OCTOBER 2023

NSC

Structural Steel Design Awards 2023


Make sure your Steelwork Contractor is RQSC approved

Cover Image
Copr Bay Bridge, Swansea
Architect: ACME
Structural engineer: Ney & Partners
Steelwork contractor: S H Structures Ltd
Client: City & County of Swansea
Image: © Hufton & Crow

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Tough judging makes for special Awards

Nick Barrett - Editor

The Structural Steel Design Awards has been showing the world the best of UK constructional steelwork for 55 years now, making the Awards one of the longest running in the construction industry. This year's winners and shortlisted projects are celebrated in this issue of NSC, and will receive wider publicity in key industry magazines.

The projects speak for themselves really, and the construction teams associated with all of them can feel justifiably proud of having produced work of this quality. Steelwork contractors are involved in this sort of quality every day of course, but even those that score fully on quality and the other features of constructional steelwork like speed of construction, flexibility, cost-effectiveness and demonstrably high sustainability credentials, can fall just short of making the SSDA shortlist - shortlisted projects have to have that special something extra that makes them stand out from the crowd and make it as far as being an SSDA National Finalist.

One special thing about the SSDA itself is its judging process. As Chairman of the Judges Roger Plank explains in this issue's coverage of the Awards, having the judges visit all of the shortlisted projects is a special feature. Desk top assessments, which is all many awards base decisions on, are only used to filter entries to the SSDA, after which all projects are invited to host a visit from judges.

As he explains, as well as all of the quality factors, the judges are looking for demonstrations from construction teams that a real commitment has been made to reducing lifetime carbon use. The projects gaining Awards, Commendations, Merits, in fact all of the National Finalists, have impressed the judges that they are making whatever contribution to achieving net zero carbon is currently possible.

That commitment is seen across an extremely diverse range of Awards this year. Battersea Power Station for example has been a widely loved London landmark for many years and steel has helped its transformation into a mixed-use destination that will impress for generations to come. A transformation of the obsolete concrete HYLO building, also in London, was made possible only with the use of structural steel.

Excellent sustainability credentials were particularly praised at One Centenary Way in Birmingham, creating an elegant, high-quality office building which has helped transform the area. Two outstanding bridges completed the Awards list. Copr Bay Bridge provides a dramatic new gateway to Swansea, using an innovative stressed skin design. Stockingfield Bridge in Glasgow provides new links between disconnected communities and much needed pedestrian and cycle routes across a canal and a road.

As well as high sustainability commitment, good design and quality construction, successful projects seem to benefit from close collaboration among construction teams, which the judges found throughout the shortlisted projects. Of the 21 shortlisted projects another six were given Commendations, and three achieved Merits, and as you can see in this issue of NSC, they all look like they could have justified Awards.

The judges admit that they have a hard task each year when comparing notes based on their site visits and talks with construction teams in deciding which to make the 'winners'. There aren't any 'losers' but consensus is eventually reached. It is an arduous process, but that is what makes the SSDA the highly regarded recognition of excellence that it has been for so long.

AWARDS

Battersea Power Station, London

Copr Bay Bridge, Swansea

HYLO, London

One Centenary Way, Birmingham

Stockingfield Bridge, Glasgow

COMMENDATIONS

Clery's Quarter, Dublin

Ed Sheeran Mathematics Tour

Montacute Yards, London

The Outernet, London

SAS13 Bridge Replacement, Birmingham

Tropical Fruit Warehouse, Dublin

MERITS

Cody Dock Bridge, London

Shipbuilders of Port Glasgow

New Riverside Stand at Fulham FC

NATIONAL FINALISTS

Farringdon Crossrail Station, East & West Ticket Halls

Church of Oak Distillery Ballykelly, Co. Kildare

Dukes Meadows Footbridge, Chiswick

Arbor, Bankside Yards, London

The JJ Mack Building, London

M8 Footbridge, Sighthill, Glasgow

The National Robotarium, Edinburgh

STRUCTURAL STEEL DESIGN AWARDS 2023

Winners announced at 55th Structural Steel Design Awards

BCSA President, Gary Simmons

SSDA guest presenter Emma Crosby

Five projects were Award winners at this year's Structural Steel Design Awards (SSDA).

The five winning projects at the 55th annual SSDA were Battersea Power Station, London; Copr Bay Bridge, Swansea; HYLO, London; One Centenary Way, Birmingham; and Stockingfield Bridge, Glasgow.

From an initial shortlist of 21 projects, all of this year's entries once again scored highly in terms of sustainability, cost-effectiveness, efficiency and innovation, with six schemes getting Commendations and three collecting Merits.

Jointly sponsored by the British Constructional Steelwork Association and Steel for Life, the SSDA's were announced at an evening reception at Christ Church Spitalfields Venue in east London.

Referring to the SSDA shortlist, British Constructional Steelwork Association President Gary Simmons, said: "The scale, scope and complexity of the projects are a great example of what can be achieved by our steel construction industry, even in challenging times. I would like to congratulate each and every project team for your outstanding achievements.

"I suspect that many of the schemes being celebrated here this evening have benefitted from the early involvement of the steelwork contractor.

"And since one of my aspirations during my term as BCSA President is to raise the profile of the steelwork contractor within the larger project delivery team, what better opportunity than tonight to raise this before an audience of main contractors, engineers, architects and enlightened clients."

Guests await the SSDA announcement

The Award winning teams

Battersea Power Station, London

Copr Bay Bridge, Swansea

HYLO, London

One Centenary Way, Birmingham

Stockingfield Bridge, Glasgow

NEWS IN BRIEF

Lindapter has announced that its carbon steel, hexagonal head Hollo-Bolts have been independently fire tested under tensile and shear loading with simultaneous exposure to standard fire conditions in accordance with ISO 834/ASTM E-119 for 120 minutes.

Morgan Sindall Construction's Eastern Counties business, alongside property consultants Concertus, have been appointed to deliver a 420-place net zero in operation primary school and pre-school in Lakenheath, Suffolk. The landmark steel-framed school will be a two-storey building, with attached leisure and sporting facilities and soft landscaping outdoor play areas.

ISG has started work on the site of the former Monwel Hankinson factory, Ebbw Vale, to create a new hi-tech post-16 education facility. The 2,000m² facility will provide state-of-the-art training and education for young people and businesses in the fields of robotics, advanced materials and manufacturing, and digital and enabling technologies.

Bruntwood SciTech, a 50:50 joint venture between Bruntwood and Legal & General has appointed GMI Construction for its latest £42M, 11,600m² specialist lab and office workspace. Located within Manchester University NHS Foundation Trust's Oxford Road Campus, it will offer world-leading, highly specialist space specifically designed to support companies working in precision medicine, including those in diagnostics, genomics, biotech, medtech and digital health.

Network Rail has awarded the contract to build the new railway station for Chelmsford's Beaulieu development to **J Murphy & Sons**. The £124M contract includes main construction work for the new station on behalf of partners Essex County Council and Chelmsford City Council. The facility will include three platforms with a central loop line and new tracks to enable stopping services to call at the station, while allowing fast trains to pass through unimpeded.

PRESIDENT'S COLUMN

At the time of writing this column, the UK Government had just announced a £500m contribution to keep open the UK's largest steelworks plant in Port Talbot, Wales. With additional major investment from the owners Tata Steel, this money will be used to fund the installation of new Electric Arc Furnaces (EAFs) to reduce the level of site emissions by 85%.

By the time this column is published, the UK Government may have also confirmed a similar arrangement with British Steel to invest in the same EAF technology at their Teesside and Scunthorpe plants.

Although the consequential restructuring of these large plants could regrettably result in the loss of many jobs, at face value it would appear to be a step in the right direction for steel production in the UK. This investment was sorely needed, but is it enough to revitalise the UK steel industry and is there a bigger strategy going forward?

Let's start by looking at some figures.

The UK currently produces around 6 million tonnes of steel per annum, one-sixth of which is already produced using the greener EAF technology. The introduction of new EAF's at Port Talbot alone will reduce the UK steel industry's carbon emissions by 7% and the UK's entire carbon emissions by around 1.5%.

In contrast, the world's leading steelmaker, China, currently produces over 1 billion tonnes of steel per-annum, with India following in second with over 300 million tonnes per-annum. Worryingly, almost all of this steel is produced using coal-powered blast furnaces.

Due to our current production limits, in order to meet the demand for steel in the UK, we need to import as much as we currently produce, and although approximately two-thirds of this additional volume is sourced in nearby Europe, the ongoing uncertainty on steel import tariffs and Brexit fallout could seriously compromise this necessity.

In specific relation to the UK steel construction market, we again rely heavily on the need to import certain products and grades, and there are no signs of this position changing in the foreseeable future.

Current data tells us that if we build sufficient EAF plants within the UK, we can supply them with the required volume of recycled steel to meet our demands, which would effectively convert UK steelmaking into a low carbon industry.

Whilst steelmaking accounts for just 0.1% of the UK economy, in my opinion, it's importance to national defence, transport, manufacturing and construction, means that we must have the confidence that it will remain a stable UK industry. So, why not widen the objectives and solve some major problems together?

- First, let's collectively agree that a UK steel industry is essential to UK security and the economy and, together with Government, work out a strategy to secure its future.
- Second, let's calculate the real investment and infrastructure needed to convert the industry to the technologies required (not necessarily limited to EAFs) to meet our 2050 net zero target.
- Third, let's plan and use that investment to increase the UK steel production to a more self-sufficient level of the specific products we use to reduce the reliance on major steel imports.

I know that some will argue it will take too long and cost too much, but what time and value do you put on controlling your own future, whether it be for security, the economy or the environment?

Gary Simmons
BCSA President

Work starts on giant Teesworks wind farm factory

Steelwork erection has begun on a £450M SeAH Wind monopile manufacturing facility at South Bank, Teesworks.

The 800m-long building will be the world's biggest monopile facility when complete and the first of its kind in the UK. Standing 40m-tall, it will annually produce up to 200 monopiles – which form the foundations of offshore wind turbines.

A landmark £100M-plus deal between SeAH, British Steel and Severfield has been signed, which will see material from British Steel's Teesside Beam Mill at Lackenby, near Redcar, used in the giant development. Severfield will fabricate the steelwork ahead of it being installed on the 90-acre site.

British Steel will supply more than 30,000t of steel under the agreement. Recycled steel from former steelworks sites will also be used in the new construction to help create the new facilities from the ashes of the old.

Tees Valley Mayor Ben Houchen said: "Our steel built the world from the Sydney Harbour Bridge to Canary Wharf. Now from our proud past we're building a bright future in the industries of tomorrow – and we're making use of what we do best.

"This once again shows how SeAH and the firms we're bringing to the Teesworks site are fully behind having a local workforce at the heart of making Teesside the green energy capital of the UK.

South Korean manufacturer SeAH's factory will comprise 105,000m² of high-quality factory space to produce monopiles up to 120m long, 15.5m in diameter and weighing 3,000 tonnes.

Steelwork starts on Derby's newest entertainment and conference venue

Main contractor Bowmer + Kirkland said it is on course with construction of the Becketwell Entertainment Venue as the important steelwork erection phase has now begun.

Shipley Structures is fabricating, supplying and erecting 1,500t of steelwork for the project and is due to complete its work in January 2024.

Heavy machinery will be helping the 10 operatives involved with fixing the steelwork into place and, with the heaviest single piece weighing 3.5t and the longest single span at 12.9m, it is said to be a mammoth task.

Developed on the site of the former Pink Coconut nightclub, the £45.8M Becketwell Entertainment and Conference Venue will be a fully flexible, scalable space. It will have a maximum seated/standing capacity of 3,500, while a secondary space will have a capacity of up to 400.

Bowmer + Kirkland Site Manager, Joshua Bredenkamp, said: "It's exciting to see the steelwork starting. Now everyone can see the structure taking shape and the venue really becoming part of the city landscape."

Paul Morris, Director of St James Securities, added: "We are delighted to see construction work underway on this exciting new entertainment, events and conference venue, which will serve the people of Derby and the wider region."

It is anticipated that the venue will hold hundreds of cultural and commercial events each year, offering a varied programme for local people and attracting an additional 250,000 visitors to Derby every year.

The project is due to be completed by early 2025.

Major commercial scheme planned for Manchester

Henry Boot Developments (HBD) is set to submit a major planning application for Colloco, a highly sustainable, 18,580m² office scheme within the St John's District of Manchester City Centre.

The development is targeting the highest levels of sustainability credentials including net zero carbon, a BREEAM 'Excellent' rating, as well as a 5.5-star accreditation for NABERS UK. It will also be compliant with British Council for Offices standards and include a host of amenities aligned with the WELL building standards.

Located at the edge of Spinningfields and the St John's district, the 16-storey building will front onto the corner of New Quay Street and Gartside Street. EPR Architects has designed the building to reflect the rich industrial heritage of the area.

The site was formerly home to the LTE Group's Manchester College before it relocated to its new campus last year. During the construction phase, 850 jobs will be created per annum.

Steelwork contractor gains carbon neutral certification

Billington Holdings, which is undertaking carbon reduction initiatives across the Group, has announced that its structural steelwork business, Billington Structures, has been certified as carbon neutral for its operations.

The Group has a commitment to achieve, as a minimum, the goals set by the Science Based Targets Initiative of a 50% carbon emissions reduction by 2030 and net zero by 2050.

Since May this year, Billington Structures has used electricity procured from 100% green energy with an accredited 0% emissions factor. Its vehicle fleet is increasingly electric, reducing carbon emissions by approximately 15% annually, and further planned reduction activities include the introduction of biofuel across factories and site-based activities.

Mark Smith, Chief Executive Officer of Billington (pictured), said: "We believe that operating in a sustainable and responsible manner is key to the growth and success of the Group. As part of this, Billington is therefore

committed to achieving carbon neutrality across all of its businesses as soon as possible, together with minimising the environmental impact of its activities."

Plans submitted for new Oldham Theatre

Architect Feilden Clegg Bradley Studios has put forward proposals for Oldham Theatre, a £24M new venue the council hopes will replace the town's Coliseum Theatre.

Designs submitted to Oldham Council include the transformation of the town's Grade II-listed former Post Office and former Quaker Meeting House into a purpose-built theatre.

The scheme's plans include 300-capacity auditorium, a 120-seat studio theatre, an education suite and a café with an outdoor terrace.

Councillor Arooj Shah, Leader of Oldham Council, said: "One of the very first things I did after becoming council leader was to meet with the Oldham Coliseum board.

"We agreed they will be tenants at the brand-new theatre we are building in Union Street – underlining our collective determination to work together for the good of the borough."

A triple-height front-of-house foyer will open onto Union Street, a major road running through the town, with an additional entrance connecting the venue with Oldham Civic Gardens if the plans get the green light.

Completion is anticipated in 2026.

Edinburgh city centre mixed-use scheme is gets the nod

Joint venture partners Mactaggart & Mickel Group, Mactaggart Family & Partners, Millard Estates Limited and Rennick have announced that the application for the demolition of the existing office buildings and erection of a new mixed-use development at Dundas Street has been approved by The City of Edinburgh Council.

The new development, comprising 49 flats with 3 commercial units, amenity space, landscaping, basement level car and cycle parking and other associated infrastructure, was recommended for approval by officers at The Edinburgh City Council and complies with The City of Edinburgh Council's Local Development Plan.

The development meets the council's aspirations for 20-minute neighbourhoods by making best use of a city centre site to create much-needed new homes, of which 25% will be affordable, within walking distance of work, shops, bars and restaurants with a bus stop on its doorstep.

The efficient reuse of previously developed brownfield sites is critical to the successful delivery of the new City Plan targets for homes in Edinburgh.

Andrew Rennick, Managing Director at Rennick said, "We are delighted that The City of Edinburgh Council has supported our vision to redevelop this part of Edinburgh in a sympathetic way that will reuse and repurpose an existing development site to deliver an exciting new mixed-use residential development with a host of local amenities adding to the vibrancy of what is already a very desirable location at the heart of Edinburgh's New Town."

Diary

For SCI events contact Jane Burrell, tel: 01344 636500 email: *education@steel-sci.com* web: *https://portal.steel-sci.com/trainingcalendar.html*

Wednesday 18 October 2023
Embodied Carbon - Your Project in a Global Context
Webinar
Climate change is a global challenge requiring joined-up, global solutions. Decarbonising steelmaking needs to happen but national, embodied carbon targets for buildings and infrastructure projects need to take into account, not only global supply and demand constraints, but also other broader sustainability considerations. This webinar will explain this global context in relation to structural steel and give an overview of what the sector is doing to decarbonise.

Tuesday 7 November 2023
Analysis & Design of Structures Against Explosions
Webinar, SCI/BCSA members only
This webinar will describe a method and software for estimating the blast load acting on a building, the calculation of material properties and the combinations of actions used in design against explosion loads. It will introduce simplified response analysis software which can be used for the dynamic analysis of structural steel components and building frames. It complements the SCI design guide P415 *Design of Low to Medium Rise Buildings Against External Explosions* (Which can be downloaded by Members for free once logged into SteelBiz)

Tue 14 & Thu 16 November 2023
Steel Frame Stability & 2nd Order Effects
Online
This course will demonstrate that second-order effects are always present, and how they are managed in design. Starting with members and then moving on to entire frames, the course will review the behaviour being assessed, and how this is covered in the design standards. The design of braced frames and portal frames will form the core of the course. Presented by David Brown, SCI

Frame up for speculative Widnes warehouse

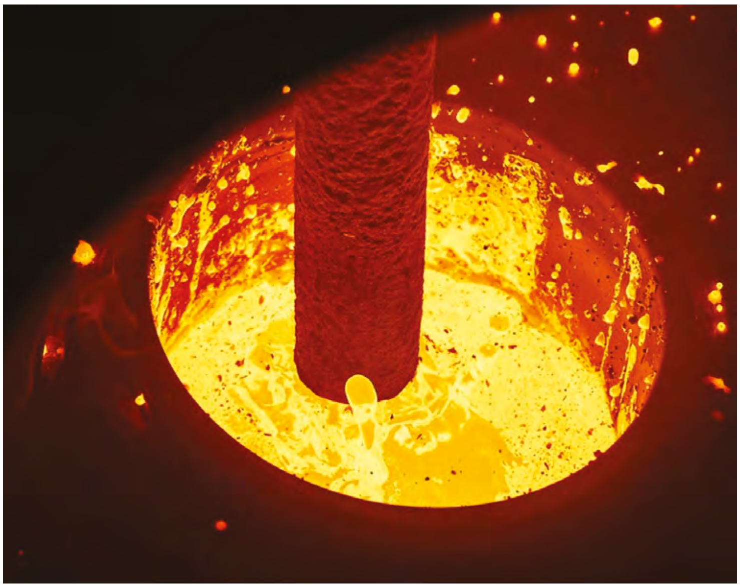
Work is nearing completion on an 18,580m² speculative warehouse at Viking Park in Widnes.

Located on a 12-acre former brownfield site, the project is part of the Mersey Multimodal Gateway development and other nearby businesses include Eddie Stobart, Tesco and Warburtons.

Being developed by Liberty Properties, the steel-framed structure is 16m-high, founded on 3,200 driven piles and features a total of 16 dock levellers. The structure also includes an integrated two-storey office block.

Working on behalf of main contractor Hargreaves Contracting, James Killelea fabricated, supplied and erected 750t of structural steelwork for the project.

Green light for South Wales steel decarbonisation centre



Morgan Sindall Construction has been commissioned to design and build a new £20M Swansea Bay City Deal-backed facility in Neath Port Talbot, which will help the metals and steel industry decarbonise.

Led by Neath Port Talbot Council in partnership with Swansea University, the facility will be known as SWITCH (South Wales Industrial Transition from Carbon Hub) Harbourside and will be located close to Tata Steel's Port Talbot plant.

The building forms part of the City Deal Supporting Innovation and Low Carbon Growth programme and is aimed at establishing the region as a leader in low carbon growth and the green economy. It is expected to take 18 months to complete.

