

Judges' comment

This maintenance building for Boeing is built in the challenging environment of a live airport. The design team worked closely throughout optimising structural efficiency. Deep steel trusses span up to 75m creating a vast column-free space. The trusses, supported on lattice columns, and braced elevation columns form a primary stability system enabling an efficient construction with few temporary supports.

National Finalist

Structural Steel Design Awards 2020

The Balfour, Kirkwall, Orkney

PROJECT TEAM

Architect: **Keppie Design**
Structural Engineer: **AECOM**
Steelwork Contractor: **BHC Ltd**
Main Contractor: **Robertson**
Client: **NHS Orkney**

The £64 million Balfour Hospital provides a state-of-the-art clinical environment for the delivery of essential health care services to the Isle of Orkney, significantly reducing the number of people travelling to the Scottish Mainland for routine care.

In a challenging and exposed location, the building is designed with protection and shielding from the elements in mind. The curve of the building protects the main entrance space and inpatient accommodation while referencing the ancient architectural form of Skara Brae.

The speed of steel construction was vital to the project and achieved an early weathertight position to allow internal trades to commence.

Judges' comment

The curved forms of this new general hospital in the Orkney Islands reference the circular, sheltering prehistoric structures found on the islands while making a positive contribution to the local community. A steel frame, prefabricated on the mainland, allowed speedy completion and reduced vulnerability of the construction programme to extreme weather conditions. Team members collaborated on an integrated BIM model to integrate complex services within the geometry of the structure.

National Finalist

Structural Steel Design Awards 2020

National Infrastructure Laboratory, University of Southampton

PROJECT TEAM

Architect: **Grimshaw Architects**
Structural Engineer: **Buro Happold**
Main Contractor: **Wates Construction Limited**
Client: **University of Southampton**

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The £48 million National Infrastructure Laboratory (NIL) provides researchers and students with state-of-the-art equipment to facilitate world-leading research to improve the efficiency of existing infrastructure as well as develop more cost-effective ways of constructing new infrastructure. The NIL hosts over 100 academics and researchers in five major laboratories and three floors of offices.

A full-height atrium provides daylighting and passive natural ventilation, reducing energy demand and enhancing the wellbeing of the academic staff. The steel frame provides inherent flexibility of spaces for the lifetime of the structure and the project has achieved a BREEAM 'Excellent' rating demonstrating its low impact design.

Judges' comment

The Laboratory, which houses a 3m geotechnical centrifuge and large structures laboratory, is part of Boldrewood Innovation Campus, an internationally-recognised community delivering the highest standards of engineering excellence. The project uses different materials, each complementing the other. The steel elements providing open clear spans and elegant feature staircases. The result is a well-engineered and engaging showcase for state-of-the-art research.

National Finalist

Structural Steel Design Awards 2020

The Wave, Coventry

PROJECT TEAM

Architect: **FaulknerBrowns Architects**
Structural Engineer: **Engenuiti**
Steelwork Contractor: **Billington Structures Ltd**
Main Contractor:
Buckingham Group Contracting Ltd
Client: **CV Life**

© Billington Structures Ltd

Located adjacent to Coventry's 70m-high Grade II-listed Christchurch Spire, The Wave water park is a high-quality destination, accessible to all and houses multiple water slides, a lazy river, wave pool, day spa, 25m-long swimming pool, 120 station gym, dance studio and squash courts.

The pool ride hall is a cylindrical, multi-level, open-plan structure which forms the main architectural theme of the building. Large open-plan spaces on the lower floors facilitate future re-purposing of spaces, whilst the roof has been designed to enable the rides to be re-configured. The compact nature of the building minimises the building volume and energy demand.

Judges' comment

Forming the focus of an inner-city regeneration programme, this major public leisure facility responds to an adjacent historic church ruin with considerable panache, colour and profile. The high point is a fantastical freeform leisure pool with flume rides supported within and from a complex diagrid roof structure.

National Finalist

Structural Steel Design Awards 2020

Drake Circus The Barcode, Plymouth

PROJECT TEAM

Architect: **Corstorphine + Wright**

Structural Engineer: **Evolve Consulting Engineers**

Steelwork Contractor: **BHC Ltd**

Main Contractor: **McLaren Construction Group**

Client: **British Land**

The Drake Circus Leisure Complex, otherwise known as The Barcode due to its striking façade, forms part of the ongoing transformation of Plymouth's city centre. The structure, measuring 130m by 50m in plan, forms a real landmark and houses a 12-screen cinema stacked above 13 restaurants, a large indoor golf leisure facility, a sky-bar and several levels of car parking.

With a structural grid changing up the building to suit efficient layouts for the auditoriums, retail units and car parking, and a planning height restriction, the steel frame is necessarily complex with offset bracing, transfer structures and shallow composite beams.

Judges' comment

A steel frame was the natural choice for this highly integrated mixed-use scheme incorporating a range of leisure uses over car parking in this tricky city-centre site. The judges were impressed with the collaborative approach of the team: sharing of digital models was key to the success of quality and coordination as well as the development of critical construction stage modelling.

National Finalist

Structural Steel Design Awards 2020

Bridgewater Place Wind Amelioration Scheme, Leeds

PROJECT TEAM

Architect : **Chetwoods Architects**

Structural Engineer: **Buro Happold**

Steelwork Contractor: **S H Structures Ltd**

Main Contractor: **Lendlease**

Client: **CPPI Bridgewater Place LP**

Bridgewater Place is a landmark structure and the tallest building in Leeds. Topped out in 2005 the building's shape accelerates winds in severe weather to the extent that pedestrians experienced real difficulties walking nearby, with adjacent roads and main entrances to the building having to be closed for safety reasons.

As the prevailing westerly wind reaches the building it is deflected downward to ground level, this is known as 'downwash'. The wind mitigation measures comprising a series of perforated metal wind baffles, canopies and screens ameliorate the 'downwash', improving the environment for pedestrians, road users and the occupants of Bridgewater Place.

Judges' comment

This wind-swept urban space has been significantly improved for pedestrians and road users alike by a series of structural steel wind baffles and screens. Designed to withstand vehicle impact loading, construction was further complicated by restricted site access at this very busy intersection.

2021 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 2021 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 2019-2020; 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 26th February 2021

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.

2021 Entry Form

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 2021, I declare that this steel-based structure has been fabricated by a UK or Irish steelwork contractor. It was completed during the calendar years 2019-2020. 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 overleaf, 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)

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 26th February 2021

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

The British Constructional Steelwork Association Ltd
4 Whitehall Court, Westminster,
London SW1A 2ES

Tel: 020 7839 8566
Email: postroom@steelconstruction.org
Website: 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

Trimble Solutions (UK) Ltd.
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