www.newsteelconstruction.com

NSC

STRUCTURAL STEEL DESIGN AWARDS 2019

October 2019
Vol 27 No 9

Cover Image
Tottenham Hotspur Football Club, New Stadium
Architect: Populous
Structural engineers: BuroHappold Engineering, schlaich bergermann partner
Steelwork contractor: Severfield
Main contractor: Mace
Client: Tottenham Hotspur Football Club
Photo: © Hufton+Crow

October 2019
Vol 27 No 9

EDITOR
Nick Barrett Tel: 01323 422483
nick@newsteelconstruction.com

DEPUTY EDITOR
Martin Cooper Tel: 01892 538191
martin@newsteelconstruction.com

PRODUCTION EDITOR
Andrew Pilcher Tel: 01892 553147
admin@newsteelconstruction.com

PRODUCTION ASSISTANT
Alastair Lloyd Tel: 01892 553145
alastair@barrett-byrd.com

COMMERCIAL MANAGER
Fawad Minhas Tel: 01892 553149
fawad@newsteelconstruction.com

NSC IS PRODUCED BY BARRETT BYRD ASSOCIATES ON BEHALF OF THE BRITISH CONSTRUCTIONAL STEELWORK ASSOCIATION AND STEEL FOR LIFE IN ASSOCIATION WITH THE STEEL CONSTRUCTION INSTITUTE

The British Constructional Steelwork Association Ltd
4 Whitehall Court, Westminster, London SW1A 2ES
Telephone 020 7839 8566
Website *www.steelconstruction.org*
Email *postroom@steelconstruction.org*

Steel for Life Ltd
4 Whitehall Court, Westminster, London SW1A 2ES
Telephone 020 7839 8566
Website *www.steelforlife.org*
Email *steelforlife@steelconstruction.org*

The Steel Construction Institute
Silwood Park, Ascot, Berkshire SL5 7QN
Telephone 01344 636525 Fax 01344 636570
Website *www.steel-sci.com*
Email *reception@steel-sci.com*

CONTRACT PUBLISHER & ADVERTISING SALES
Barrett, Byrd Associates
7 Linden Close,
Tunbridge Wells, Kent TN4 8HH
Telephone 01892 524455
Website *www.barrett-byrd.com*

These and other steelwork articles can be downloaded from the New Steel Construction Website at *www.newsteelconstruction.com*

SSDA will reflect digital transformation

Nick Barrett - Editor

The Structural Steel Design Awards is now into its sixth decade and remains the ultimate recognition for the best achievements in steel construction. Some stunning projects were on show at the 51st awards ceremony in London, all of them worthy of the accolade of National Finalist.

Something that sets the SSDA apart, other than the high quality of the shortlist, is the stringent and methodical judging process.

It starts with an intense 'desk-top' scrutiny of the written submissions. At least two judges, all of them highly experienced architects or engineers, visit each shortlisted project - 20 of them this year - which is not universal practice in awards judging. As well as looking at the quality of the design and finished project, the judges ask the project team a range of questions. And they expect detailed answers!

By this stage, the judges are looking for reasons why a project would justify the accolade of an award, and the bar is set very high indeed.

The range of sizes and types of projects chosen for awards is highly varied, as we see again this year with Tottenham Hotspur's new stadium - selected as Project of the Year - at one end of the size scale and a seal hide at the other.

There was great variety among the Award winners. In addition to Tottenham Hotspur's new stadium, they included the slender design of a footbridge over the Thames at Taplow; a major regeneration at Coal Drops Yard in King's Cross, London, with a striking 'kissing roof'; a new headquarters for a software company in Sunderland exhibiting high quality in design and construction; and the retractable roof at Wimbledon's No 1 Court that was made possible by large, movable trusses installed to exacting tolerances.

All of these projects were made possible by steel; some would not have been possible at all using any other material, others would not have been the vital additions to the built environment that they now are.

These projects are also made possible by the technology that designers and steelwork contractors can use today. And the advance of the digital transformation underway across the construction industry means the prospects for innovation in design and construction have never been more exciting.

The digital transformation means that a new vocabulary of terms like artificial intelligence, machine learning, blockchain, internet of things and digital twins has to be learned, and ways of releasing the potential that they create have to be developed.

As BCSA President Tim Outteridge says in his column this month, the constructional steelwork sector has always been an early adopter in the take up of new technology, and is well placed to take full advantage of the digital advances to come. We can expect to see the benefits of the digital transformation unfold in the entries to the SSDA in future.