SWITCH Harbourside will be a purpose-built open access centre establishing a collaborative network of expertise across academia, industry and government, aiming to accelerate the region's transition to net zero.

Professor Helen Griffiths, Pro Vice Chancellor Research and Innovation, Swansea University, said: "SWITCH Harbourside will showcase what can be achieved in a net zero future, both in its design and its purpose.

"SWITCH Harbourside will build on Swansea University's track record of bringing together academia, industry, local authorities and government. It will make Welsh research expertise more accessible to business and industry, to accelerate our transition to net zero."

Green light for Canada Water commercial scheme

Southwark Council has granted permission for a 140,000m² commercially-driven scheme at Canada Water in south London to go ahead.

The 4.5-acre site known as Canada Water Dockside is said to be one of London's largest and most innovative developments that sits at the heart of the wider Canada Water regeneration area.

According to the developer, Art-Invest Real Estate UK, it will bring an exciting and unique proposition; a new workspace hub offering Grade A, sustainability-led buildings with new places to eat, drink and relax fronting the water's edge, surrounded by 130 acres of open green space.

Canada Water Dockside will provide flexible and future-focussed workspaces for up to 10,000 people, alongside new community and public spaces providing a network of vibrant and socially and ecologically rich environments. Marking a departure from the traditional office offer, its designs respond to a post-pandemic paradigm change in aspirations for workplaces and draw on the area's abundance of green and blue infrastructure.

Comprising 22,296m² of space across 11 storeys, the project's main building will be a new type of office for London. It has been designed to meet ambitious sustainability standards, including BREEAM 'Outstanding'.

Structural Steel Design Awards 2023

One Centenary Way, Birmingham
Photo: © Sir Robert McAlpine

HYLO, London
Photo: © Michael Cockerham

The Judges

Roger Plank is a structural engineer and, having recently retired as Professor of Architecture and Structural Engineering at the University of Sheffield, is currently a director of Vulcan Solutions Ltd offering software and consultancy services in fire engineering. He has collaborated extensively with the steel construction sector in the fields of fire engineering and sustainability, and is a Past President of the Institution of Structural Engineers.

Richard Barrett was Managing Director of Barrett Steel Buildings for over 20 years prior to its sale in 2007 in a management buyout, and is Chairman of steel stockholder Barrett Steel. Richard studied engineering at Cambridge University, graduating in 1978. At Barrett Steel Buildings, he developed the business into a leading specialist in the design and build of steel-framed buildings for structures such as distribution warehouses, retail parks, schools, offices and hospitals. He was President of the BCSA from 2007 to 2009, and was a member of BCSA's Council from 1994 to 2017.

Paul Hulme joined Robert Watson & Co as an apprentice draughtsman in 1981. In the following 36 years he held positions in all areas of the company, gaining appreciation of all aspects of the steelwork industry, most recently in the role of Project Director. Over the years Paul has been fortunate to be involved in many complex steel structures, both in UK and abroad. Most notable are Kansai and Hong Kong airports, Terminal 5 roof, London 2012 Olympic Stadium and Wimbledon Centre Court Redevelopment. Paul currently works as an independent consultant offering design and buildability advice to the construction industry. Paul is a Fellow of the Institution of Civil Engineering.

Emily McDonald is a Partner in Buro Happold with over 25 years experience. A civil and structural engineer by training she originally joined the practice as a graduate fresh from Cambridge University. She has extensive experience having worked on a wide range of multi-disciplinary projects including innovative new builds and refurbishment schemes across a number of sectors and typologies. She had been involved in diverse and landmark projects notably Cutty Sark Conservation project and Phase One of the Battersea Power Station redevelopment, now known as Circus West village and Faraday House. She is currently the project principal leading large multi-disciplinary teams of engineers on several projects including: Stratford Waterfront East Bank, and the Barbican Renewal Project, caring for the things people love about the Barbican Centre, while opening up the creative experience for everyone.

Christopher Nash is a senior Consultant Architect. He graduated in 1978 from Bristol University School of Architecture and was a Director and Partner at Grimshaw Architects until retiring from the Partnership in 2012. While at Grimshaw Chris was responsible for many of the practice's high-profile buildings, through which he developed a working knowledge of the steel construction industry. Chris continues to practise as a consultant in architectural practice management, architectural education and property development.

Sarah Pellereau is an Associate Director at Elliott Wood with 21 years' experience. She has been involved in a number of award-winning schemes including leading a project shortlisted for the Stirling prize. As a Structural Engineer, she is rare in having graduated with a Part 1 in Architecture as well as a Masters in Engineering from the University of Leeds. She has a diverse portfolio of experiences in structural design but also has worked on-site with the CTRL alterations to St Pancras Station and tutored at Nottingham University.

Bill Taylor is an architect in private practice. Having joined architects Michael and Patty Hopkins straight from Sheffield School of Architecture in 1982, he became their first partner in 1988. In 2010 Bill left Hopkins Architects to concentrate on his own projects and since then he has also collaborated with architect Robin Snell and his practice. Bill is a founding member of Tensinet, the pan European organisation researching lightweight and tensile construction. He has been a member of the RIBA National Awards Group and CABE Panels and is a Senior Assessor and Client Adviser for the RIBA competitions programme.

Oliver Tyler is Managing Director of award-winning architectural practice WilkinsonEyre. Oliver joined WilkinsonEyre in 1991 becoming a Director in 1999. He has spent over 35 years in architectural practice and has extensive experience in leading and coordinating the design and construction of many high-profile buildings and infrastructure projects. Oliver has led a number of prestigious projects at WilkinsonEyre including Stratford Regional Station in London for the Jubilee Line Extension; the Dyson Headquarters in Wiltshire, regional headquarters for Audi in west London, the Arena and Convention Centre in Liverpool, the Emirates Air Line, the UK's first urban cable car. Oliver has recently completed a number of major infrastructure and commercial office schemes in the City of London, including Liverpool Street Station for the Elizabeth Line, the Bank Station capacity upgrade project, 8 Finsbury Circus and the 50-storey office tower 8 Bishopsgate.

Introduction

By Roger Plank – Chairman of the Judging panel.

This is my first year as chair of the judging panel and I am indebted to my fellow judges for making the role so easy and enjoyable. Each are experts in their own fields of architecture, engineering design and steel fabrication, and give freely of their time to make this Awards scheme such a success. Having returned to our normal pre-pandemic procedures last year we were again able to meet together to examine the schemes submitted and debate their merits, with members of the panel bringing their passion for high quality design and construction in steel.

The Awards scheme provides an opportunity for the sector to showcase excellence in the use of structural steel by practitioners in the UK and Ireland across a wide range of projects varying in scale, regional location and budget. We look for high quality in all aspects of a project, and are particularly interested in those which demonstrate a real commitment to reducing lifetime carbon use.

Again, this year there was a wide variety of entries ranging from the largest prestige city office buildings to elegant footbridges and public sculptures. Following our established practice, we met to make a preliminary selection based on a 'desk-top' examination of the paper submissions to give us a shortlist of projects to be visited. Companies submitting entries should therefore recognize the critical importance of this - a clear, concise, well-illustrated entry highlighting those aspects of the project which make it special will help in making the cut.

The entrants of the shortlisted schemes were all then notified and invited to host a visit by the judges. These visits are a special feature of this Awards scheme, giving the judges a firsthand opportunity to understand and experience the selected projects, and to quiz the project teams about any specific points. In this way we are able to build up a much clearer view of the special merits of individual entries and this is extremely helpful in coming to our final decisions. Again, visits which are represented by an informed, collaborative and enthusiastic team are particularly useful.

Once all visits had been completed the judging panel reassembled to compare notes and exchange views. It is not an easy task to compare such a diverse range of projects, considering their architectural and engineering merits, the quality of fabrication and assembly, any particular innovations or challenges, issues of sustainability, and the contribution they make to society at large. But the judges bring all of their professional experience and expertise to bear and, after a detailed discussion, we were able to reach a consensus.

In conclusion I can say, on behalf of all the judges, that the awards, commendations, merits and national finalists recognised in the Structural Steel Design Awards this year reflect the impressive quality of the current steel construction industry, and everyone involved should be proud of what has been achieved.

SSDA 2023
AWARD

Battersea Power Station, London

The landmark, Grade II* listed and much-loved industrial relic has been sympathetically transformed into a vibrant twenty-first century destination.

FACT FILE

Architect: WilkinsonEyre
Structural engineer: Buro Happold
Principal structural steelwork contractor: William Hare
Architectural structural steelwork contractor: CMF Ltd
Main contractor: Mace
Client: Battersea Power Station Development Company

Originally built in two phases either side of the Second World War, Battersea Power Station has been one of the capital's iconic landmarks for decades as its four chimneys are instantly recognisable to millions of people.

It once supplied around one fifth of London's electricity needs, but was decommissioned in 1983, due to its age and the subsequent output reduction.

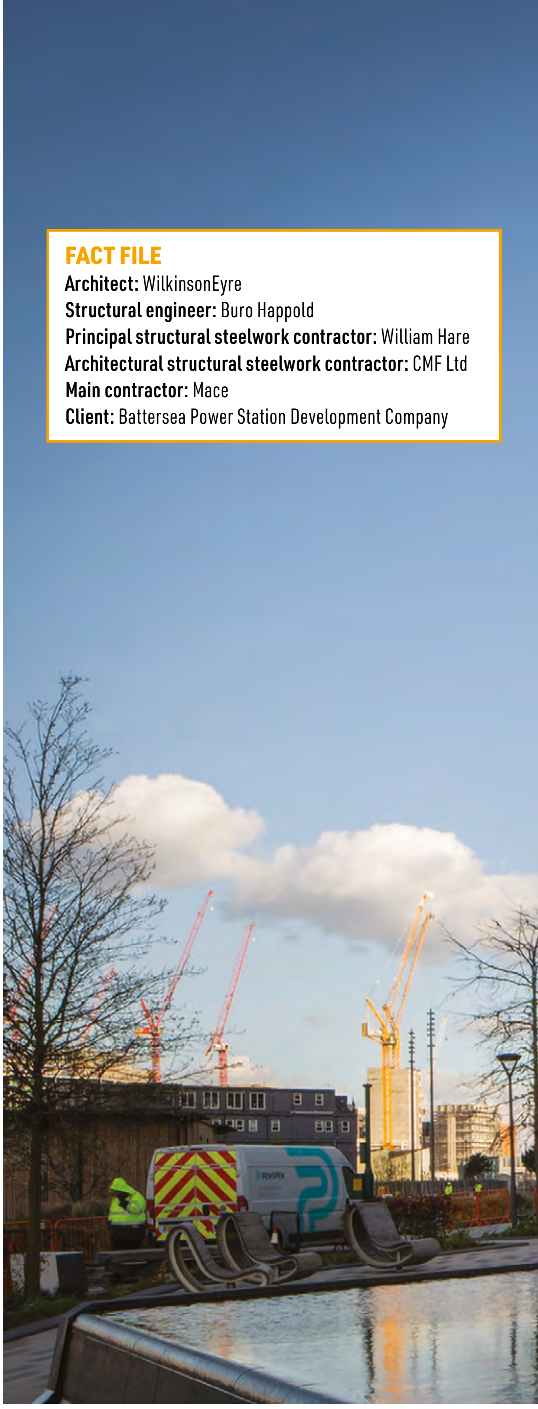
After a number of failed attempts to redevelop the site, the power station has now been transformed into a huge mixed-use scheme, which is served by the Northern Line underground extension and sits at the heart of a 42-acre regeneration of this former brownfield site.

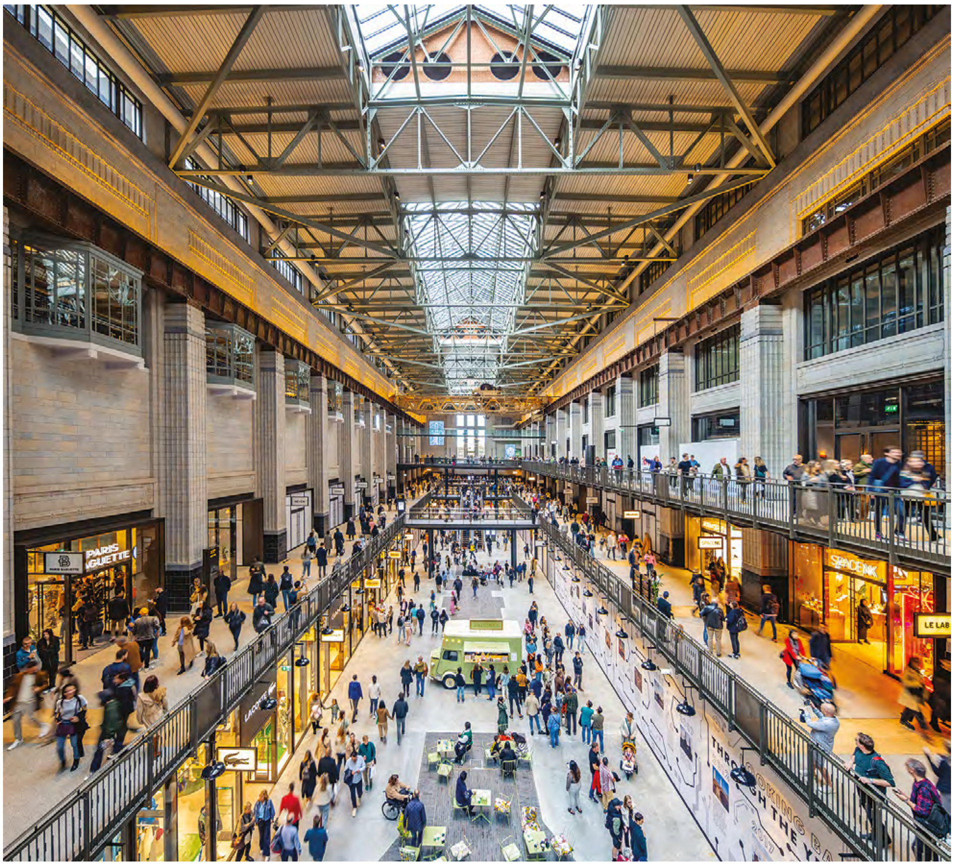
Work on the power station constitutes phase two of the project and included the brief to provide 252 apartments, restaurants, shops, cinemas, six floors of office space and an entertainment venue capable of accommodating 2,000 people.

The building can be divided up into a number of elements, consisting of a central boiler house, turbine halls, a switch room and annexes on both sides – east and west. Each of these elements are separated from the adjoining areas by internal walls, which are largely retained elements from the original building.

Within these retained elements, steelwork forms the new amenities with most of the floors having been formed with steel beams supporting metal decking, with the only exception being a few areas on the eastern side where precast elements were utilised for programme reasons.

Erecting these new steel elements was not a straightforward procedure as the entire programme had to be coordinated around a vast array of temporary works and bracings that had been installed to support the existing structure after a





© John Sturrock

partial demolition programme had been completed.

The temporary works could only be removed once the new steel frames had been installed and connected to the retained walls, thereby providing the required support.

"One of the biggest challenges was the integration of new steelwork elements and then connecting these to the original retained steel frames," says Mace Project Manager Andrew Barrow.

"Unsurprisingly, a lot of the old steelwork, which dates from the 1930s and 40s was in a poor condition as a lot of water ingress had occurred since the building had been decommissioned. This meant a lot of work was needed to treat the corrosion and rust."

To bring light into the building, the new floors were set back from the north and south elevations of the boiler house, thereby creating tall atria and exposing the as-found condition of the walls. New support was provided through a bowstring truss and façade restraint beams.

Within the boiler house there are five different elements including car park, retail, public/event spaces, offices and residential apartments all


© Buro Happold

stacked vertically on top of one another. They each required a different column grid pattern and through frame optimisation and organisation of spaces, these stacked usages were achieved with only two structurally super-efficient transfer levels, one of which doubles as a plantroom.

In the historic turbine halls, new structure was introduced behind the delicate heritage fabric, allowing features such as the new retail gallery decks to be introduced in a 'light touch' manner.

This approach required pinpoint accuracy to introduce columns set 75mm away from the existing structure to support new cantilevering turbine hall walkways and a new 13-storey building infill inside the adjacent boiler house.

To facilitate this proximity without compromising existing foundations, buried concrete-encased 24t steel beams cantilever over new piles to support the new columns.

The two turbine halls, which are approximately 150m-long × 25m-wide and 25m-high, house three-level retail zones, topped and spanned by a series of trusses, which support either glazing or roof gardens.

The western turbine hall's trusses date back to the 1930s-original build and have been retained, albeit with some strengthening works. The eastern turbine hall was a later addition, built during the second stage of the power station's construction in the 1950s. These trusses have been replaced with a new set to accommodate the increased roof garden loads. All of the new steel frames are independent structures getting their stability from new concrete cores, which have also been installed within the original structure. However, many of the steel frames are inter-connected to their adjacent frames, via floors and bridges.

At the northern end of the boiler house, framing the entrance to the main retail zone and events space is a large 27m-long × 2.6m-deep plated girder weighing a massive 62t, which is positioned at the underside of the fifth floor. As well as helping to create the large open space below, it also transfers a load in excess of 2,000t down the building, while supporting eight floors above.

The beam, which is one of the largest single pieces of steel to be manufactured in the UK in recent times, was brought to site in one section.

"The operation to transport the beam, lift and install it required detailed planning and close cooperation with our supply chain, local authorities and police. We also had to install one of Europe's largest tower cranes for the job," says Mr Barrow.

Working in conjunction with the large beam, and also helping to create the events space's column-free interior are two feature 12m-high steel trees, that each support a 30m × 30m floor area.

Principal structural steelwork contractor contractor William Hare delivered each of the two trees in three main elements, with a fully-welded base node weighing 48t being the first part. Four Y-shaped arms, each weighing 43t were then bolted to the node to form the main tree element, along with a further four infill arms, connecting up the main elements. Each tree has an overall steel tonnage of approximately 300t.

Summing up, the judges say the iconic Art Deco Battersea Power Station has been meticulously transformed into a contemporary mixed-use destination. The newly revealed steel structures reflect its industrial legacy, seamlessly integrating with the building's aesthetics. ■

Copr Bay Bridge, Swansea

A landmark gold-painted steel pedestrian and cycle bridge reconnects Swansea city centre with its renowned coastline and beaches.

Forming an integral part of Swansea's large-scale urban regeneration, Copr Bay phase one has reactivated a previously underutilised plot of land by delivering a state-of-the-art, 3,500 capacity arena, comprising a live performance area and conference centre, as well as new public realm including the city's first new coastal park since Victorian times, high-quality, new social housing and retail space for local businesses.

Creating a highly visual statement and connecting this development to the city centre by spanning Oystermouth Road's six lanes of traffic, a gold-painted steel pedestrian and cycle bridge has been installed.

The completed Copr Bay Bridge is said to provide a new gateway for Swansea and is a celebration of the city's past, present and future.

Designed by a local artist Marc Rees and architectural practice ACME, the 49m-long single span bridge is an eye-catching structure that is 12m-wide x 7.5m-high and has a structural skin of 15mm-thick steel plate. Featuring a distinctive gold paint finish, the side panel plates are perforated with numerous laser profiled cut-outs and pressed into complex shapes.

The design is said to balance a contemporary aesthetic with references that celebrate the city's heritage. The 2,756 laser-cut origami-inspired shapes, each dispersed across the panels, create a visually interesting pattern.

The perforations are abstracted and exploded silhouettes of swans, inspired by the emblematic Swansea bird. The bridge colour and lighting are designed to move in synchronisation with the illuminating facade of the arena, to create a Copr Bay district that pulsates with life at day and at night.

In acknowledgment of Copr Bay's history as the centre of coal and copper production, the bridge is said to have the colour of freshly smelted copper.

The bridge structure offers a degree of protection from the elements. The steel has been rolled into a double curved surface and butt-welded into a single tube. Openings have been cut into the sides where the structural stresses were lower, offering glimpses across the road, the arena and the new coastal park and to allow the bridge to glow at night from within.