STRUCTURAL STEEL DESIGN AWARDS 2019

Winners announced at 51st Structural Steel Design Awards

PROJECT OF THE YEAR
Tottenham Hotspur Football Club, New Stadium

AWARDS
Tottenham Hotspur Football Club, New Stadium

Coal Drops Yard, London

Taplow Riverside Footbridge

Tombola HQ, Sunderland

Wimbledon No. 1 Court

COMMENDATIONS
Battersea Arts Centre

Chiswick Park Footbridge

Fen Court, London

Ingenuity House, Birmingham

Neuron Pod, London

Royal Academy of Music, London

MERITS
GW Annenburg Performing Arts Centre

Greatham Creek Seal Hide, Middlesborough

The Macallan Distillery

Telford Central Footbridges

NATIONAL FINALISTS
160 Old Street, London

Aga Khan Centre, London

Ely Southern Bypass

Kettner's Townhouse & Soho House Greek Street

Project Mint at The O2

Five projects were Award winners at this year's Structural Steel Design Awards held this week at LSO St Luke's in London.

The five winning projects at the 51st annual SSDA were Tombola HQ, Sunderland; Coal Drops Yard, London; Wimbledon No.1 Court; Taplow Riverside Footbridge; and Tottenham Hotspur Football Club, New Stadium, which also received the Project of the Year accolade.

From an initial shortlist of 20 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 four collecting Merits.

Chairman of the Judges, Chris Nash said: "This year there has been a greater variety in the types of projects entered for the scheme.

"Scales of entry range from the largest sports building projects, through prestige city and regional office buildings, to smaller educational projects. While there are no residential projects this year, we see an increase in high-quality leisure sector projects and footbridges.

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

British Constructional Steelwork Association President Tim Outteridge said: "As with many of you, I really look forward to these awards. They show how vibrant and innovative our sector is, and they reinforce the UK's position as a world-leader in steel construction. And how fantastic is it that they've been going for 51 years?

"Huge congratulations to all of tonight's winners and finalists. Every single one of them really showcased expertise and a passion for steel.

"Thanks must go to our awards sponsor Trimble Solutions UK, who again this year has partnered with BCSA to deliver a superb awards."

Chairman of the Judges, Chris Nash

BCSA President, Tim Outteridge

The recipients of the Project of the Year Award for the new stadium at Tottenham Hotspur Football Club

The Award winning teams

Coal Drops Yard, London

Taplow Riverside Footbridge

Tombola HQ, Sunderland

Wimbledon No. 1 Court

NEWS IN BRIEF

The **British Constructional Steelwork Association** (BCSA) has announced that Dr David Moore, currently Director of Engineering has accepted the position of Chief Executive Officer of BCSA following Director General Sarah McCann Bartlett's resignation.

ArcelorMittal has published an English language version of its Pre-design Tables for Filler Beam Railway Bridges according to Eurocode. The tables are said to allow quick pre-design of filler beam bridges with spans up to 35m. Five categories are considered with service speeds up to 300km/h. The tables can be downloaded from *https://sections.arcelormittal.com/products_and_solutions/Our_Specialties/Bridges/EN*

The BCSA is one of the sponsors for the international conference, **Eurosteel**, which is coming to Sheffield in September 2020. More information is available on the Conference website (*https://eurosteel2020.com*), or contact the conference administration on *eurosteel2020@sheffield.ac.uk*.

Steelwork contractor **Billington** has delivered record revenue for the first half of 2019 stating that a number of major project wins has helped raise group revenue to £47M. Its accrued revenues generated a pre-tax profit in the six months to June up 38% to £2.68M. Additionally, the Group's operating margin rose to 5.6% from 4.9% for the previous six months.

Developer Chancerygate has awarded a £10.7M contract to **Caddick Construction** to build the first phase of its Novus business park in Knutsford, Cheshire. At 22,600m^2 in total, Novus has a gross development value of about £33M and is expected to create up to 700 jobs.

Property developer **Osborne+Co** has been given the go-ahead by Glasgow City Council to deliver a new commercial scheme at Argyle Street in the city's International Financial Services District (IFSD). Designed by Glasgow-based architects Cooper Cromar, the scheme will provide approximately 25,000m^2 of Grade A office space over 14-storeys.

PRESIDENT'S COLUMN

One thing that really raises my blood pressure is hearing politicians using that old chestnut 'metal bashers' when in fact nothing could be further from the truth. But it's sometimes hard for those outside the sector to reconcile their traditional image of the structural steelwork industry with the modern-day reality of digitisation, automation and business process improvement.

In fact, BCSA members are already expert in the use of technology and automation and are always on the lookout for what's next. And BCSA's Digital Technology Working Group continues to investigate new technologies on behalf of the structural steelwork sector.

Software use is integral to the steel fabrication process, supporting activities such as internal knowledge and bid management, project planning, analysis and design, 3D modelling and BIM co-ordination.

At the start of the process, modelling and estimating software is essential to the bidding process for steelwork contractors, and I can see that its use is increasing. This software creates a model of the steel frame so steelwork contractors can visually present the content of their bid alongside the associated costs and provide insight into the sequence of construction works.

During the design phase, the structural steel is modelled to fabrication levels of detail. Materials Resource Planning software then processes data from the model which is used for materials procurement, manages data to drive automated cutting and fabrication machinery, and plans logistics. These technology advancements have allowed steelwork contractors to operate on a "just-in-time" basis.

Automated CNC machinery is standard today for each stage of the steel fabrication process. While every steelwork contractor has a slightly different process, it starts with the efficient and seamless transfer of 3D model information from the design office to the equipment in the workshop. I know that when visitors come into a structural steelwork workshop, they are amazed at how automated the fabrication process is.

So what for the future?

The sector is moving towards the adoption of full automation of all processes on the factory floor, utilising robots or cobots (collaborative robots). While this is some way off, some steelwork contractors are already moving into robotics.

Further technological advancements will drive the adoption and advancement of mixed reality and holographic technology, both in the factory and on-site.

And 3D printing, while still in the distant future for everyday steel structures, is coming on in leaps and bounds.

While we can't predict the future, what I do know is that BCSA's Digital Technology Working Group will continue to monitor these and other emerging technologies to help keep the structural steelwork sector at the forefront of digitisation, automation and efficiency.

Tim Outteridge
BCSA President & Jamestown Manufacturing

Steel frame completes on Lidl headquarters

More than 1,400t of structural steelwork has been erected to form the new headquarters for Lidl GB in Tolworth, south west London.

Working on behalf of Winvic Construction, Caunton Engineering fabricated, supplied and erected the steel for the five-storey office building, which is expected to achieve a BREEAM 'Excellent' rating.

Situated adjacent to the A3, the building's structural frame measures 112m-long × 43.8-wide and gains its stability from concrete cores. Open-plan offices are created on all floors with long span beams, with the longest span measuring 15.2m-long.

Overall, Caunton erected 5,174 individual steel pieces for the project, with the heaviest member weighing 13.8t.

The building, which will be ready for occupation by the end of 2020, comprises offices, meeting and conference rooms, and canteen facilities.

Winvic Construction Director Naim Basha commented: "We have made excellent progress on this scheme and the whole Winvic team, which not only includes our dedicated staff, but suppliers and consultants, is proud to reach this important steel frame completion milestone. We're now almost halfway through the complex project and the office's fully glazed external envelope is one of the next transformative areas of work, when the exterior design really begins to come to life."

Frame up for new Greenock health centre

More than 450t of structural steelwork has been erected to form the frame for the new Greenock Health and Care Centre in Scotland.

The £21M centre, located on the site of a former academy, will bring together four existing GP practices, district nurses, health visitors, dental and podiatry departments, and a number of out-patient clinics, alongside a community café.

Working on behalf of the main contractor BAM Construction, Hescott Engineering fabricated, supplied and erected the steel for the project.

Hub West Scotland is the main client, and its Chairman John Brown says: "The current facilities at Greenock Health Centre are out-dated and not ideal for the provision of modern health and social care services.

"This new purpose-built centre has been designed to be much more than a simple replacement of the existing facility. It has the potential to bring together the key elements from a range of professions to tackle health inequalities, improve health and contribute to social regeneration."

Including the ground floor, the steel-framed centre is a four-storey structure measuring approximately 50m x 50m. The large square building features a large open centre, which will accommodate a landscaped garden.

Commenting on the project, Hescott Engineering Director Chris Scott said: "The erection of the steel frame was difficult due to the sloping nature of the site. The difference in level between the lowest base and the highest base is 7150mm, which over the width of the site is quite significant. Consequently, loads had to be scheduled to suit where the cranes and MEWPs could be positioned."

Lincolnshire bridge approved by Tees Valley Mayor

Tees Valley Mayor Ben Houchen has given his seal of approval to one of the latest steel structures being manufactured at Cleveland Bridge UK.