ACME Design Director Friedrich Ludewig says: "The iconic arch stabilises the super-slender bridge deck and creates a new urban space floating over the road, enclosed by patterned steel offering

FACT FILE
Architect: ACME
Structural engineer: Ney & Partners
Steelwork contractor: S H Structures Ltd
Client: City & County of Swansea

All images on this spread © Hufton & Crow

glimpses across the road, the arena and the new coastal park.

"The choice of steelwork was primarily because of its structural properties and ability to span large distances. It gave the design flexibility to work with an interesting structural solution, essentially a deformed bow truss formed of plate steel, allowing the creation of the sculptural form, super thin bridge deck, and the opportunity to create a clear identity through the development of perforations in the truss walls and application of a gold paint finish."

Fabricated, supplied and installed by S H Structures, on behalf of the main contractor, the 140t bridge was delivered to site in sections, consisting of four deck pieces, six roof sections and 11 side panels.

The roof sections measured 10.5m × 4.1m × 600mm and the side panels were 2.8m × 6.9m × 15mm.

The largest steel elements to be transported to site and also the heaviest were the deck sections, measuring 24.5m × 6m × 2m and weighing 24.6t each.

"As the deck is only 15mm-thick and needed to be split longitudinal for transportation, the open end was extremely lively, both when being transported and during lifting," says S H Structures Project Manager Will Sharples.

"We had to come up with a bespoke transport lifting beam that strengthened the deck and allowed a multiple eight-point pick up procedure."

Once onsite, the bridge deck was assembled on temporary works positioned in an area adjacent to the bridge's final location. The curved plates, which form the sides, arch and roof were then welded into place, before the complete structure was given its final topcoat of gold paint.

The completed structure was then lifted onto self-propelled modular transporters (SPMTs) and manoeuvred onto its two concrete abutments during a Saturday night road closure.

After the bridge structure was in its final position, the steel deck had an anti-slip resin and aggregate finish applied.

Mr Rees says: "It has been the thrill of a lifetime to be involved in such an iconic part of the regeneration of my hometown. Dylan Thomas infamously described Swansea as an "ugly, lovely town" – whatever the merits of that when he said it, Swansea's aspiration to change, grow and flourish is more than apparent now. The council's transformation of the city is creating a modern, vibrant city and opportunities for residents, artists and businesses, both those who call Swansea their home and those who should."

In summary, the judges say the innovative stressed skin design and the quality of the manufacturing have resulted in an exemplary project. ■

SSDA 2023
AWARD

HYLO, London

A total of 13 new steel-framed floors have been added to a 1960s-built office block, resulting in one of the most pioneering tall building retrofit projects in London.

© Grant Smith

Located just north of the City of London, a 16-storey office block, built in the 1960s, has been reinvented by stripping back the original concrete frame and adding 13 new steel-framed floors to enlarge the structure into a modern 29-storey tower.

The works also included enlarging two podiums that sat adjacent to the building, removing and replacing two existing cores, and substantial strengthening works to the existing columns to allow them to support the extra loadings.

The scheme delivers flexible workspaces together with 25 units of affordable housing, and introduces a new public arcade, with shops, cafes and restaurants that will now transform this area of Islington.

The decision to refurbish and enlarge the building instead of demolishing it and starting afresh, had a number of benefits.

AKT II Associate, Michael Hynd, says: "The primary driver was minimising the embodied carbon of the scheme and being as environmentally-friendly as possible through reusing the inherent capacity in the existing structure.

"It is more sustainable to refurbish and enhance the building as opposed to undertaking a large demolition programme, which was something the local authority and the client was keen to avoid."

This refurbishment and extension solution for the site has doubled the leasable area, from 12,000m² to 25,800m², while saving 35% of the 'up front' embodied carbon in comparison with an equivalent new construction.

Information on the existing building was compiled from a series of engineering record drawings, and a fundamental redesign of the existing building followed an exercise which back-analysed the structure, verifying initial assumptions. This investigation and analysis showed that the original building had residual capacity within the floor slabs, which were believed to have been designed to accommodate printing works on some floors, and also the large diameter under-ream piles, which meant that large portions of the existing building, basement and foundations could be retained and reused.

"This analysis, with finite element modelling of the existing structure and foundation system were key to delivering the 13-storey extension. The whole project represents a best practice approach for the retrofit and large-scale retention and expansion of existing structures," says HCL Managing Director Stephen Cherry.

Although much of the original structure was retained, the building's two existing cores were demolished, as they were too small for the needs

FACT FILE
Architect: HCL Architects
Structural engineer: AKT II
Steelwork contractor: Bourne Group Ltd
Main contractor: Mace
Client: CIT Group

of the enlarged tower, and replaced with a new core configuration that facilitated a more efficient floorplate, while also providing stability for the 13-storey vertical extension.

The choice of structural steelwork for the new upper floors was made due to the material's lightweight attributes, which minimised the additional loading, and speed of construction. No other framing solution would have allowed the existing foundations to be reused, while achieving the desired spans and floor zones in the extension floors.

Throughout the structure, the concrete columns were strengthened with concrete jackets, installed on every floor. The only exception were some areas where the internal architectural vision required a slimmer solution and in these places steel strengthening collars were used.

From level 16 upwards, new steel columns were installed on top of the existing concrete members. However, the existing grid pattern is based around a column spacing of 6.1m × 7.6m. This was deemed to be restrictive for the new floorplates and so some column positions have been omitted, with the upper floors having just one row of internal columns and spans of up to 12m.

All of the steelwork is standard S355 grade, and the beams are all custom-made plate girders, with depths ranging from 525mm to 665mm. Modular pieces for the perimeter, weighing up to 7t, were also introduced to reduce the number of crane lifts. The floorplates are generally repetitive up to level 25, but level 26 has a step-back creating a terrace.

Bourne Steel Project Manager Theodoros Pitrakkos says: "Considerable planning was required to devise a construction programme that allowed the works to be continuous. To achieve this, the floorplate was split into three main areas and the steelwork was built three floors at a time. Primary activities involved welding fittings to cast-in plates in the concrete core walls for beam connections, steelwork erection, metal decking works and on-site painting. These activities continuously rotated throughout the floorplate to meet programme."

With the steel frame starting at Level 16, Bourne's main challenge was dealing with high winds during construction, while maintaining the programme and the tight erection tolerances. Because the site is a confined high-rise plot, there was limited storage space and so the steel was generally erected directly from the delivery trailer by tower crane in conjunction with MEWPS.

According to the client, HYLO is a design-led work and lifestyle office development. As the line between corporate and creative becomes more integrated, HYLO delivers a workplace solution that offers flexible spaces that embrace collaboration and connectivity at the same time.

The tenants enjoy the latest building amenities and specification with unparalleled views across London, while the landscaped roof terraces, breakout spaces and dining areas create a relaxed environment away from traditional desks.

There are generous locker and shower facilities, as well as cycle storage for over 400 bikes, and an expansive ground floor reception incorporating a modern lounge and café.

In summary, the judges say this exemplary transformation of an obsolete sixties concrete 'monolith' was made viable only by the ambition of the client, the skill of the team and the use of structural steel. ■

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One Centenary Way, Birmingham

Spanning the A38, a 13-storey steel-framed structure, featuring exoskeletons on four elevations, was the first building to be constructed in phase two of Birmingham's Paradise development.

The One Centenary Way project is a stand-out commercial building featuring an expressed steel exoskeleton on all four elevations, while the exposed nature of the steelwork also extends to the interior of the building, where columns, beams and connections are on show.

Below ground level, the steelwork is equally impressive as just over 60% of the total footprint of the building is sat on top of a series of trusses that span the A38 dual carriageway tunnel, a key transport artery through the city. In addition, the site also overlays a major services tunnel.

"One Centenary Way is an important building for the Paradise masterplan because it was the first building of Phase Two to complete. It is also an important building for Birmingham, not least for its green credentials but it's also the first commercial exoskeleton building in the region," says Glenn Howells Architects Partner Dav Bansal.

Approximately 1,950t of the project's overall 7,450t structural steelwork tonnage, was used to fabricate the 12 × storey-high trusses, which are up to 34.5m-long and weigh up 130t.

Fabricated at BHC's Lanarkshire facility, the trusses were transported to site as complete sections, measuring up to 6.15m-wide. Once on site, a 1,200t-capacity mobile crane, one of the largest in the UK, erected each of the trusses.

Ramboll Principal Engineer Daniel Yoxall, says: "Although the trusses were delivered and lifted into place as individual items, 10 of them are installed as pairs, tied together in-situ with cross members, as this configuration was better suited to transferring the loads from the building above to the foundations below. The exceptions are two single trusses at either end."

The trusses form part of the basement level and their top chords help create a platform to support the majority of the building's structural frame. One of the building's two basement levels is accommodated within the trusses' depth. This upper basement floor houses a well-equipped and accessible cycle hub for the whole estate. With up to 350 spaces, this is Birmingham's first city centre major cycle hub offering associated facilities including showers and locker rooms together with servicing and bike hire. The part of this floor level that is not within the trusses accommodates a

© Greg Holmes

retail basement area and vehicular ramps for the car parking that is also located in the basement.

Due to the tight site constraints, a typical load-bearing core with columns going into the ground to hold the building up and give it stability was not an option. The project's design team's solution was to use the building's façade to provide the stability in the form of a Vierendeel exoskeleton.

As well as the stability provided by the exoskeleton, there is also a centrally-positioned steel braced core that provides some more rigidity.

"The exoskeleton on its own doesn't provide enough stiffness for the overall structure, so the two stability systems work in tandem," explains Mr Yoxall.

The project used a steel core, instead of a concrete one as the former offered a lighter solution. This was important, as the core had to be positioned on top of the trusses, so it could sit in a central position within the building and thereby satisfy the desired internal office layout.

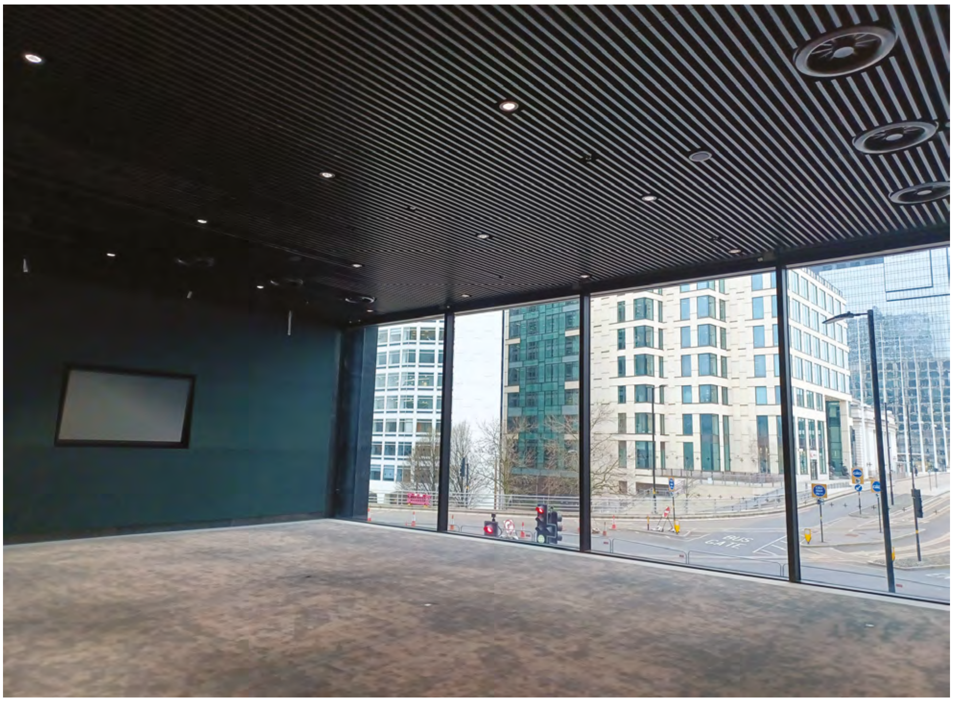
The Vierendeel exoskeleton is formed with a series of vertical and horizontal steel sections forming 12m-wide rectangular boxes. The rectangles incorporate 3m-wide horizontal windows, encased within an exposed structural steel façade. The interior of the building offers large office floorplates, as well as retail space at ground floor level. The column grid is based around a 12m × 9m spacing, as this layout requires minimal internal columns, while also providing the desired modern open-plan office layout.

Within the building, cellular beams have been used throughout to accommodate the building services within their depth. They support metal decking, which along with a concrete topping forms a composite flooring solution for every level above the ground floor slab.

As well as retail, the ground floor also has a triple-height reception area with a floor-to-ceiling height exceeding 9.5m. To accommodate this much higher and impressive reception area, the first floor does not cover the entire building footprint. The upper floors have a standard 3.8m floor-to-ceiling height.

Another unique feature of the building is the lantern area that sits on top of One Centenary Way. The lantern is made up of 504 individual glass units with 576 reflective backing screens. The screens are controlled by a panel that allows over one million colours to be chosen, allowing the building to play its part in supporting and highlighting key dates and causes.

Summing up, the judges say this elegant, exposed steel structure springs off a system of trusses spanning a busy road tunnel. The result, is a high-quality office building with excellent sustainability credentials which has helped transform this area into a pedestrian friendly campus. ■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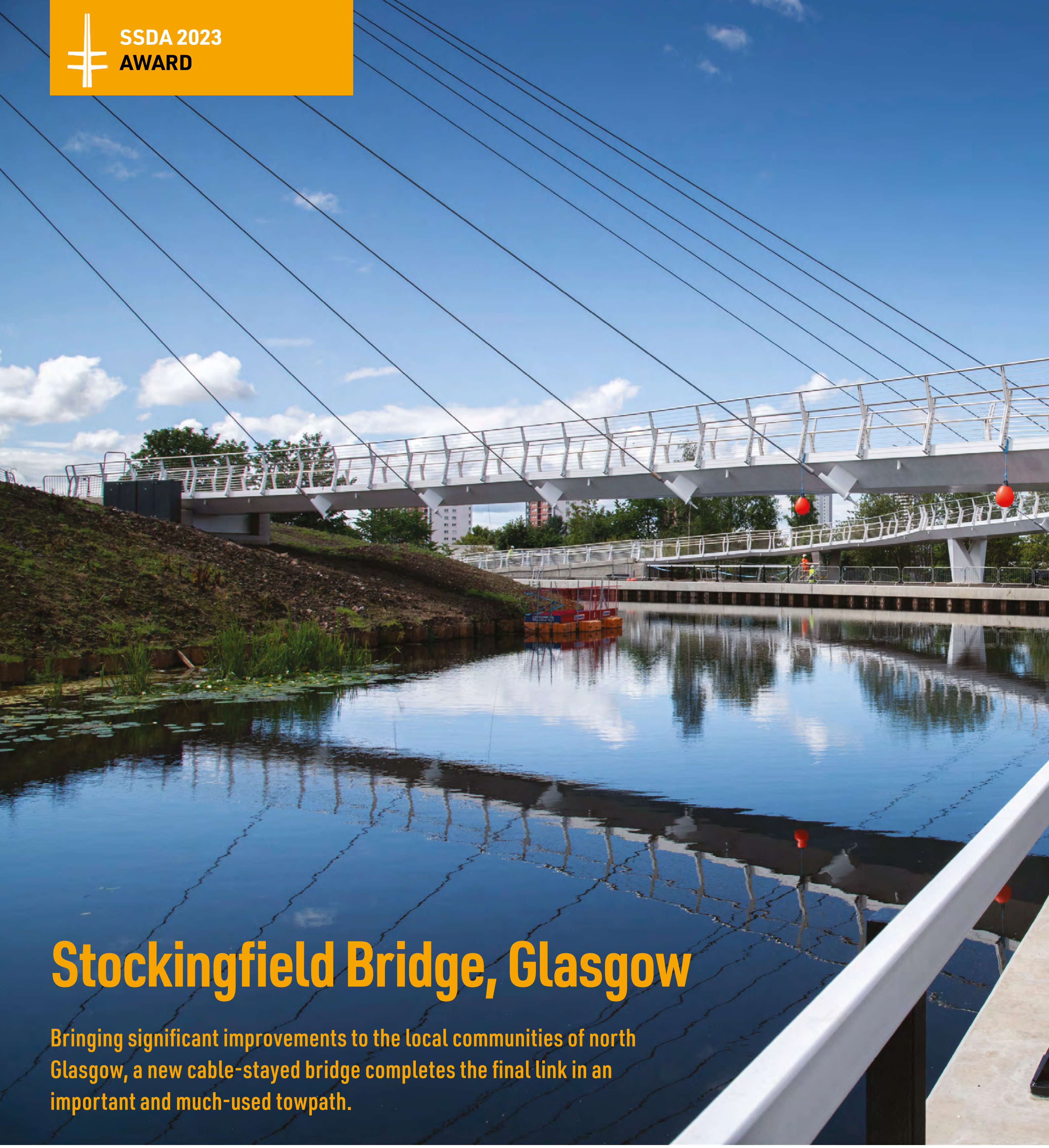


SSDA 2023 AWARD

Stockingfield Bridge, Glasgow

Bringing significant improvements to the local communities of north Glasgow, a new cable-stayed bridge completes the final link in an important and much-used towpath.

Funded by the Scottish Government through Sustrans, and the Glasgow City Council's Vacant Derelict Land Fund, the £13.7M Stockingfield Bridge reconnects the communities of Ruchill, Gilsochill and Maryhill in north Glasgow and completes the last link in the Forth and Clyde Canal towpath.

The two-way spanning cable-stayed pedestrian and cycle bridge opens routes for leisure and to employment opportunities in the west end and city centre. The 3.5m-wide bridge comprises two curved single span decks suspended on a network of cables connected to a single inclined pylon situated on the east bank of the canal.

The new crossing allows pedestrians and cyclists to cross the canal at towpath level rather than having to exit the towpath to use a potentially dangerous road tunnel.

The topography of the site was one of the many challenges faced by the project team. The significant difference in level from the top of the site to the towpath led to a cable-stayed design with a 35m high pylon. At that height, the pylon was potentially unstable in high winds. To overcome this, the natural terrain was used to create a 5m-high platform at the base of the pylon which was tied back into the hillside. This was developed to improve the overall aesthetics of the bridge while providing the community with a viewing platform and, crucially, mitigating the structural effects of wind.

The client was keen that community engagement played a vital part in the project's ultimate success. Residents and community groups were consulted from concept to completion giving them a real sense of ownership. High on the residents' original wish list were attractive landscaping, a viewing point, and the inclusion of public art, all of which have been provided.

In addition, to ensure that the space is safe

FACT FILE
Architect: Jacobs
Steelwork contractor: S H Structures Ltd
Main contractor: Balfour Beatty
Client: Scottish Canals

for female users, the project team worked with a Glasgow violence against women and girl's charity, Wise Women. As part of this collaboration, local women visited the site and provided feedback on lighting, access, and layout.

The existing site included an area of waste land. This has been landscaped with the introduction of trees, shrubs, and hedges, 65% of which are native species, which provides a safe, public space, where anyone can access the community observation platform to enjoy the canal and surrounding area.

Following the initial community engagement 14 submissions were received for potential artwork to be included on the site with eight being selected. These include ceramic panels and paving stones based upon community-produced artworks.

The steel fabrication and assembly of the bridge and mast also presented a number of challenges. Heavily plated structures, such as the bridge's curved, tapering, trapezoid-shaped twin decks, are prone to weld shrinkage and distortion during fabrication.

The use of bespoke jigs, welding control and dimensional monitoring were all employed to eliminate the risks. The project team also redesigned the internal stiffening configuration of the bridge

© Peter Sandground

decks to reduce the number of longitudinal stiffeners and transverse diaphragms, used to control plate buckling, by up to 50%. This reduced not only the steel weight, saving both cost and carbon, but also, crucially, the amount of welding required, which in turn reduced heat induced distortion.