The Mayor signed a large girder, which will form part of a new 1,400t weathering steel bridge that will cross the River Witham.

When complete, the five-span composite bridge will measure around 225m-long and will be six girders wide.

Mayor Ben Houchen said: "Cleveland Bridge is an iconic business that has helped build the world. I'm very proud it is a key part of Tees Valley's economy, with a reputation that flies the flag for the area.

"I was delighted to put a Tees Valley seal of approval on the steel girder being produced at Cleveland Bridge's factory in Darlington. It shows that this area has high quality manufacturing companies that can deliver on projects, whether they are on our doorstep or anywhere across the globe, as a result of growing, developing their expertise and investing in skilled workforces."

Assembly begins for landmark Hull bridge

Forming the initial phase of Highways England's A63 Castle Street scheme, which will help to connect key sites in Hull city centre, a new 60m-long steel bridge is currently being assembled.

The Princes Quay Bridge will allow pedestrians and cyclists to cross the A63, and will link the city's marina with the southern end of Princes Dock.

Working on behalf of main contractor Interserve, the bridge is being supplied and installed by S H Structures. It is currently being assembled offsite close to its final location, prior to being moved into position using self-propelled modular transporters.

The bridge has dramatic feature canopy, which is formed from complex double curved plate and acts with the arch structure to support the suspended deck.

The canopy also provides sheltered viewing balconies at each end of the bridge, which will offer views across the city and waterfront.

Work starts on Lord's cricket ground redevelopment

The £52M redevelopment at Lord's cricket ground has officially started as main contractor ISG and the Marylebone Cricket Club (MCC) have broken ground to mark the start of construction work.

Two new three-tiered stands, designed by WilkinsonEyre, are being built over the next two years, with Severfield contracted to fabricate, supply and erect the steelwork.

The redevelopment forms the second phase of the ground's updated masterplan. The stands' designs are said to remain consistent with the overall architectural identity of Lord's and the 'village cricket green' ethos, while working to improve the overall harmony of the north-east end of the ground.

The new designs include integrated catering and WC facilities, and an improved spectator experience.

The seating capacity will be increased by around 2,500, accommodating 11,500 spectators overall, which will enable the MCC to better satisfy the demand for tickets from the general public. There will also be wheelchair-accessible spaces as well as lift access at all levels.

A rapid-build design sequence has been developed to minimise interruption to match fixtures, with the new stands' seats due to be ready for use during the 2020 season.

Scottish contractor endorses BCSA CRAFT apprenticeships

Four BHC apprentices have recently been awarded the British Constructional Steelwork Association (BCSA) CRAFT certificate.

Over the past four years, the apprentices – Steven Barclay, Sam Baverstock, Mark Ewart and Connor Morrison (all pictured) undertook a variety of training modules with the assistance of their coaches.

The monitoring of the training and final confirmation of the module tests were validated by BHC's in-house BCSA Registered Validators, Jimmy Cowan (Registered Welding Coordinator), Brian Edwards (Production Process Engineer) and Richie Struthers (HSQE Manager).

BHC said it continues to invest heavily in the apprentices it employs and recently welcomed 20 new first-year apprentices into the company.

The BCSA CRAFT apprenticeship is a key element to the company's ongoing success and BHC said it is proud to recognise the importance of apprenticeships within the steel construction industry.

BCSA's CRAFT Scheme is an industry approved alternative apprenticeship training scheme developed by the Association.

The BCSA is also a Lantra approved corporate training provider with the intention to help member companies that wish to bring new people into the industry. The CRAFT Certificate delivers a training package that is relevant to the steelwork fabrication processes used in the industry.

For details about CRAFT please contact Pete Walker, BCSA's Director of Health, Safety & Training.

Email: *pete.walker@steelconstruction.org*

Diary

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

Tuesday 15 October 2019
Open Section Truss Joints
This webinar will consider the design of the joints using simple calculations of the component resistances.
Webinar

Tuesday 15 October 2019
Steel Frame Disproporationate Collaspse Rules Course
This course provides a solid introduction into the design of steel-framed buildings to avoid disproportionate collapse.
Milton Keynes

Thursday 7 November 2019
UK Steel Construction Day 2019: Innovative Steel Solutions
At this event we will look at a range of different solutions that address the multiple needs to build with improved speed, quality, safety, predictability, and using less materials. Some of these solutions are already being applied, others are for the future. London

Tuesday 12 November 2019
Steel and composite beams with web openings
This webinar provides an overview of the behaviour of steel and composite beams with openings in webs.
Webinar

Wednesday 13 November 2019
Steel for Life - Steel Essentials Seminar
Practical guidance for designers considering the use of structural steelwork on key aspects from preliminary scheme development to optimising in-service performance.
Manchester.
Contact *christina.gulvanessian@steelconstruction.org* or tel 0207 747 8139

Collaborative working

Everyone in the industry is accustomed to Requests for Information and while they can be crucial for resolving issues, they can hinder the progress of a project. However, with greater collaboration between all parties and the better use of software on a project, they can be minimised. Here, Steve Insley, Business Development Manager at Trimble Solutions (UK) Ltd explores the problem, the solution and why steelwork contractors should influence change within the supply chain.