"Other materials for the bridge were considered, such as concrete and timber," says S H Structures Sales Director Tim Burton. "Steel was selected as it was the most structurally efficient and cost-effective solution."

The construction team considered various options for the installation methodology. Taking into consideration time, cost, safety and environmental issues, the solution chosen required the temporary closure of the canal. The waterway's sides were protected with sheet piles and, using carefully selected fill material, temporary working platforms, or causeways, were created within the waterway to facilitate the bridge construction.

The complex nature of the project combined with the restricted sloping site demanded close collaboration between the various contractors to ensure the project was installed safely and efficiently.

The reduction of carbon within the construction played an important part in the design and the selection of materials. Various initiatives were introduced to reduce the carbon footprint of the project, through design. As well as the redesign of the bridge decks' internal stiffening, these included the reuse of the temporary causeway material as part of the site's landscaping, the use of recycled materials in the asphalt and the use of more sustainable cement replacements in the concrete mixes. The project also recycled 3.75 tonnes of plastic waste.

Officially opened on 3rd December 2022, the project has been overwhelmingly welcomed by the community it serves, who demonstrated their support for the project by turning out in their hundreds to witness the opening ceremony.

Summing up, the judges say this is a well-conceived, finely executed project providing significant practical and social value with new links between disconnected communities and much needed pedestrian and cycle routes across a canal and adjacent road. ■

SSDA 2023
COMMENDATION

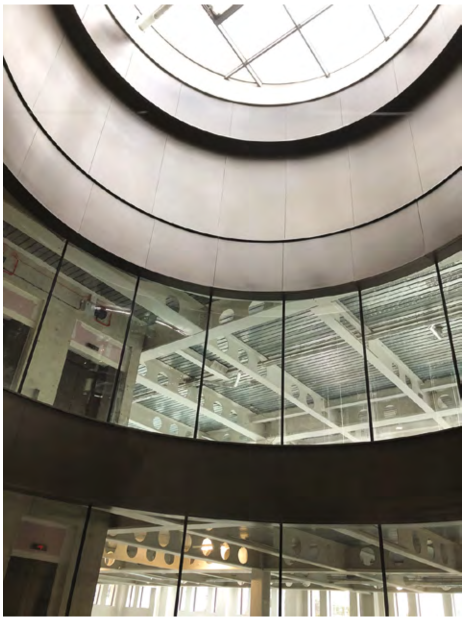
FACT FILE
Architect: Henry J Lyons
Structural engineer: Waterman Moylan
Steelwork contractor: Kiernan Structural Steel Ltd
Main contractor: Glenbrier Construction
Client: Oakmount

Clery's Quarter, Dublin

One of the world's first purpose-built department stores has been refurbished with structural steelwork to create a new city centre mixed-use development.

Opened in 1853, but largely rebuilt in 1922, Clery's department store was for many years a Dublin landmark that sadly closed its door to shoppers in 2015.

A major refurbishment has brought the building back to life as the centrepiece of a new mixed-use development. The work included the removal of alterations built in the 1940s and 1970s to bring the protected structure back to its original architectural expression.



The building was then vertically extended with a new third, fourth and fifth level along with a glass cylinder atrium, lift cores, and a bespoke curved roof structure. Overall, the floor area was increased from 10,000m² to 16,500m².

As the existing structure could not support the vertical extension, the new frame had to be threaded through the existing structure and supported on new micropile foundations. The new perimeter columns could only be positioned behind the existing columns to maintain the façade and minimise their impact on the existing floorplates.

To minimise the new foundation work, a lightweight solution was required for the new vertical extension. This, along with a requirement for long-span beams from the façades to the central cores led to a steel-framed solution to deliver the scheme and minimise the impact on the existing structure.

"The scheme, to vertically extend while retaining as much of the existing frame as possible, could only have been realised utilising a structural steelwork framing system," says Waterman Moylan Associate Anthony Byrne.

"The ability to retain over 60% of the existing structure through application of the steel framing meant that the upfront embodied carbon for the development was limited to approximately 400kg CO_2e/m^2, which would put it on the lower band of structural embodied carbon in direct comparison to similar commercial and retail developments."

After removing the existing cores, it was necessary to maintain the stability of the overall structure by including a new steel vertical bracing system before the new cores were installed.

Notably, a new steel frame was installed behind the existing façade and raked back to these temporary stability elements. Following the construction of the new framing, these restraint elements were integrated into the permanent scheme via cantilever trusses installed to create a viewing platform behind the length of the retained façade. This helped integrate the façade restraint steelwork into the permanent diaphragm.

The new three steel-framed floors were constructed using long-span cellular beams from the new columns adjacent to the perimeter façade to the internal core areas. The use of cellular beams facilitated service integration to maximise the beam depth, while minimising the floor zone. The curved bespoke roof structure was also constructed using cellular beams supported on the perimeter columns and cores.

The judges say the architectural intent sought to repair and renew the original building, adding a sympathetic vertical extension, turning the former department store into high-quality mixed-use accommodation. ■

Ed Sheeran Mathematics Tour

Said to be the first use of a temporary demountable self-supporting structure, a unique steelwork project is currently travelling the world with a famous pop artist.

Ed Sheeran's ongoing Mathematics world tour features a unique steel structure that allows the artist to appear in the round, whereby the audience surrounds the stage, adding intimacy to each performance.

As a conventional stage set-up was thereby out of the question, the usual configuration has been replaced by a unique structure from which all the equipment, such as lighting and LED screens, are suspended.

Designing this structure had a number of challenges, not least that it had never been done before and so there were no examples to follow.

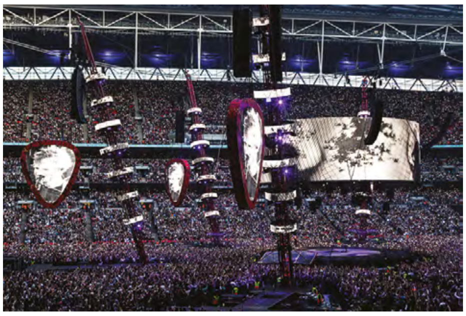
The main requirement was for a structure that could be easily transported, unloaded and erected in just three days within different stadia around the world and then dismantled in an equally short period of time.

The resultant touring structure consists of six 30m-tall steel truss masts, positioned around the central stage, supporting a 60m-span cable net constructed of 22mm diameter galvanized steel spiral strand cable. This, in turn, is used to suspend the central 21m-diameter, 45t circular transparent LED screen over the stage, as well as 10t of audio systems. Additional audio systems and double-sided LED screens shaped like plectrums, both weighing 22t, are suspended from the top of each mast, adding cutting-edge production to a unique structure.

All of the production items are suspended from the top of the steel truss mast or the central cable net, which supports them via pure tension. The central cable net is horizontally restrained by the back-stay cables, which also act in tension and are anchored to the base frame, where ballast is provided to prevent any uplift.

The masts restrain the central cable net vertically and, acting in compression, provide a way to transfer the gravity loads to the ground. The mast supporting steel base frames are designed to safely spread the loads on the field of play and transfer the horizontal base reactions to the field cover (which is always present to protect the pitch) in friction, effectively closing the 'circle' of the load path.

The tension forces in the back-stay cables and the radial cables connected to the top of the masts are constantly recorded using load-monitoring pins. All the values are accessible in real time from control



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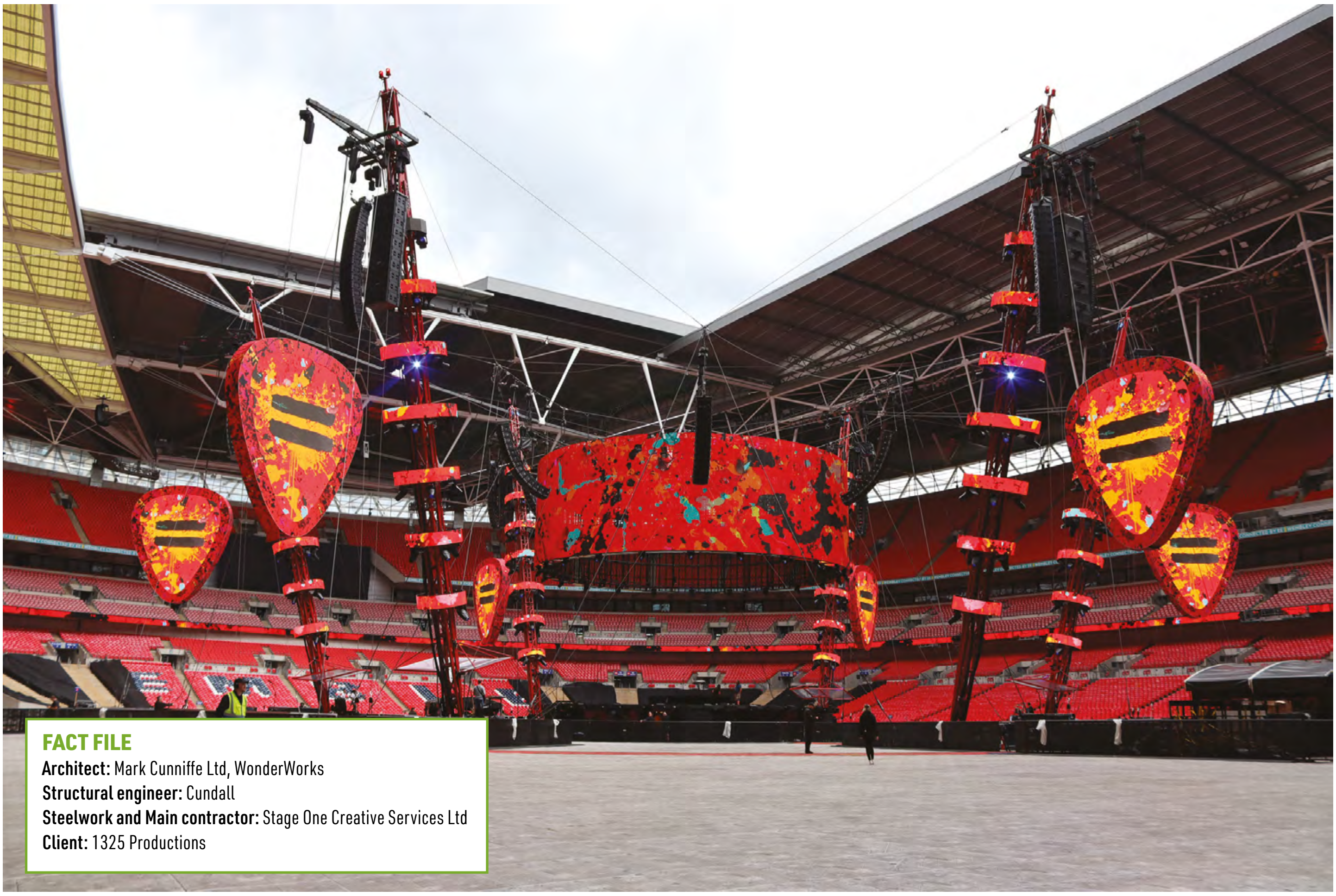
boxes located at the base of the masts, or on a cloud platform.

The entire structure was trial erected and load tested one month prior to the start of the tour. This also provided an opportunity to practice the erection process and hone the erection riggers' experience to achieve the fastest possible build time, which was 15 hours for 180t of steelwork.

Two sets of steelwork were designed, detailed and fabricated in six months. After one season of touring, comprising 52 gigs and 11 builds of each system, remedial inspection revealed no structural issues and only minor cosmetic repairs were required. The systems are currently in their second season of touring the world.

The judges say this is a very good example of how structural steelwork can provide a temporary demountable structure. By adopting techniques typically used in other areas of construction, the team has developed an easily deployable structure capable of accommodating the variable constraints of multiple locations. ■



FACT FILE
Architect: Mark Cunniffe Ltd, WonderWorks
Structural engineer: Cundall
Steelwork and Main contractor: Stage One Creative Services Ltd
Client: 1325 Productions

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SSDA 2023 COMMENDATION

Montacute Yards, London

FACT FILE
Architects: Allford Hall Monaghan Morris
Structural engineer: Heyne Tillett Steel
Main contractor: ISG Ltd
Client: Brockton Everlast

Comprising new offices, retail outlets and a warehouse, alongside the refurbishment of a Grade II listed Georgian townhouse, a Shoreditch brownfield site has been integrated into the wider public realm.

Montacute Yards is said to celebrate the industrial heritage of Shoreditch through the creation of a two-storey warehouse. Conceived around generous volumes and featuring a steel exoskeleton, the overall project also creates two new office and retail buildings with a glazed connection, while an adjacent Grade II listed townhouse has been refurbished.

At the heart of the project's design was the desire to express the structure, which has been articulated through the external and internal exposure of the steel frame.

A steel-framed solution is said to have been chosen as it provided the desired industrial look, was lighter than alternative solutions, suited the transfer structures that frame the elevations of the building and reduced the foundation costs.

The use of hot rolled steelwork combined with composite steel and concrete slabs was a cost-effective structural solution and through careful detailing of the steelwork connections the structure could be expressed, reducing the costs typically associated with finishes.

Structural thermal break-pads carefully detailed into the connections at the façade, allow the steel exoskeleton to be achieved without affecting the thermal performance of the building. The heavily constrained site and limited loading space meant the project required a building which could be erected quickly, with bulk deliveries at appropriate times, which again suited a steel-framed solution.

The integration of the structure and services to meet architectural requirements was coordinated through a BIM process, which ensured that penetrations through the steel beams aligned with the layout of service distribution.

The external steelwork introduces complications with thermal expansion and contraction with changing weather. On other exoskeleton schemes, primary structural members have typically been detailed to resist these movements by holding them in place, and designing them for the residual internal stresses that develop.

On this scheme, movement joints were introduced into the external steel frame, to allow the expansion and contraction to occur without inducing stresses in the structure. The design was carefully considered to ensure the frames were independently stable, and could still provide vertical support to the main structure. The result is an external steel frame with members sized appropriately for their function, and a structure which can adapt to changes in external temperature.

For fabrication and erection, the structural frame was modelled in 3D in both analytical and BIM formats, allowing coordination between the design team to be fed back into the structural design model seamlessly.

The judges say an ingenious backyard development on a severely constrained unpromising site, which draws upon the industrial heritage of the area. The legibility of structure leaves one in no doubt that this is a steel building. Together, base building and fit out combine seamlessly to create a well-considered, flexible and attractive project. ■

All images on this page © Timothy Soar

The Outernet, London

Music, arts and culture are at the heart of a four-building development that sits adjacent to London's Denmark Street, a thoroughfare steeped in musical heritage and also known as Tin Pan Alley.

FACT FILE
Architect: Orms
Structural engineer: Engenuiti
Steelwork contractor: Severfield
Main contractor: Skanska UK
Client: Consolidated Developments Ltd

© Jake Davis/Khroma Collective

Entertainment spaces form a key element of Central London's The Outernet, which overall provides around 23,230m² of mixed-use space, spread across four buildings and a large combined basement.

The largest of these venues is the Urban Gallery, a four-storey column-free space that forms part of Building A, which is a seven-storey steel-framed structure that also contains hotel, office and restaurant spaces.

Effectively the face of the project, The Urban Gallery is a flexible, interactive events space that contains one of the world's largest LED screen installations.

"The urban gallery's concept is built on the musical and creative past of Denmark Street and provides a venue relevant for the 21st Century," says Orms Project Architect and Associate, Andrew McEwan.

"A series of sliding doors allows the Urban Gallery to be open to the general public or closed for private events, while the moving three-storey high louvres situated above the doors can be open for most of the day and evening allowing the gallery to essentially be a covered outdoor area. They bring a real sense of theatre to the building."

One of Building A's columns in the north-west corner sits directly above a lift shaft for adjacent Tottenham Court Road tube station and so foundations were out of the question and it is consequently hung from cantilevering steelwork.

Some large beams in the gallery, up to 34t in weight, connect to this hanging column and transfer the loads from above onto adjacent columns.

"These beams are so large because they also support the 24 moveable louvres, that weigh four tonnes each. Consequently, there are some considerable loads being transferred to the box section columns," says Engenuiti Associate Ian Hamilton.

A series of three 24m-long two-storey high trusses form the lid to the gallery, with parts of the building's upper floors accommodated within their depth.

The Urban Gallery fills roughly two-thirds of Building A's footprint, with a smaller area to the south formed in a traditional beam and column configuration around a central core. The rear part of the building, as well as part of the top three floors, accommodates an hotel, alongside offices, conference spaces and a top floor restaurant.

The subterranean parts of the scheme dictated the construction programme and methodology. To construct the scheme efficiently and within the timescale a top-down method was adopted, whereby the basement was dug-out while the steel frames for Buildings A and B were simultaneously erected above.

The basement houses the steel-framed box-in-box HERE at Outernet venue. This 18m x 30m column-free, three-storey high entertainment space is acoustically isolated from the Crossrail and Northern line tunnels that sit below and adjacent to the basement and sits upon over 250 individual bearings.

In summary, the judges say the complex Outernet project at the heart of London's nightlife district, cleverly integrates a spectacular immersive digital Urban Gallery above a large performance space built between two underground rail lines, and a grassroots music venue within the sensitively preserved, heritage neighbourhood. ■

© Andrew Parish

FACT FILE
Structural engineer: Tony Gee & Partners LLP
Steelwork contractor: Severfield
Main contractor: Skanska UK
Client: Network Rail

SAS13 Bridge Replacement, Birmingham

Forming an important part of the HS2 line approach to Birmingham, a weathering steel Warren truss structure is the longest railway bridge in the Midlands.

Located close to Birmingham city centre on the Stechford to Aston (SAS) line, the SAS13 bridge is a single-span weathering steel Warren truss structure spanning 92m.

Designed to minimise disruption to the railway network, the construction of the bridge only required three weekend closures of the lines over which it spans, while the SAS lines were closed for a period of just three weeks.

The old viaduct, which the bridge replaces, was demolished in two stages. In the first stage, the steel deck was lifted out by crane and removed. Following this, the masonry arches were mechanically demolished by large excavators operating at ground level.

The whole scheme was designed to make the structure buildable within a short rail blockade, with limited time available to install the bridge. This led to the decision to build offline and use Self-Propelled Modular Transporters (SPMTs) to lift and transport the bridge into its final position.

The new replacement bridge comprises 1,095t of weathering steel, chosen because it will require less maintenance in the future compared to other grades of steel, and 26,715 bolts, which weigh a further 25t.

Once the steel bridge structure was assembled offline, it was jacked up to a height of 5m from a build height of 1.5m. The fibre-reinforced concrete deck slab, upstands and walkways were then cast, comprising 3,601m³ of concrete, which added a further 1,600t to the overall weight of the bridge.

Once the deck the completed, 18 SPMTs were used to lift and transport the bridge into its final position. Each SPMT had 12 axles, which meant a total of 216 axles and 432 wheels were used to move the bridge from its fabrication compound to its final position.

Within 1.5 hours of starting the move in the fabrication yard, the bridge was placed in its final position with 75% of the load on the bearings. The entire installation period took just under three hours to complete.

At the same time as the bridge was being fabricated and assembled offline, the new bridge abutments and foundations were being constructed. On the west side, the site constraints meant that large diameter piling was not possible. The foundations were instead designed as 4.5m diameter 'monopiles' constructed as caisson shafts either side of the viaduct.

Meanwhile, access to the east abutment was less constrained and so large diameter bored piles were chosen as the most economical foundation solution.

Overall, offsite fabrication and assembly of the bridge adjacent to its final position cut the number of lorry movements along local roads, while minimising both carbon emissions and the impact to the local community.

In summary, the judges say with careful planning, taking full advantage of lessons learned on earlier projects, the bridge was installed fully assembled with minimal line closures. Constructed in weathering steel it provides a handsome addition to the local environment. ■

Tropical Fruit Warehouse, Dublin

Overlooking Dublin's River Liffey, structural steelwork was the chosen framing solution for two office blocks that are connected at ground, third and fourth floor levels.

Incorporating much of the original 19th Century structure's fabric, the Tropical Fruit Warehouse project comprises a five-storey (Block 1) and a two-storey (Block 2) office block that are connected via a two-floor glazed link bridge as well as ground floor atrium.

Block 2 is constructed at third and fourth floor levels, over the footprint of an existing two-storey protected warehouse, with minimal structural columns to allow the structure to cantilever over the structure to achieve the appearance of a floating glass box.

"The primary factor governing the design of the steel structure to Block 2 was the deflection of the structural frame," says Torque Consulting Engineers Managing Director Ken Moriarty.

"The façade contractors stipulated that the maximum differential deflection between any two glazing panels (2.55m apart) on the perimeter of the structure should be a maximum of 4mm under superimposed dead and imposed loads. During the intermediate stages of the project the structural model allowed us to accurately determine slab edge deflections for various load cases."

A total of six fabricated plate girder columns and one central concrete core provide structural support to Block 2, which measures approximately 19.5m x 40m in plan. The longest cantilevers to the structure are on the north-east and south-east corners of the building and measure 10.35m on the diagonal.

These were achieved by using a series of triangular shaped steel trusses at roof level and at underside of third floor level concurrently. These trusses span from the central core across two fabricated plate girder columns and extend out to the slab edge, where they connect via steel perimeter columns. In this way, the entire structure acts as one unit over its full height.

For Block 1, a steel-framed solution was chosen to facilitate the long spans and shallow depths required to meet the client's brief and keep within planning constraints for building height.

The steel-framed solution was also said to be ideally suited to provide the transfer structure at second floor level above the open-plan ground floor entrance atrium and the large cantilevers at each floor level to the south of the main stairs/lift core.

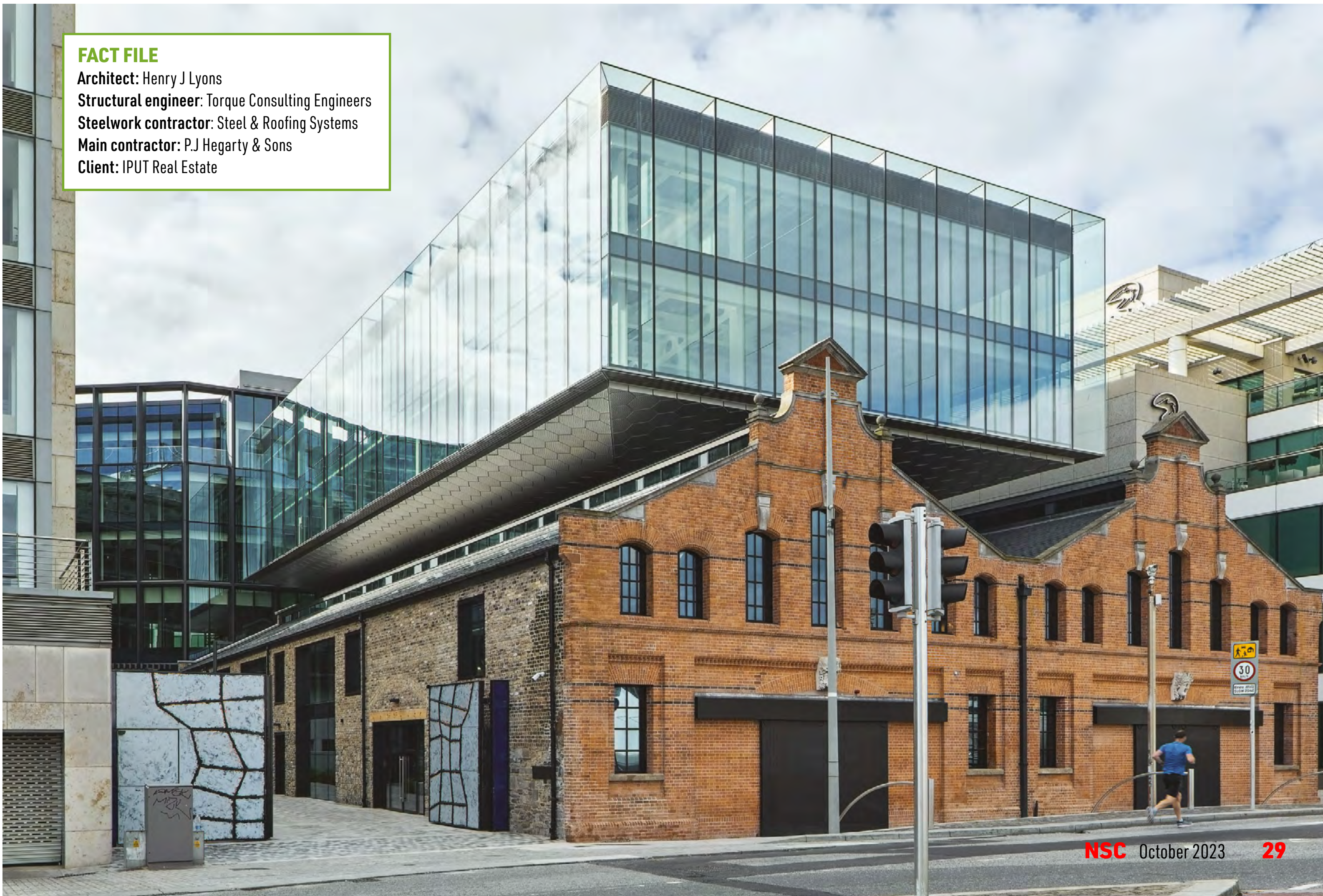
The block's floor solution comprises a series of parallel Westok cellular steel beams supporting metal decking and a concrete topping to form a composite slab.

Importantly, to allow the client to have flexibility for future vertical expansion, Block 1 has been designed to carry two additional stories.

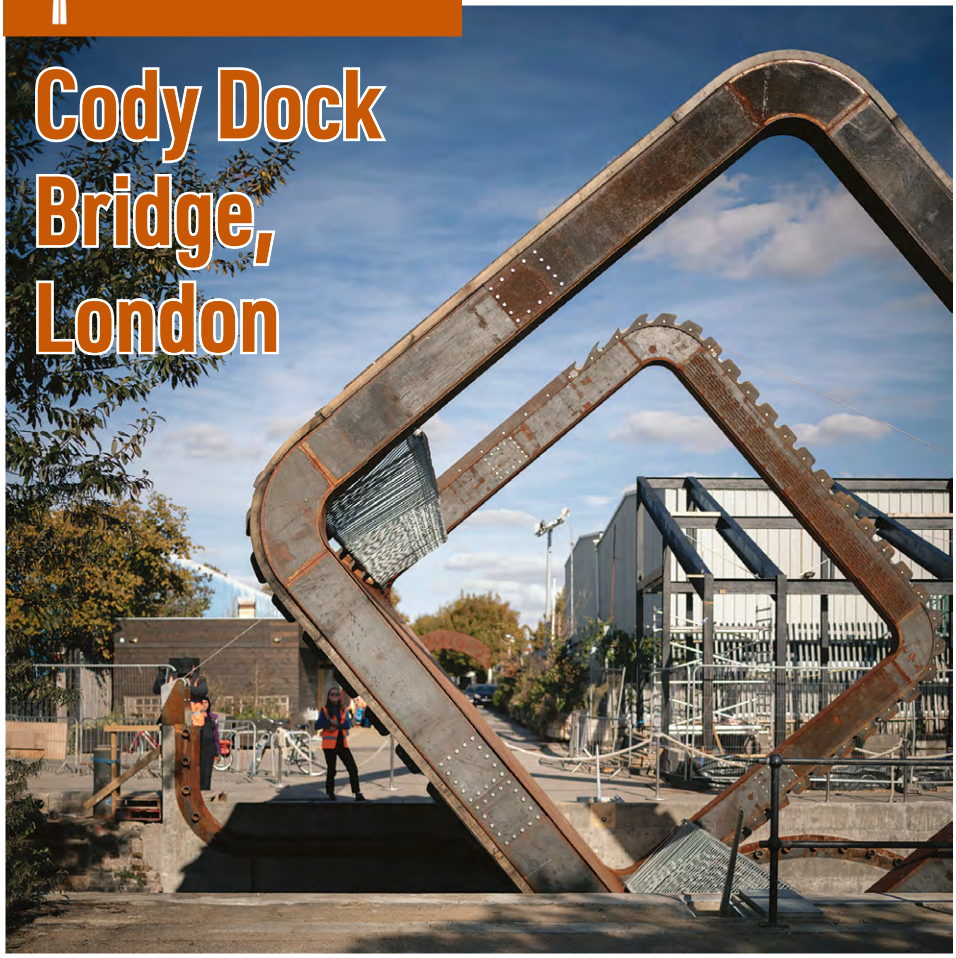
In summary, the judges say this is a hugely imaginative scheme, which revitalises a protected warehouse building. It successfully creates a prestigious and substantial office on the River Liffey waterfront, while still preserving the original warehouse. ■

All images on this page © Enda Cavanagh

FACT FILE
Architect: Henry J Lyons
Structural engineer: Torque Consulting Engineers
Steelwork contractor: Steel & Roofing Systems
Main contractor: P.J Hegarty & Sons
Client: IPUT Real Estate



Cody Dock Bridge, London



© Jim Stephenson

Complex and unique engineering challenges were overcome to design and install a new rolling steel bridge, spanning the entrance to a reinvigorated dock near the mouth of east London's River Lea.

Cody Dock in east London has been brought back to life following many years of restoration and regeneration. Part of the overall scheme is a new steel rolling bridge, that allows vessels in and out of the dock.

The bridge is carefully counterweighted so that the centre of gravity is level, allowing the 13t structure to roll using only a hand cranked winch. Despite the simplicity of this movement, whereby the deck actually turns upside down, the design process and fabrication revealed complex and unique engineering challenges.

The footbridge is a simply supported structure with a monocoque steel deck spanning 7m over the dock mouth and tapering in depth from 400mm to 550mm at midspan.

Two 5.5m rounded square portals at each end allow it to roll along undulating concrete abutments, which are cast into the existing masonry walls. The upper section of each portal is counterweighted so that the centre of gravity is raised to the midpoint of the frame.

The path geometry ensures this point remains horizontal when in motion, so that the bridge weight is never lifted vertically. The bridge is driven with a cable by a pair of manually operated winches on one bank, creating a safe, human-powered mode of operation. The handrails are constructed from a welded lattice of steel reinforcement bars and can fold down, via a torsional spring mechanism, for additional clearance height when the bridge is inverted.

Most of the structure is weathering steel, which has the desired strength, durability, and fabrication accuracy balanced with minimal maintenance requirements. Oak bearing strips fixed to the hoops roll on the undulating steel track, while precision cut weathering steel teeth interlock with Hardox steel pins.

The geometry of the bridge track is said to be loosely based on the square-wheel bicycle problem. Mathematicians Robison (1960) and Wagon (1990) previously derived the path geometry that results from rolling various shapes along a horizontal trajectory.

While the path geometry of a square has been demonstrated to be a set of inverted catenaries, a new solution had to be generated to derive the path of the bridge portals. This involved numerically integrating elliptic integrals to calculate the path shape around the rounded corners (as no analytical solution exists) and combining this result in software with that of a square wheel. This gave a set of transformations that guide the movement from start to finish. In combination with conclusions taken from testing physical scale models, these generated the geometry of the teeth and track.

Monitoring the weight and geometry of the bridge was also vital, in both design and construction. Any increase or offset in weight has the knock-on effect of increasing frictional forces, which determine pin sizes, cable tensions and ultimately the overall deck structure. These constraints lead to an inherently efficient steel structure.

The judges say this intriguing project was realised thanks to a dedicated team working closely together and applying painstaking analysis with "real time" adjustments as the bridge was being fabricated. This ensured a smooth operation on site with the tight tolerances required of a machine. ■

FACT FILE
Architect: Thomas Randall-Page
Structural engineer: Price & Myers
Main contractor: Gasworks Dock Partnership
Client: Gasworks Dock Partnership

© Guy Archard

Shipbuilders of Port Glasgow

Celebrating a rich shipbuilding heritage, two 10m-high stainless steel figures, by renowned sculptor John McKenna, also serve as tourist attractions, bringing people to Inverclyde.

Located in Coronation Park, Port Glasgow, two steel figures of workers in active positions about to strike downwards with their hammers has been installed to pay tribute to the area's shipbuilding history.

The structural form of the large figures echoes the technique of building ships, with the surface skin being steel plates that are welded to a steel subframe and associated ribs. This is said to maximise the mass of the structure, while minimising the weight of steel required to create it.

Councillor Michael McCormick, Inverclyde Council's convener of environment and regeneration, says: "The delivery of these sculptures has been a long time coming and much has been said about them but it's now clear to see that they are quite spectacular and the reaction thus far suggests they are well on their way to becoming an icon of Inverclyde and the west of Scotland.

Initially, a scaled down version of the proposed sculpture was made in clay, which was 3D scanned and transferred into to CAD software. This was used to establish a best fit 'stick form' primary skeleton for one of the figures. Close liaison within the project team was required to ensure that the skeleton could be split up into a series of segments that could readily be fabricated, transported to site and subsequently erected. Once the 'stick form' primary skeleton geometry had been agreed, a 3D structural analysis model was created to design the structural elements.

The primary skeleton comprises a series of circular hollow sections (CHS), with flanged bolted connections. Welded to this are the square hollow sections (SHS) and steel rod secondary elements that act as outriggers to reach the SHS tertiary outer sub-frame that is located just under the 0.9mm to 1.2mm stainless steel faceted surface 'skin'.

"The of use of steel bolted connections to connect the segments of the primary frame together meant that test builds could be carried out at John McKenna's workshop, prior to them being transported to site in segments and reconnected," explains Narro Senior Associate Ian Downie.

Flexibility in the exact positions of the secondary frame and tertiary outer sub-frame was desirable, so exact positions could be finalised based on ease of access and buildability issues during the fabrication. As a result, the secondary and tertiary elements in the overall figure were not modelled, and instead the design was based on spacing rules that could be followed during fabrication to ensure there was sufficient structural capacity in the completed frame.

Sculptor John McKenna says: "When my design of the shipbuilders sculpture was overwhelmingly voted for by the people of Port Glasgow I was absolutely thrilled that my vision for the artwork would be realised. It was no easy task to design and complete the sculpture, a complete unique one-off, a dynamic pose, the colossal pair swinging their riveting hammers, trying to evoke working together."

The judges say an impressive and well executed piece of public art, which has been many years in realisation since the initial competition win. The sculpture is formed from numerous small folded/shaped stainless steel 'tiles' fixed back to a steel tube subframe, shaped to create the large forms of two shipbuilders. ■

FACT FILE
Sculptor: John McKenna Sculptor Ltd
Structural engineer: Narro
Main contractor: John McKenna Sculptor Ltd
Client: Inverclyde Council

SSDA 2023
MERIT

FACT FILE
Architect: Populous
Structural engineer: WSP
Steelwork contractor: Severfield
Client: Fulham FC

© Dave Shopland, Shutterstock

New Riverside Stand at Fulham FC

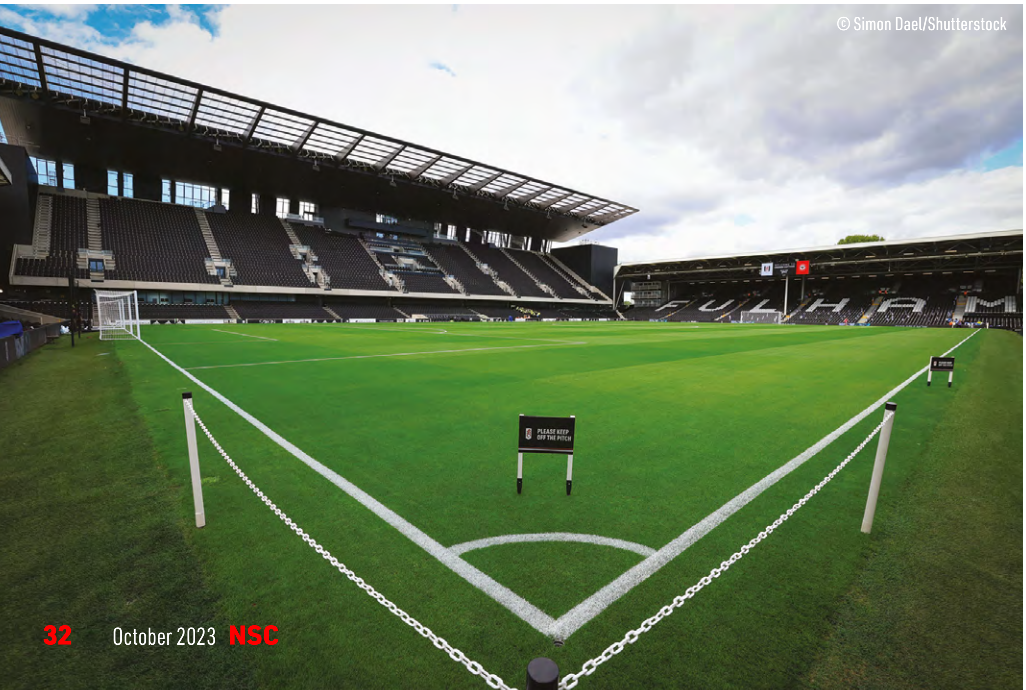
A new stand at one of the country's oldest continuously used football grounds has created a 21st century facility and was constructed while the club carried on playing at their home.

Including the opening up of the adjacent Thames Riverwalk, the project team say that the architecture of the new Riverside Stand at Fulham FC, seeks to distance itself from the traditional structurally driven approach normally found in football stand design.

The structure of the roof is hidden within a clad soffit, affording the opportunity to place plant within the roof structural depth and freeing up usable floor space in the building below. The glazed façade elevates the appearance of the Riverside stand beyond what would be expected of a stadium, while the floodlights are integrated into the roof, reducing the light pollution.

The design has been influenced by the architecture of boathouses that are a feature of this section of the River Thames, and so there are large openings at ground level, occupied balconies above, with glazed openings to the elevated accommodation. The result is an iconic but appropriate design which completes the riverside, creating a contemporary waterfront destination and a natural social gathering place for the local community.

When viewed from the river, the roof appears to 'hover' over the accommodation below. This has the effect of reducing the apparent scale and bulk of the building, as an open horizontal 'slot' is created between the two volumes, a solution afforded by the relatively low-density nature of a steel solution.



© Simon Dael/Shutterstock

The rear of the roof is articulated with a dramatic curve in cross section, so that the rear edge of the roof is also a fine line, but rather than being straight and level as it is pitch-side.