As we know, Requests for Information (RFIs) are generally used to clarify information in the documentation, drawings and the specifications of a project, or to provide information that was not complete at the time the contract was agreed. However, unfortunately they have long been a sore point for all within the industry, as they can lead to costly delays.

For example, if a steelwork contractor urgently requires vital positioning information for a steel component, they have to submit an RFI, which means they are unable to proceed, resulting not only in delays within their manufacturing facility, but also delays to the work being carried out on site. It becomes a bottle neck for productivity – something the end client does not want to hear; they just want their project completed on time and to budget.

People are able to process visuals 60,000 times faster than text (according to research compiled by 3M). Therefore, in order to reduce RFIs, the industry should look to incorporate cloud-based BIM software within a project, allowing relevant people in the supply chain to physically see the 3D model (rather than a 2D drawing), which means they will be able to highlight issues easily, while also providing a more informed decision on how to solve a problem, in order to keep pushing the project forward to meet the deadline.

And the good news is that any party within the supply chain can instigate the use of this software, even if the main contractor is not already using their preferred cloud-based BIM software.

For example Trimble Connect, and other collaboration tools such as Viewpoint for Projects, have been designed to not only help the construction industry build better, but to improve communication between the contractor, structural engineer and steelwork contractor, to create a coordinated environment where all parties can review the latest models, plans and schedules.

By making information easily visible, accessible and sharable, it enables everyone involved in a construction project to know what is happening at all stages during a project and more importantly, what needs to happen next – encouraging a higher level of communication, productivity and efficiency.

Steelwork contractors are often one of the last parties to join the design team for a project, it is even more important that they influence this change, as when they join a project, those involved earlier on will have moved on, meaning if they have a technical query, then it could be a while before an answer is received. What's more, steelwork contractors are probably one of the most prepared members of a supply chain, having already used a 3D model for fabrication purposes, so it might be easier than they think to become the influencer – especially as they are well accustomed to the benefits BIM can bring to a project.

Indeed, if you bring all consultants and suppliers together by allowing them to remotely login to a visual session and effectively communicate with one another, all queries can be understood more quickly and resolved collaboratively. Providing more people with access to BIM models and project plans can reduce the amount of time wasted on site and, labour and cost overruns, with fewer design clashes, the need for less rework on site and more informed schedules, meaning that the work is more likely to run to programme.

For example, assuming the average site rework item costs £5,000 to resolve, before the cost of delays are considered, using inexpensive software to visualise the problem and resolve it as quickly as possible becomes the obvious answer.

The change may not happen overnight, but by applying pressure to incorporate software or early engagement strategies, steelwork contractors can have a positive impact on the whole workflow of a project – and be seen as more proactive.

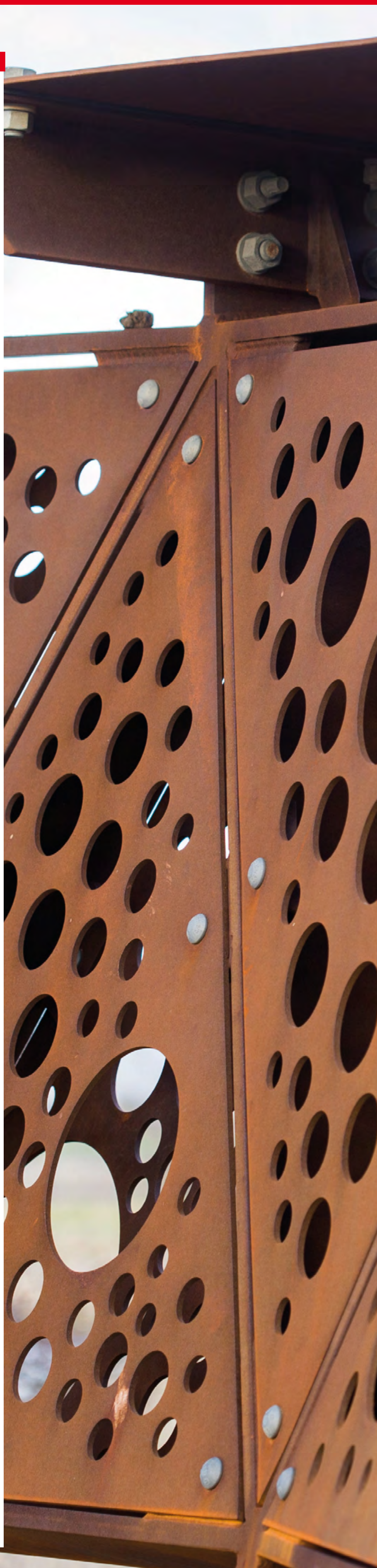
For more information, please visit *www.tekla.com/uk/products/trimble-connect*