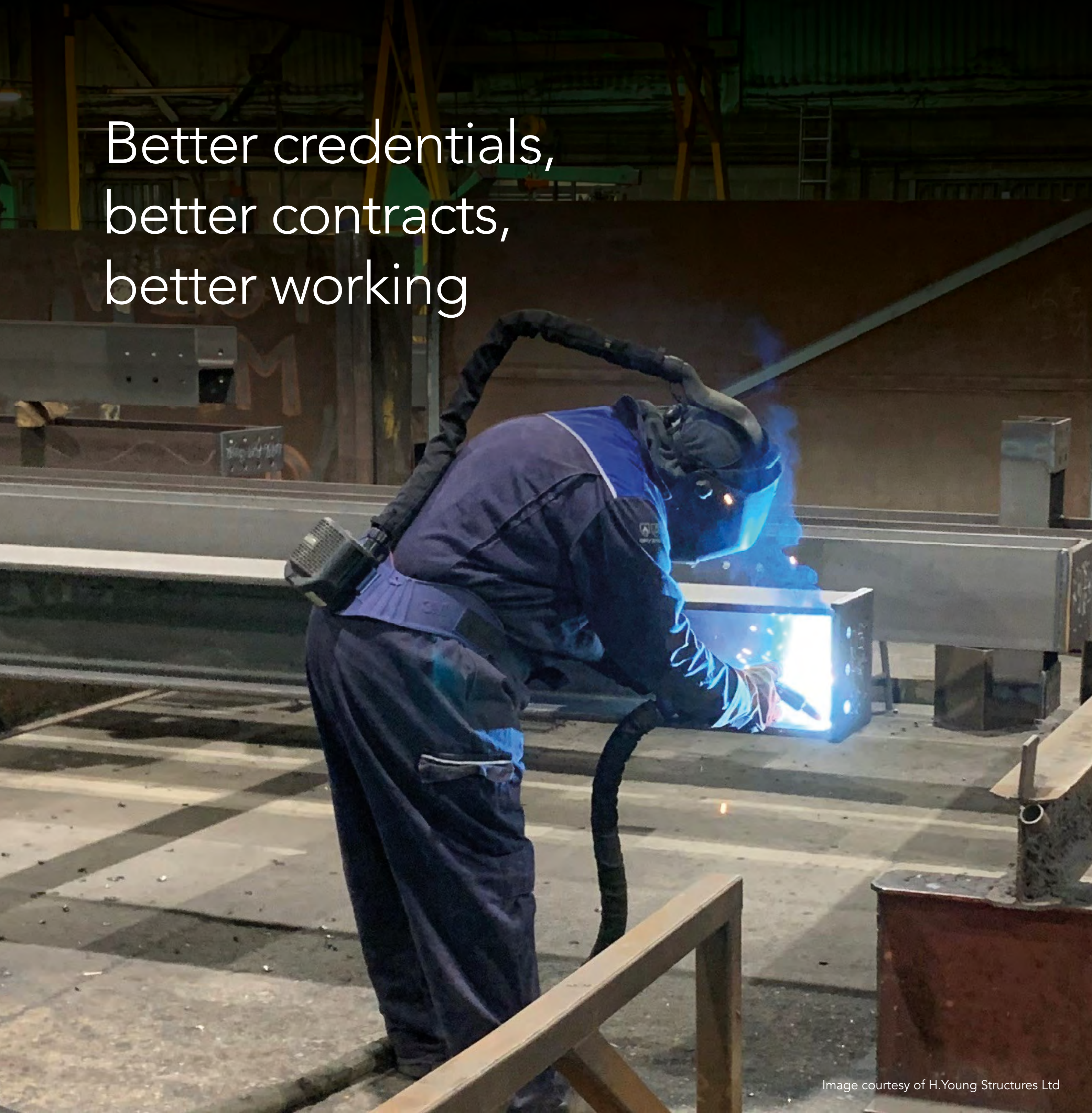
"One of the main challenges for the design team was the extremely tight site, flanked by the pitch to the north and the river to the south, as well as designing a stand that would contribute and enhance the heritage and historic nature of the ground, as well as the prestigious setting in the heart of the capital," says Populous Principal Marian Moravek.

To overcome the constrained nature of the site, a significant portion of the steel frame, all precast concrete elements and a large quantity of the cladding was transported by river, reducing congestion and the impact of road traffic on the neighbourhood.

Steel roof trusses, spanning 35m, were assembled together in pairs at Tilbury docks and fitted with roof finishes to both surfaces as well as MEP. This offsite construction was then lifted onto barges, sailed up the river, in harmony with the tides, before being craned into position.

The steel frame solution also allowed the incorporation of some key features to improve space and maximise the useable floorplate. Three transfer trusses, up to 22m-long, were installed to provide column-free spaces and vertical Vierendeel trusses provide the support to the cantilever roof to minimise the impact on the use of the floorplate.

In summary, the judges say the sizeable Fulham Riverfront Stand was constructed without interrupting football operations. Prefabricated and partially assembled at Tilbury docks, the substantial components were then transported along the Thames to site for installation. This innovative approach ensured seamless progress and minimised disruptions, showcasing exemplary planning and execution. ■


Better credentials,
better contracts,
better working
Image courtesy of H.Young Structures Ltd

FACT FILE
Architect: Aedas
Structural engineer: AECOM
Steelwork contractor: Bourne Group Ltd
Main contractor: BAM Ferrovial Kier JV
Client: TfL (Crossrail)

© Morley von Sternberg

Farringdon Crossrail Station, East & West Ticket Halls

Structural steelwork played an important role in the construction of the Crossrail Elizabeth line in London. An example of this work are the two tickets halls at Farringdon station.

The western ticket hall is approximately 75m-long x 62m-wide and steelwork commences at Level -1 and extends up to Level 3, which is formed by a series of 18.7m-high columns. The upper levels accommodate the large tunnel ventilation fans and other Crossrail plant rooms, administrative space and staff areas.

Creating a large open-plan area at upper ground floor, a series of steel trusses up to 21m-long and 4m-deep, form the cathedral-like Upper Apse ceiling and support a six-storey office block above.

The smaller eastern ticket hall is approximately 69m-long x 33m-wide and also provides an interchange with the London Underground platforms at nearby Barbican station. The design of the eastern ticket hall has used a series of raking columns to avoid loads being transferred to the shallow London Underground tunnel, which passes under its northern façade. ■

Church of Oak Distillery Ballykelly, Co. Kildare

FACT FILE
Architect: ODOS Architects
Structural engineer: J.J. Campbell & Associates
Steelwork contractor: Steel & Roofing Systems
Main contractor: Ormonde Construction
Client: Oakmount

Dating back to the early 1800s, the long-established Church of Oak Distillery has been largely refurbished to create a visitor attraction with tasting rooms, a roof garden and an exhibition area.

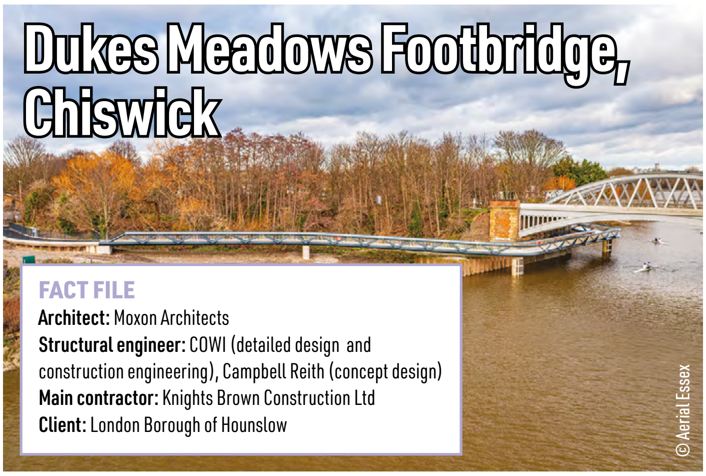
The centrepiece of the scheme is the redeveloped Block C, where a two-storey steel-framed infill structure has been installed within retained walls and vertical steelwork, originally built in the 1930s.

The ground floor of the building accommodates the distillery processing and is a column-free space. Work is centred around a large pot still that has been incorporated through the suspended first and second floors. A glass floor at the uppermost level allows visitors to see the distillery below.

An elaborate steel roof structure, clad with weathering steel and incorporating elevated ventilation enclosures, tops the building.

A 3m-wide cantilevered external planter at first floor level meant that a significant 50-tonne load had to be transferred into each frame, which creates large horizontal shearing forces at both the roof and second floor levels. These two floorplates were designed to avoid any movement from the lateral shearing stresses created by the planter. ■

Dukes Meadows Footbridge, Chiswick



FACT FILE
Architect: Moxon Architects
Structural engineer: COWI (detailed design and construction engineering), Campbell Reith (concept design)
Main contractor: Knights Brown Construction Ltd
Client: London Borough of Hounslow

© Aerial Essex

Dukes Meadows Footbridge is a new pedestrian bridge in Chiswick, west London, positioned beneath the existing Grade II listed Barnes Bridge. The low-carbon structure rejuvenates a previously disconnected stretch of the Thames Path, dramatically improving safety, access and pedestrian flow.

The steel structure is a 'half through' truss form with distinctive bracing members angled to maximise oblique views to the river. Estimates show innovation in structural arrangement, material specification and construction technique between design and completion enabled a 20 to 30% reduction in the footbridge's overall carbon footprint compared to the client's reference design.

The steelwork fabrication employed state-of-the-art digital 3D modelling techniques to inform the team of the complex geometry. This process employed double-curved SHS chords, RHS cross beams, bespoke fabricated diagonals and purlins, facetted steel boxes with openings for temporary works and electro-polished stainless steel parapets.

The delivery and installation of the main span beneath Barnes Bridge was carried out making full use of the tidal range of the Thames. The span was transported to site along the Thames on a specialist marine pontoon. ■

Arbor, Bankside Yards, London

© CentralPhotography.com

FACT FILE
Architect: PLP Architecture
Structural engineer: AKT II
Steelwork contractor: Severfield
Main contractor:
Multiplex Construction Europe Limited
Client: Native Land

Part of the first phase of Bankside Yards a development on London's South Bank, Arbor is an 18-storey office block that combines high-spec office space and a surrounding public realm.

Levels one, two and three of the building are only partial floorplates that help to create Invicta Plaza, an open and covered area at the ground floor level that will serve as one of the district's main gateways, along with and a triple-height reception, with a full-height atrium above.

The partial floorplates also help Arbor to span over part of the adjacent railway arches, with a series of four columns, punched through the Victorian structure and supporting part of the building's eastern elevation.

These 20m-long columns weigh close to 22t each and had to be fabricated and brought to site in two pieces. The baseplates were welded to the lower halves and fixed to the pile caps, while the upper halves were passed through the arch openings and connected via a splice connection. ■

The JJ Mack Building, London

Located in the City of London, The JJ Mack Building is a 10-storey, steel-framed office block of 19,000m² that also accommodates ground floor retail space.

Sat on a complex site, the substructure interfaces directly with the 20m-deep excavations of Farringdon station's Crossrail facilities and tunnels.

A steel-framed solution was chosen as it efficiently provided the desired long spans and special flexibility within the site's irregular plan, minimised the foundation loadings and minimised disruption to the surrounding infrastructure and estate.

At the southern edge, a storey-high Vierendeel truss spans 15m and integrates with the façade mullions to create a dramatic entrance space opposite the forthcoming Museum of London development.

Through the upper levels, the massing transfers inwards with a series of cascading transfer beams to create three terraced amenity spaces overlooking the historic Smithfield Market buildings and the adjacent urban intersection.

FACT FILE
Architect: Lifschutz Davidson Sandilands
Structural engineer: AKT II
Steelwork contractor: William Hare
Main contractor: Mace
Client: Helical plc

A single core helps to maximise the uninterrupted internal floor area and an internal 'light-scoop' - a structural void that cuts through six storeys - provides generous daylighting. ■

M8 Footbridge, Sighthill, Glasgow

© Peter Devlin

FACT FILE
Structural engineer: Jacobs
Steelwork contractor: Severfield
Main contractor: BAM Nuttall
Client: Glasgow City Council

Spanning the M8 motorway, a new footbridge forms a central element of the £250M Sighthill Transformational Regeneration Area (TRA), which offers affordable housing within walking distance of Strathclyde University, Queen Street Station and Glasgow's most popular shopping locations

The bridge deck is part of a striking wider public realm project featuring 800 trees, 10,000 plants and a distinctive 210m-long southern approach with a ramp. To the north side, in Sighthill, the bridge arrives to a new public square which guides users up onto the hill or to the west to the canal basin amenities.

The bridge structure's main span is formed by a 58m-long open-top steel box girder acting compositely with a reinforced concrete deck slab and required 420t of steelwork.

Weathering steel was said to be the natural choice for this structure, as it is widely used in the UK for both National Highways and Network Rail bridges, where minimal future maintenance is a key consideration. ■

The National Robotarium, Edinburgh

© Robertson

Based at Heriot-Watt University's Edinburgh campus, The National Robotarium is the largest and most advanced facility of its type in the UK and is a stand-out landmark building within the university campus.

The desired architectural vision for an industrial-looking interior has been created with exposed steel columns and beams throughout, while the exterior features a prominent double-skin glazed frontage, formed with a secondary lightweight steel frame.

The project is said to have suited the use of steel because of the long spans involved, and in order to achieve the architectural design that incorporates exposed services.

FACT FILE
Architect: Michael Laird Architects
Structural engineer: Tetra Tech
Steelwork contractor: BHC Ltd
Main contractor: Robertson
Client: Heriot-Watt University

Overall, the building is approximately 75m-long × 45m-deep. The ground floor houses the main laboratory areas, situated around a full-height forum that sits in the centre of the structure.

Measuring 24m × 12m, the forum is a multi-purpose area, acting as a meeting point, auditorium, general break-out and circulation space. It is topped by a series of six triangular rooflights that allow natural daylight to penetrate into the building. ■

Better can sometimes be worse – the dangers of over-strength

As engineers we are always concerned with strength – do we have enough resistance to cope with ultimate (ULS) levels of load? We then consider stiffness – will deflections and dynamic behaviour be acceptable for serviceability (SLS) requirements? This order of priority seems reasonable as something falling down is likely to be more important than it simply deforming too much. However, there is a third criterion that may not always be appreciated, namely that of ductility. Failure to assure appropriate ductility, including accidental failure through the provision of over-strength materials, could result in premature collapse, as Graham Couchman explains and illustrates below through some typical examples.

What defines the strength, stiffness, and ductility of a structural member?

If we assume that stability is not a problem, in other words there is no danger of local or global buckling limiting resistance, then the strength of a member is a function of its cross-section and material strength. Its stiffness is a function of the cross-section and the elastic modulus of the material. These material properties are represented on a stress-strain curve for steel by the initial slope of the curve (up to the elastic limit), and the stress associated with the 'plateau' (or, for a material that shows a less bi-linear response than structural steel, the stress at a certain level of 'proof' strain). Figure 1 reproduces the simplified bi-linear stress-strain curve that BS EN 1993-1-1[1] says may be used in design for structural steel, illustrating these values.

Ductility is assured when a material can accommodate a significant amount of strain beyond the point at which it reaches its 'strength'. In other words a long plateau on a stress-strain curve, in compression or tension as appropriate, indicates a material with ductility. Typically, structural steel actually sees an increase in strength along this plateau, as strain hardening occurs. So the ultimate strength of a piece of steel, f_u, exceeds its yield strength f_y. The rules

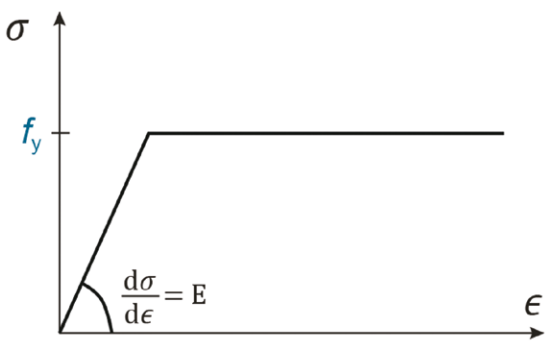


Figure 1: Idealised stress-strain curve for structural steel

given in Eurocode 3 are only valid for steels that satisfy certain limits. In clause 3.2.2 these limits are given in terms of the ratio between yield and ultimate strengths, a minimum value for elongation at failure over a certain gauge length, and the ultimate strain that corresponds to the ultimate strength. Although the beneficial effect of strain hardening on section resistance is normally ignored, satisfying these relationships ensures that the assumptions concerning plastic behaviour implicit in some of the Eurocode design rules are not invalidated.

Why may ductility be critical?

The way something fails can be very important. Cars used to be designed with large bumpers and strong sub-structures so they could best resist an impact (and remain relatively unscathed). Today they are designed with crumple zones, that contain materials that can deform, i.e. they are ductile, and in so doing absorb the energy of the impact. Significant local damage is accepted. Examples are considered below to illustrate that in steel structures making a component strong is not always the best answer, and indeed building something that contains components that are stronger than assumed in design could be a problem because the structure would not then fail as intended.

Some examples

Partial strength end plate joints

Perhaps the most obvious example of a situation where the materials and components used need to have the correct strength is partial strength (a term that means the resistance of the joint is less than that of either of the connected members) moment resisting joints that adopt end plates, and are assumed to be able to rotate as 'plastic hinges'. Rotation takes place in the joint, not the connected members, because the joint is the weak link. Such joints contain a number of components, such as welds, bolts, and the end plate itself, as well as the two members the joint connects together. Each of these components has a different resistance, which can be determined using the component method as presented in BS EN 1993-1-8[2]. The lowest of the resistances of the different components defines the moment resistance of the joint itself (along with the lever arm relevant to the critical component). As well as different resistances, the components have different levels of ductility – bolts and welds cannot accommodate large amounts of strain (they are brittle), whereas an end plate deforms plastically out-of-plane, exhibiting yield lines and therefore having significant ductility (Figure 2). The component

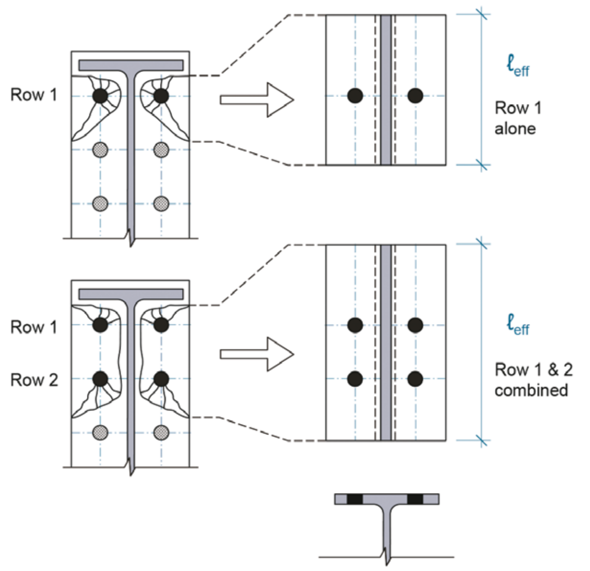


Figure 2: Example yield lines defining ductile bending of an end plate and enabling its resistance to be quantified

▸ 38

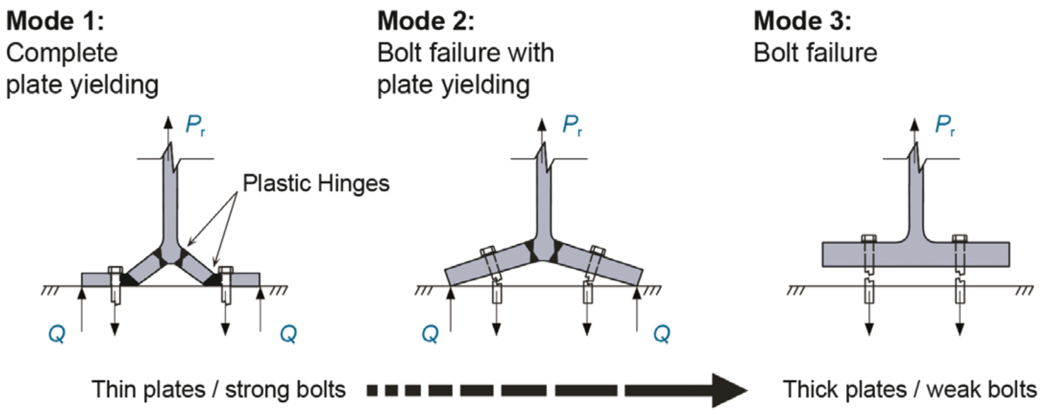


Figure 3:
Definition of failure modes for an end plate joint

▶ 36

with the lowest resistance will also dictate the ductility of the joint. The so-called moment connections Green Book P398[3] includes some partial-strength standard joints alongside the more usual 'rigid connections', and talks about different failure modes for a joint, namely Modes 1, 2 and 3 (see Figure 3). Mode 1 is the most ductile, and Mode 3 the least. Many economically proportioned joints will exhibit Mode 2, meaning a sufficient level of ductility can be achieved. Joints for use in frames designed according to SCI publications concerning semi-continuous braced frames and wind-moment frames[4,5] will invariably fail in Mode 2. Conversely, for a joint that is designed to be 'rigid' Mode 3 failure may be desirable, because the deformation associated with Mode 2 means the joint may be less rigid than assumed.

However, if one of the components in a joint is supplied 'over-strength' it could result in not only the resistance of the joint increasing, but also the failure mode changing. Using an over-strength end plate could result in a joint that was supposed to show ductility, i.e. rotation capacity, becoming brittle because its resistance was then dictated by, say, failure of the bolts. The age of the SCI publications referred to above means the standard details they propose adopt S275 end plates, with plate thicknesses and bolt sizes carefully 'matched' to ensure the bolts are stronger than the plates. However, in 2023 there is a reasonable chance that S355 plates might be supplied, not to mention the fact that steel is normally supplied to achieve a minimum yield strength, with no upper limit specified. Bigger bolts, and welds, could be needed to assure the behaviour assumed by the designer, so at the fabrication stage it is important to ensure the correct material has been used. It should be recognised that of course bolts and welds may also be supplied overstrength!

As an aside when considering steel grades, the maximum loads attracted by structural elements supporting others that are subject to blast loads, depend on the ultimate strength of the connected parts. Unlike yield, ultimate strengths are given as minima and maxima in product standards for steel sections and plates e.g. for S355, ultimate strength must be between 470 MPa and 630 MPa for material up to 100 mm thick. There may be instances where the upper bound strength is the relevant one to use for assessing the effect of blast or other accidental loads.

Shear stud resistances and transverse reinforcement in a composite beam

BS EN 1994-1-1[6] presents rules, through reference to BS EN 1992-1-1[7] for determining how much transverse reinforcement is needed in a composite beam. Although not explicitly stated, the reinforcement should be chosen as a function of the number and resistance of the shear studs. The purpose of this reinforcement is to ensure that the forces transferred locally from the steel beam into the concrete slab via the shear studs can migrate out into a larger width of slab. The relationship between transverse reinforcement and shear stud forces is much easier to understand in the way BS 5950-3.1 clause 5.6.2 presents the design rule, which is simply that the longitudinal force to be resisted per unit length v is the resistance of the shear connectors (NQ, where N is the number of connectors in a group and Q is the resistance of an individual connector) divided by the longitudinal spacing of the connectors/groups s:

$$v = \frac{NQ}{s}$$

A reason for 'sizing' the transverse reinforcement based on the number and resistance of the studs, rather than an applied force, is that failure of the transverse shear plane in a composite beam may not provide the level of ductility (slip capacity) associated with stud failure. Potential planes, as presented in BS EN 1994-1-1, are shown in Figure 4. However, the rules in the codes for plastic design of composite beams assume that the studs have sufficient ductility to redistribute forces between themselves, so it is necessary to avoid non-ductile failure. It is therefore important not to underestimate the

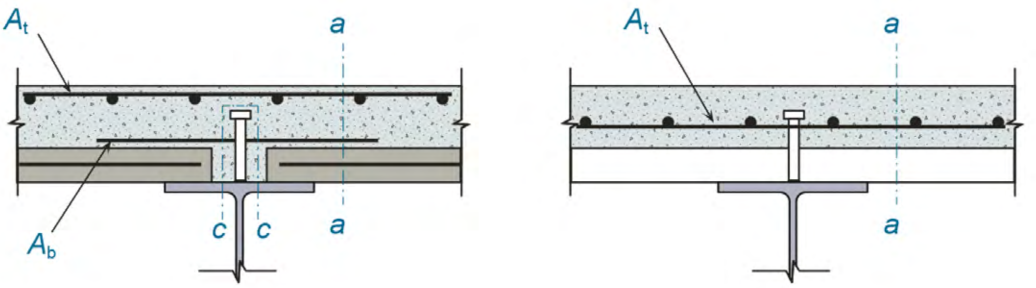


Figure 4: Potential transverse shear planes in a composite beam (according to Eurocode 4). The slab on the left is formed from a combination of precast and in-situ concrete, the one on the right uses metal decking.

resistance of the connectors and by so doing fail to provide sufficient transverse reinforcement. It is also worth noting that even though design with ductile connectors assumes the shear force is equally distributed between them, in reality the studs nearer the support experience higher levels of slip than those near the centre line (for uniform loading). So even when the applied loads do not require all studs to be 'at capacity', some of them will be. Assuming a lower force could, in theory, result in insufficient transverse resistance.

Seismic design

Design for seismic conditions is unusual in the UK, however it provides a very good example of the importance of ensuring that the intended 'weak link' in a structure is indeed the weak link. The use of I-section beams with notched flanges is common, where the notches ensure that the resistance is lowest at a specific point (where the designer has assumed the plastic hinges will form). This avoids the joints being over-loaded. Some steel frames designed for seismic events also adopt so-called fuses, weak points which are designed to be the focus of damage and can therefore be replaced without the need to replace beams and columns during renovation.

Stainless steel

Stainless steel, particularly austenitic, exhibits significantly more strain hardening behaviour than carbon steel. As an example, this could result in the moment resistance of a beam being underestimated by around 20%, depending on the beam's cross-section. The strain hardening exhibited by stainless steel can also lead to a large increase in strength following cold working. The yield strength of a cold-formed hollow section made of austenitic stainless steel can be up to 50% greater than that of the preformed material. Depending on how such steels are to be used, designers should beware that this phenomenon does not result in changed, detrimentally, failure modes.

Conclusions

It feels only natural to assume that if something is stronger than assumed in design, it will be more able to support the applied loads than was assumed, and that this can only be a good thing. However, the examples given above show that the relative strengths of structural components that interact with each other is also important – not just their absolute strengths. If the way in which they interact changes as a result of one of them being stronger than expected, it can affect which component is critical. This can potentially change ductile behaviour of the combination of components into brittle behaviour, and although failure could be at a higher applied load than anticipated, changing the critical component could have very negative consequences. ■

1. BS EN 1993-1-1:2005. *Eurocode 3: Design of steel structures. General rules and rules for buildings* BSI, 2005
2. BS EN 1993-1-8. *Eurocode 3: Design of steel structures. Design of joints* BSI, 2005
3. P398 *Joints in steel construction: Moment-resisting joints to Eurocode 3* SCI and BCSA, 2015
4. P183 *Design of semi-continuous braced frames* SCI, 1997
5. P263 *Wind-moment design of low raise frames* SCI, 1999
6. BS EN 1994-1-1:2004. *Eurocode 4: Design of composite steel and concrete structures. General rules and rules for buildings* (incorporating corrigendum April 2009) BSI, 2004
7. BS EN 1992-1-1:2004. *Eurocode 2: Design of concrete structures. General rules and rules for buildings* (incorporating corrigendum January 2008 and November 2010) BSI, 2004

AD 515: Welding of structural nuts and bolts

SCI's Advisory Desk has recently received queries from designers asking if it permissible to weld structural nuts and bolts - typically for situations where there is no access to one side of a connection.

The high temperatures reached during welding will affect the material properties of the nut or bolt and can cause the nut or bolt to become distorted, therefore welding fasteners is generally not permitted. Clause 8.2.1 of BS EN 1090-2 specifies that bolts and nuts shall not be welded, unless otherwise specified, however it is difficult to think of circumstances where welding fasteners would be appropriate.

Mechanical properties of structural fasteners made from carbon steel and alloy steel are given in BS EN ISO 898-1. Annex B of the standard explains that elevated temperatures can cause changes in the mechanical properties and in the functional performance of a fastener.

The Corrigenda to the 7th edition of the National Structural Steelwork Specification for Building Construction (NSSS), published on 3rd April 2023 and which came into force on 2nd October 2023, makes the use of the *Model specification for the purchase of structural bolting assemblies and holding down bolts* mandatory, which in turn states that bolting assemblies shall not be welded.

In situations where access is not possible, various solutions are available which do not involve welding the fastener. Cages which are welded to the plate, constraining the nut, are one solution. Various types of expanding anchors and gravity operated toggle bolts are available for one-sided ("blind") fixing applications.

Contact: **Liam Dougherty**
Tel: **01344 636555**
Email: **advisory@steel-sci.com**

New and revised codes and standards

From BSI Updates September 2023

BS EN PUBLICATIONS

BS EN 12152:2023
Curtain walling. Air permeability. Performance requirements and classification
supersedes BS EN 12152:2002

BS EN 12153:2023
Curtain walling. Air permeability. Test method
supersedes BS EN 12153:2000

BS EN 17680:2023
Sustainability of construction works. Evaluation of the potential for sustainable refurbishment of buildings
no current standard is superseded

BS EN ISO 52000-1:2017
Energy performance of buildings. Overarching EPB assessment. General framework and procedures
supersedes BS EN 15603:2008, BS ISO 16346:2013 and PD ISO/TR 16344:2012

NEW WORK STARTED

EN WI 00250289
Eurocode. Basis of structural and geotechnical design. Assessment of existing structures
will supersede None

EN 1990
Basis of structural and geotechnical design. New structures
will supersede None

EN 1991-3
Actions on structures. Actions induced by cranes and machinery
will supersede None

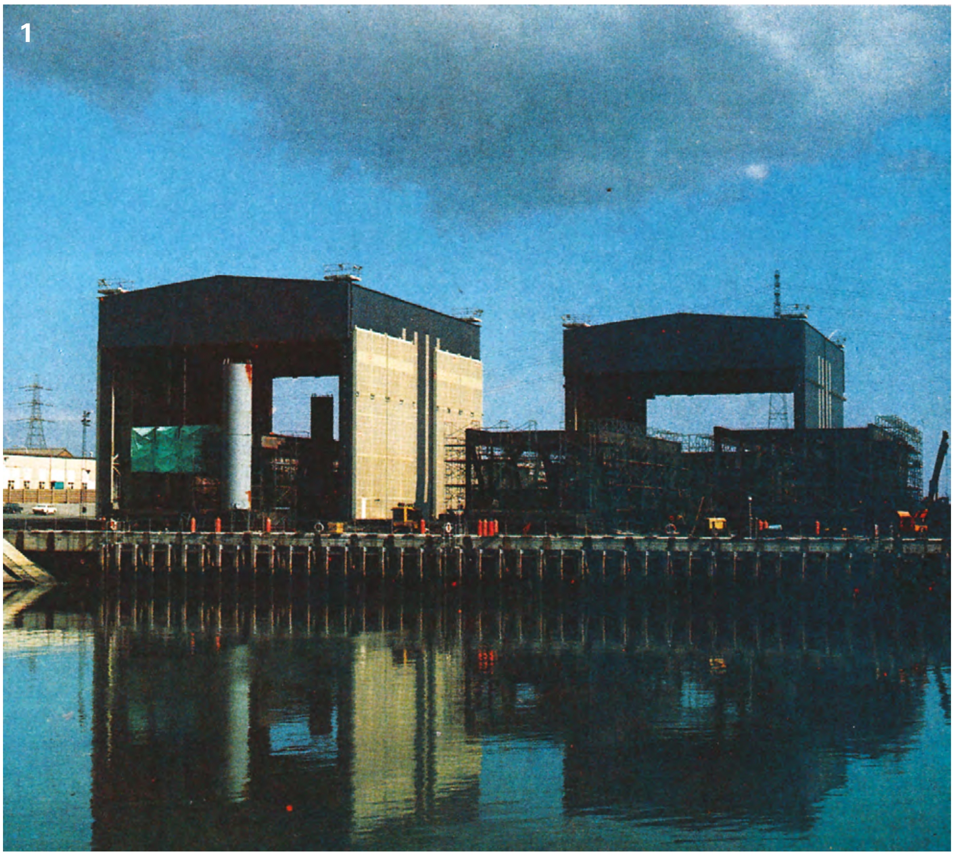
EN ISO 8501-1
Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
will supersede BS EN ISO 8501-1:2007

EN 15978
Sustainability of construction works. Assessment of environmental performance of buildings. Methodology
will supersede None

Structural Steel Design Awards 1973

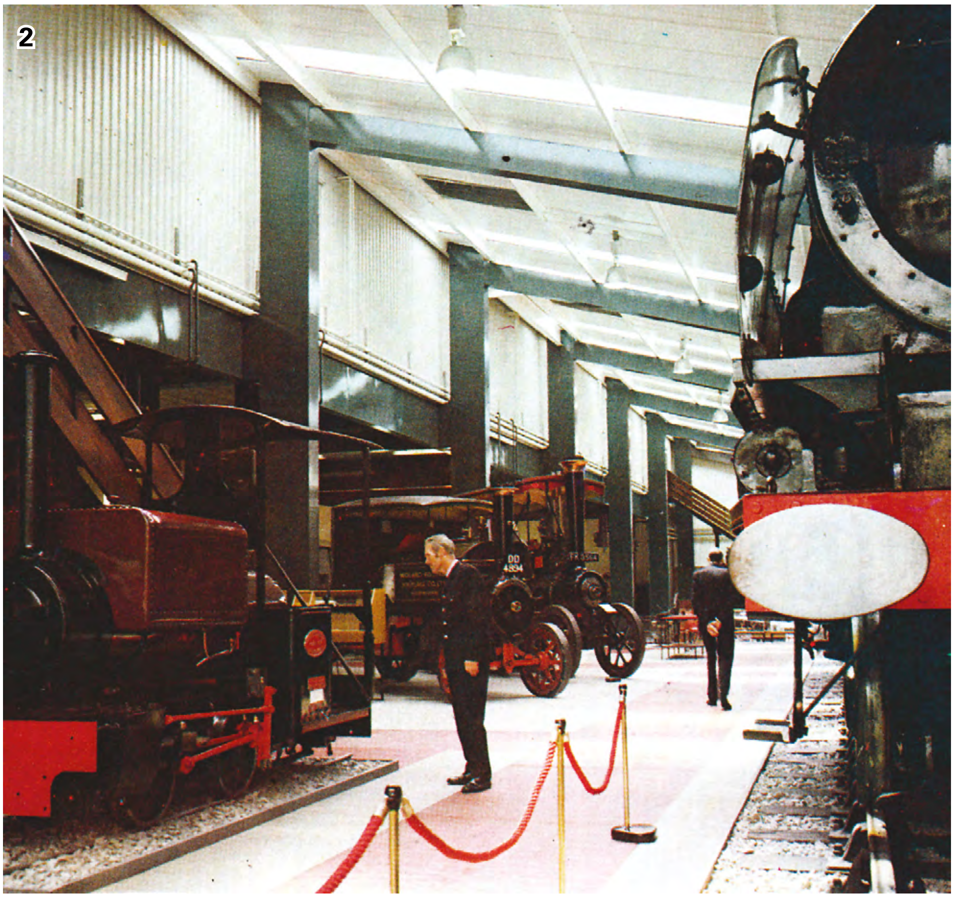
This is the fifth year of the Structural Steel Design Awards sponsored by the British Steel Corporation and the British Constructional Steelwork Association Ltd and organised by Constrado. Six structures have been selected for awards and it is interesting to note that each represents a type of building or bridge for which there has been no previous award. This demonstrates the versatility of steel and its ability to provide economic solutions for all design situations. It also demonstrates the ability of designers to find solutions to new problems – for instance the buildings at Howdon which are moved over the workplace instead of the reverse, the unguyed masts for the GLC where space was restricted and appearance was important – in fact each of the six designs has a degree of innovation which gives it considerable interest.

FROM
Building with Steel
December 1973



1 Mobile Buildings
at Howden nr. Newcastle upon Tyne for Wm. Press Production Systems Ltd
DESIGNERS
Wm. Press Ltd
STRUCTURAL ENGINEERS
Hugill of Teeside Ltd
STEELWORK CONTRACTORS
Hugill of Teeside Ltd

2 Museum of Science and Industry
Phase 1 Redevelopment; Newhall Street for City of Birmingham Leisure Services Committee
ARCHITECTS
The City Architects Department, Birmingham
STRUCTURAL ENGINEERS
Coseley Buildings Ltd
STEELWORK CONTRACTORS
Coseley Buildings Ltd



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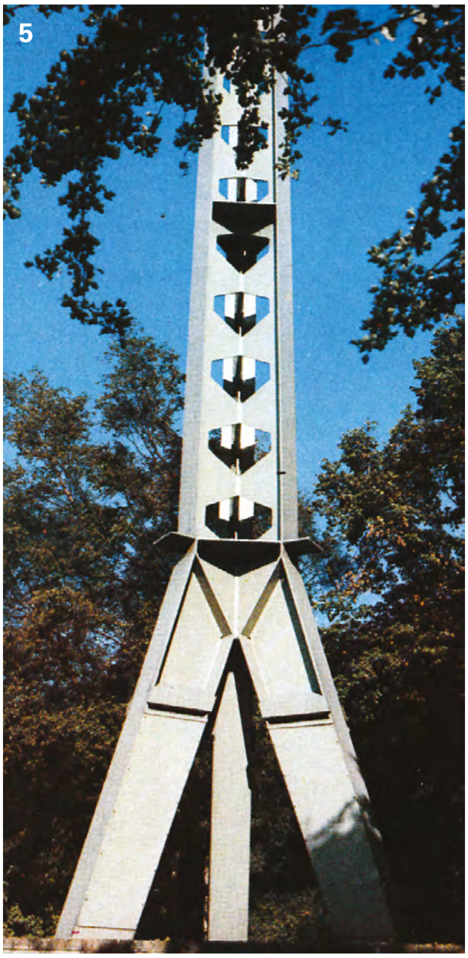


3 Dumfries Technical College

Heathhall Dumfriesshire for Dumfries County Council

ARCHITECTS

Dumfries County Architect's Departrment (A.D. Macintyre RIBA County Architect in succession to the late A.A. Wilkie RIBA)

STRUCTURAL ENGINEERS

Lambhill Engineering Ltd

STEELWORK CONTRACTORS

Lambhill Engineering Ltd

4 Underline Bridge No. 228A

At Hackney, London for British Railways

STRUCTURAL ENGINEERS

Rendel Palmer & Tritton in association with British Railways Board and British Railways – Eastern Region

STEELWORK CONTRACTORS

Clarke Chapman – John Thompson Ltd. Horseley - Piggottt Division.

4

5 Four London Ambulance Service Base Transmitter Masts

Shooters Hill, Hampstead Heath, Chelsham and Lambourne End for the Greater London Council

ARCHITECTS

Departments of Architecture and Civic Design, GLC. (Architect to the Council Sir Roger Walters KBE, FRIBA, FIStructE)

STRUCTURAL ENGINEERS

Taylor, Whalley Spyra

STEELWORK CONTRACTORS

Wellingborough Steel

6 Amphibious Training Unit Royal Marines

Poole Dorset for the Department of the Environment

ARCHITECTS

Renton Howard Wood Partnership in association with the Department of the Environment

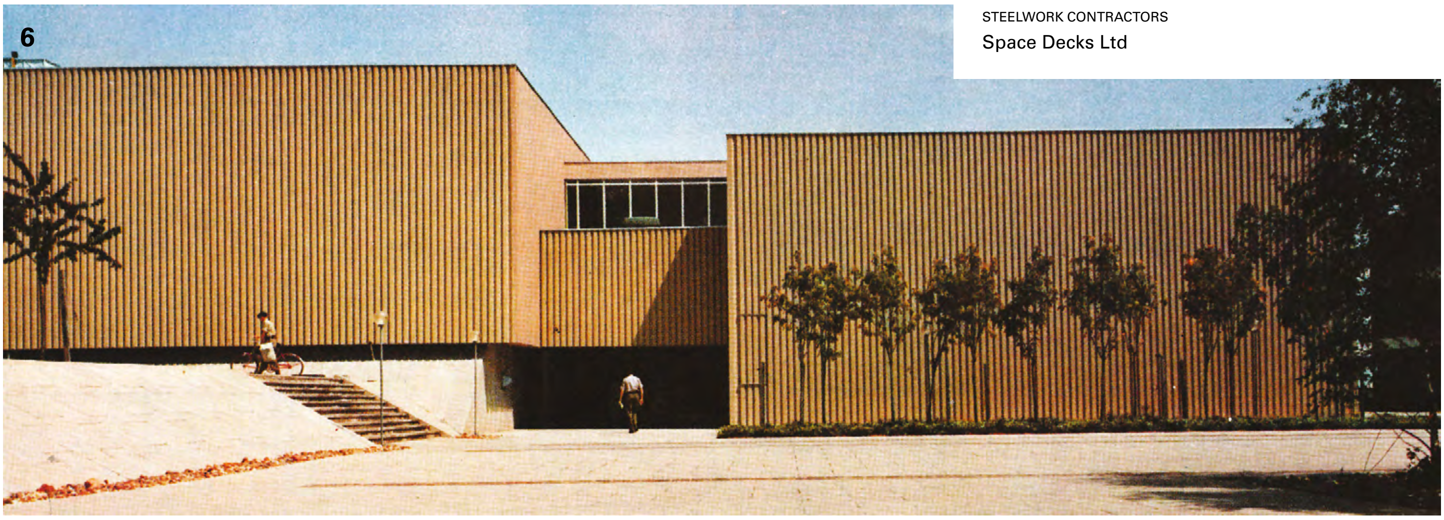
STRUCTURAL ENGINEERS

John Bolton and Partners

STEELWORK CONTRACTORS

Space Decks Ltd

6



RQSC | The Register of Qualified Steelwork Contractors Scheme **Buildings**

Steelwork contractors for buildings

BCSA

The Register of Qualified Steelwork Contractors Scheme for Buildings (RQSC – Buildings) is open to any Steelwork Contractor who has a fabrication facility within the UK or European Union.

Applicants may be registered in one or more Buildings category to undertake the fabrication and the responsibility for any design and erection of:

C Heavy industrial platework for plant structures, bunkers, hoppers, silos etc
D High rise buildings (offices etc over 15 storeys)
E Large span portals (over 30m)
F Medium/small span portals (up to 30m) and low rise buildings (up to 4 storeys)
G Medium rise buildings (from 5 to 15 storeys)
H Large span trusswork (over 20m)
J Tubular steelwork where tubular construction forms a major part of the structure
K Towers and masts
L Architectural steelwork for staircases, balconies, canopies etc
M Frames for machinery, supports for plant and conveyors
N Large grandstands and stadia (over 5000 persons)
Q Specialist fabrication services (eg bending, cellular/castellated beams, plate girders)
R Refurbishment
S Lighter fabrications including fire escapes, ladders and catwalks

FPC Factory Production Control certification to BS EN 1090-1
1 – Execution Class 1 2 – Execution Class 2
3 – Execution Class 3 4 – Execution Class 4
BIM BIM Level 2 assessed
QM Quality management certification to ISO 9001
SCM Steel Construction Sustainability Charter
● = Gold ● = Silver, ● = Bronze, ● = Certificate

Notes
(1) Contracts which are primarily steelwork but which may include associated works. The steelwork contract value for which a company is pre-qualified under the Scheme is intended to give guidance on the size of steelwork contract that can be undertaken; where a project lasts longer than a year, the value is the proportion of the steelwork contract to be undertaken within a 12 month period.

Where an asterisk (*) appears against any company's classification number, this indicates that the assets required for this classification level are those of the parent company.

BCSA steelwork contractor member	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●		✔	2			Up to £5,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3		Silver	Up to £3,400,000
Adstone Construction Ltd	01905 794561			●	●	●	●							●		✔	2	✔	Gold	Up to £3,400,000
AJ Engineering & Construction Services Ltd	01309 671919			●	●		●		●	●	●			●	●	✔	4		Silver	Up to £3,400,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4			Up to £1,200,000
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2		Bronze	Up to £2,400,000
Arromax Structures Ltd	01623 747466			●	●	●	●	●	●	●	●				●		2			Up to £1,200,000
ASME Engineering Ltd	020 8966 7150			●	●	●		●	●	●	●		●	●	●	✔	4		Gold	Up to £5,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●			●	●			●	●	✔	2			Up to £1,200,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2	✔	Silver	Up to £2,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●			●	✔	4	✔	Bronze	Up to £2,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £1,400,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	Silver	Above £10,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●		●		●	●	●		✔	4	✔	Gold	Above £10,000,000
Bourne Group Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	Gold	Above £10,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●		●	●	●	✔	4		Silver	Up to £10,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●						●	✔	4		Gold	Up to £6,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	Gold	Above £10,000,000
Cementation Fabrications	0300 105 0135	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	3		Gold	Up to £10,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✔	4			Up to £6,500,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●	✔	4			Up to £1,200,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £400,000
D Hughes Welding & Fabrication Ltd	01248 421104				●	●	●	●	●	●	●		●	●	●	✔	4			Up to £1,200,000
Duggan Steel	00 353 29 70072	●	●	●	●	●	●	●	●		●				●	✔	4			Up to £10,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	4		Gold	Up to £5,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	Gold	Up to £10,000,000
EvadX Ltd	01745 336413		●	●	●	●	●	●		●	●	●			●	✔	3		Silver	Up to £3,400,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●		●	●			●	●		2			Up to £1,200,000
Four-Tees Engineers Ltd	01489 885899	●		●	●		●	●	●	●	●		●	●	●	✔	3		Silver	Up to £2,400,000
Fox Bros Engineering Ltd	+353 (0) 53 942 1677			●	●	●	●	●		●	●				●		3			Up to £2,400,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	3			Up to £1,200,000
BCSA steelwork contractor member	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

BCSA steelwork contractor member	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
G.R. Carr (Essex) Ltd	01286 535501	●		●	●			●			●			●	●	✔	4			Up to £800,000
H Young Structures Ltd	01953 601881			●	●	●	●	●			●			●	●	✔	4	✔	● (green)	Up to £5,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £4,000,000
HBE Services Ltd	01525 854110				●	●				●				●	●	✔	2			Up to £800,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Hillcrest Structural Steel Ltd	023 8064 1373			●	●	●	●	●		●	●			●	●	✔	3		● (purple)	Up to £3,400,000*
Intersteels Ltd	01322 337766	●			●	●	●	●	●	●			●	●	●	✔	3	✔		Up to £5,000,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●					4			Up to £6,500,000*
Jamestown Manufacturing Ltd	00 353 45 434 288		●	●	●	●	●	●	●	●		●	●			✔	4			Up to £10,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●		●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (yellow)	Above £10,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4		● (purple)	Up to £6,500,000
Leach Structural Steelwork Ltd	01995 642000			●	●	●	●	●			●					✔	2		● (purple)	Up to £6,500,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●					●	●			●	●		2			Up to £600,000
Littleton Steel Ltd	01934 311670					●				●	●			●	●	✔	3			Up to £1,400,000
Loaninghill Fabrications Ltd	01506 858466				●				●	●	●			●	●		3			Up to £400,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●			●	●	✔	4		● (green)	Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●				●	✔	3			Up to £2,400,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £2,400,000
Maldon Marine Ltd	01621 859000				●	●			●	●	●				●	✔	3			Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £6,500,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●			●	●				✔	4		● (purple)	Up to £2,000,000
North Lincs Structures	01724 855512			●	●					●	●				●		2			Up to £600,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		● (yellow)	Up to £6,000,000
Peter Marshall (Steel Stairs) Ltd	0113 307 6730				●	●				●	●				●	✔	3			Up to £2,400,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £2,400,000
REIDsteel	01202 483333			●	●	●	●		●			●			●	✔	4		● (yellow)	Up to £10,000,000
SAH Luton Ltd	01582 805741			●	●	●				●	●			●	●		2			Up to £600,000
S H Structures Ltd	01977 681931	●		●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (yellow)	Up to £5,000,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●			●	●			●	●	✔	4			Up to £2,000,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (yellow)	Above £10,000,000
Shaun Hodgson Engineering Ltd	01553 766499	●			●		●			●	●			●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●	✔	2			Up to £2,400,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £2,000,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £1,200,000
Stage One	01423 358001				●		●	●	●	●					●	✔	2			Up to £6,500,000
Steel & Roofing Systems	00 353 56 444 1855	●		●	●	●	●				●	●		●	●	✔	4			Up to £5,000,000
Taziker Industrial Ltd	01204 468080	●		●	●		●	●		●	●		●	●	●	✔	3		● (yellow)	Above £10,000,000
Temple Mill Fabrications Ltd	01623 741720			●	●					●	●				●	✔	2			Up to £400,000
TSI Structures Ltd	01603 720031			●	●	●	●	●			●			●			2	✔		Up to £2,000,000
W I G Engineering Ltd	01869 320515				●					●	●			●	●	✔	2		● (orange)	Up to £600,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	4			Above £10,000,000
Westbury Park Engineering Ltd	01373 825500	●		●	●	●	●	●	●	●	●				●	✔	4		● (green)	Up to £2,400,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (yellow)	Above £10,000,000

BCSA steelwork contractor member Tel C D E F G H J K L M N Q R S QM FPC BIM SCM Guide Contract Value (1)

The Register of Qualified Steelwork Contractors Scheme **Bridgeworks**

Steelwork contractors for bridgeworks

The Register of Qualified Steelwork Contractors Scheme for Bridgeworks (RQSC – Bridgeworks) is open to any Steelwork Contractor who has a fabrication facility within the UK or European Union.

Applicants may be registered in one or more category to undertake the fabrication and the responsibility for any design and erection of:

FB Footbridges
CF Complex footbridges
SG Sign gantries
PG Bridges made principally from plate girders
TW Bridges made principally from trusswork
BA Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
CM Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
MB Moving bridges
SRF Site-based bridge refurbishment
FRF Factory-based bridge refurbishment
AS Ancilliary structures in steel associated with bridges, footbridges or sign gantries (eg grillages, purpose-made temporary works)

QM Quality management certification to ISO 9001

FPC Factory Production Control certification to BS EN 1090-1
1 – Execution Class 1   2 – Execution Class 2
3 – Execution Class 3   4 – Execution Class 4

BIM BIM Level 2 compliant

SCM Steel Construction Sustainability Charter
● = Gold ● = Silver ● = Bronze ● = Certificate

Notes
(1) Contracts which are primarily steelwork but which may include associated works. The steelwork contract value for which a company is pre-qualified under the Scheme is intended to give guidance on the size of steelwork contract that can be undertaken; where a project lasts longer than a year, the value is the proportion of the steelwork contract to be undertaken within a 12 month period.

Where an asterisk (*) appears against any company's classification number, this indicates that the assets required for this classification level are those of the parent company.

BCSA steelwork contractor member	Tel	FB	CF	SG	PG	TW	BA	CM	MB	SRF	FRF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
Adey Steel Ltd	01509 556677	●	●	●	●	●	●			●	●	●	✓	3			✓	Silver	Up to £3,400,000
AJ Engineering & Construction Services Ltd	01309 671919	●		●	●	●	●	●	●	●	●	●	✓	4				Silver	Up to £3,400,000
Beaver Bridges Ltd	01204 668773	●		●	●	●	●	●	●	●	●	●	✓	4					Up to £3,000,000
Billington Structures Ltd	01226 340666	●		●	●	●	●					●	✓	4	✓	✓	✓	Gold	Above £10,000,000
Bourne Group Ltd	01202 746666	●		●	●	●				●		●	✓	4	✓		✓	Gold	Above £10,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓	Silver	Up to £10,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●	●	●	●		●	●	●	✓	4			✓	Gold	Up to £6,500,000
Cementation Fabrications	0300 105 0135	●	●	●	●	●	●	●	●	●	●	●	✓	3			✓	Gold	Up to £10,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	●	✓	4			✓		Up to £1,200,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●		●			●	✓	4				Gold	Up to £5,000,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●	●	●		●	●	●	●	✓	3			✓	Silver	Up to £2,400,000
Jamestown Manufacturing Ltd	00 353 45 434 288	●	●	●	●	●	●					●	✓	4			✓		Up to £10,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●			●	●				●		●	✓	4	✓		✓	Gold	Above £10,000,000
M&S Engineering Ltd	01461 40111	●		●		●	●	●		●	●	●	✓	3					Up to £2,400,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓	Certificate	Up to £1,400,000
Millar Callaghan Engineering Services Ltd	01294 217711	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●	●	●	●	●	●			●	●	●	✓	4			✓		Up to £6,500,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Up to £6,000,000
REIDsteel	01202 483333	●			●	●	●		●			●	✓	4				Gold	Up to £10,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	Gold	Up to £5,000,000
Severfield plc	01204 699999	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	Gold	Above £10,000,000
Taziker Industrial Ltd	01204 468080	●	●	●	●	●	●	●	●	●	●	●	✓	3		✓	✓	Gold	Above £10,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	Gold	Above £10,000,000
Non-BCSA member																			
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	Certificate	Up to £3,400,000
Carver Engineering Services Ltd	01302 751900	●		●	●	●	●		●	●	●	●	✓	4			✓		Up to £3,000,000
Centregreat Engineering Ltd	029 2046 5683	●		●	●	●	●	●	●	●	●	●	✓	4					Up to £3,400,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Certificate	Above £10,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●	●	●		●	●	✓	4			✓		Up to £600,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	●	✓	3		✓	✓	Silver	Up to £2,400,000
Harrisons Engineering (Lancashire) Ltd	01254 823993	●	●	●	●	●	●	●	●	●	●	●	✓	3		✓			Up to £3,400,000
Hollandia Infra BV	00 31 180 540 540	●	●	●	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000*
HS Carlsteel Engineering Ltd	020 8312 1879			●						●	●	●	✓	3			✓		Up to £1,200,000
J&D Pierce Contracts Ltd	01505 683724	●	●		●	●	●	●	●			●	✓	4			✓		Above £10,000,000
Kelly's Welders & Blacksmiths Ltd	01383 512 517											●	✓	2			✓		Up to £350,000
North View Engineering Solutions Ltd	01325 464558											●	✓	3					Up to £1,200,000
Shaw Manufacturing Ltd	01642 210716			●						●	●	●	✓	4			✓		Up to £1,200,000
Smulders Projects UK Ltd	0191 295 8700	●	●	●	●	●	●	●	●	●	●	●	✓	4					Above £10,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●				●	●	●	✓	3			✓		Up to £5,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Silver	Above £10,000,000

Corporate Members

Corporate Members are clients, professional offices, educational establishments etc which support the development of national specifications, quality, fabrication and erection techniques, overall industry efficiency and good practice.

Company name	Tel
Bonham and Brook North Ltd	020 3523 9125
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	0300 123 5000
Keiths Welding Limited	07791 432 078
MMCEngineer Ltd	01423 855939
Paul Hulme Engineering Ltd	07801 216858
Sandberg LLP	020 7565 7000
Solent Commercial Management Limited	07852 309104
Structural & Weld Testing Services Ltd	01795 420264
SUM ADR Ltd	07960 775772

Industry Members

Industry Members are those principal companies involved in the direct supply to all or some Steelwork Contractor Members of components, materials or products. Industry member companies must have a registered office within the United Kingdom or Republic of Ireland.

QM Quality management certification to ISO 9001
FPC Factory Production Control certification to BS EN 1090-1
1 Execution class 1 2 Execution class 2
3 Execution class 3 4 Execution class 4
NHSS National Highway Sector Scheme

CA Conformity Assessment
UKCA and/or CE Marking compliant, where relevant:
M manufacturer (products UKCA and/or CE Marked)
D/I distributor/importer (systems comply with the CPR)
N/A CPR not applicable

SCM Steel Construction Sustainability Charter
● = Gold ● = Silver
● = Bronze ● = Certificate

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Structural components

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Albion Sections Ltd	0121 553 1877	✓	M	4			
BW Industries Ltd	01262 400088	✓	M	3			
Cellbeam Ltd	01937 840600	✓	M	4	20		
Composite Profiles UK Ltd	01202 659237		D/I				
Construction Metal Forming Ltd	01495 761080	✓	M	3			
Daver Steels Ltd	0114 261 1999	✓	M	3			
ES Steel	0161 511 8386	✓	N/A				
Farrat Isolevel	0161 924 1600	✓	N/A				
Hadley Industries Plc	0121 555 1342	✓	M	4		● Gold	
Hi-Span Ltd	01953 603081	✓	M	4		● Bronze	
Kingspan Structural Products	01944 712000	✓	M	4		● Gold	
MSW UK Ltd	0115 946 2316		D/I				
Prodeck-Fixing Ltd	01278 780586	✓	D/I				
Structural Metal Decks Ltd	01202 718898	✓	M	4			
Stud-Deck Services Ltd	01335 390069		D/I				
Tata Steel – ComFlor	01244 892199	✓	M	4			
voestalpine Metsec plc	**0121 601 6000**	✓	**M**	4		● Gold	**Gold**

Computer software

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Autodesk Ltd	01252456600		N/A				
Fabsec Ltd	01937 840641		N/A				
IDEA StatiCa UK Ltd	**02035 799397**		**N/A**				**Silver**
StruMIS Ltd	01332 545800		N/A				
Trimble UK Limited	0113 887 9790		N/A				

Steel producers

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
British Steel Ltd	01724 404040	✓	M		3B		
Tata Steel – Tubes	01536 402121	✓	M		3B		

Manufacturing equipment

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Behringer Ltd	01296 668259		N/A				
Cutmaster Machines (UK) Ltd	**07799 740191**		**N/A**				**Silver**
Ficep (UK) Ltd	**01924 223530**		**N/A**				**Silver**
Kaltenbach Ltd	01234 213201		N/A				
Lincoln Electric (UK) Ltd	0114 287 2401	✓	N/A				
Peddinghaus Corporation UK Ltd	01952 200377		N/A				

Membership services

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Deconstruct UK Ltd	02035 799397	✓	N/A				
European Metal Recycling Ltd	01925 715400	✓	N/A				

Protective systems

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Forward Protective Coatings Ltd	01623 748323	✓	N/A				
Hempel UK Ltd	**01633 874024**	✓	**N/A**				**Silver**
Highland Metals Ltd	01343 548855	✓	N/A				
International Paint Ltd	0191 469 6111	✓	N/A				
Jack Tighe Ltd	01302 880360	✓	N/A		19A		
Joseph Ash Galvanizing	**01246 854650**	✓	**N/A**				**Silver**
PPG Architectural Coatings UK & Ireland	01924 354233	✓	N/A				
Sherwin-Williams UK Ltd	01204 521771	✓	N/A			● Silver	
Vale Protective Coatings Ltd	01949 869784		N/A				
Wedge Group Galvanizing Ltd	**01902 601944**	✓	**N/A**				**Gold**

Safety systems

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
easi-edge Ltd	01777 870901	✓	N/A				
TRAD Hire & Sales Ltd	01614 304666	✓	N/A				

Steel stockholders

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
AJN Steelstock Ltd	01638 555500	✓	M	4			
Arcelor Mittal Distribution - Scunthorpe	**01724 810810**	✓	**D/I**	**4**	**3B**		**Headline**
Barrett Steel Services Limited	**01274 682281**	✓	**M**	**4**	**3B**		**Headline**
British Steel Distribution	01642 405040	✓	D/I	4	3B		
Cleveland Steel & Tubes Ltd	**01845 577789**	✓	**M**	**3**	**3B**		**Gold**
Dent Steel Services (Yorkshire) Ltd	01274 607070	✓	M	4	3B		
Dillinger Hutte U.K. Limited	01724 231176	✓	D/I	4		● Gold	
Duggan Profiles & Steel Service Centre Ltd	00 353 567722485	✓	M	4			
Kloeckner Metals UK	0113 254 0711	✓	D/I	4	3B	● Gold	
Murray Plate Group Ltd	0161 866 0266	✓	D/I	4	3B		
NationalTube Stockholders Ltd	**01845 577440**	✓	**D/I**	**4**	**3B**		**Gold**
Rainham Steel Co Ltd	01708 522311	✓	D/I	4	3B		
The Alternative Steel Co Ltd	01942 826677	✓	D/I				

Structural fasteners

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
BAPP Group Ltd	01226 383824	✓	M		3		
Cooper & Turner Ltd	0114 256 0057	✓	M		3		
Lindapter International	01274 521444	✓	M				

Welding equipment and consumables

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Air Products PLC	01270 614167		N/A				

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