Trimble

Trimble Solutions (UK) Ltd is a sponsor of the Structural Steel Design Awards

Structural Steel Design Awards 2019

Pictured: Tottenham Hotspur Football Club, New Stadium



The Judges

Christopher Nash is a senior Consultant Architect. He graduated in 1978 from Bristol University School of Architecture, and was at Grimshaw Architects from 1982, becoming a Director from 1992, Managing Partner from 1998 to 2008, and retiring from the Partnership in 2012. While at Grimshaw he was responsible for many of the practice's high profile buildings. These include - from his early years - the Financial Times Printing Works in London's Docklands and the British Pavilion for the Seville Expo 92, The Western Morning News headquarters in Plymouth, the RAC Regional Headquarters in Bristol and many other projects. Following the success of the Zurich Airport fifth expansion project, he returned to a smaller scale of work with the Cutty Sark Conservation Project. Chris continues to practise as a consultant in architectural practice management, architectural education and property development.

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 a Director 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.

Sarah Pellereau is an Associate at Price & Myers with 17 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.

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.

Julia Ratcliffe is an independent Structural Engineering consultant and founded scale consulting in 2018 after twelve years working with Expedition Engineering and as a Director of the practice from 2011. In her career, she has worked for major consultancies in the UK and overseas as well as with international development organisations. Her design projects range from towers, bridges and cultural institutions to residential masterplans, refurbishments and private houses. She is a fellow of the Institution of Structural Engineers and a Professional Engineer, licensed in the state of Connecticut, USA, a Design Council CABE built environment expert and has served on award judging panels for RIBA London and the IStructE as well as the BCSA.

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 partner in 1988. He was a pivotal figure in the development and success of the practice both in the UK and overseas and was responsible for a large number of award-winning projects, many of which received a Structural Steel Design Award. Bill is a founding member of Tensinet, the pan European organization researching lightweight and tensile construction. In 2010 Bill left Michael and Patty to concentrate on his own projects and from 2012 has collaborated with architect Robin Snell and his practice. 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 joined Wilkinson Eyre Architects (WEA) in 1991 becoming a Director in 1999. He has spent over 25 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 WEA 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 UK's first urban cable car, the Emirates Air Line and most recently a new office building in Finsbury Circus. Oliver is currently leading a number of major infrastructure and commercial office schemes in the City of London, including Liverpool Street Station for Crossrail, the Bank Station capacity upgrade project and a 50-storey office tower on Leadenhall Street.

Introduction

By Christopher Nash RIBA – Chairman of the Judging panel.

Again this year I was very pleased to moderate the deliberations of our talented judging team comprising a balance of architectural and engineering designers and experts from the steel fabrication industry. All members of the panel always bring enthusiasm and enjoyment to the job, as well as fair-minded dispassionate judgement, and this year has been no exception.

This year there has been a greater variety in the types of projects entered for the scheme.

Scales of entry range from the largest sports building projects, through prestige city and regional office buildings, to smaller educational projects. While there are no residential projects this year, we see an increase in high quality leisure sector projects and footbridges.

As in previous years, a preliminary selection was made on the basis of a close examination of the entry documents. I would like to make a plea for the initial entry documents, particularly photographs of projects, to be of high quality and comprehensively descriptive so that the panel can make as informed an initial judgement as possible. The entrants of resultant shortlisted schemes from the initial 'desk-top' selection were all then notified and each project was visited by at least two judges from different disciplines.

At this point I'd like to pass my thanks to the hosting teams who went out of their way to be present to answer the judges detailed questions. Unlike some other award schemes, we believe it is essential to get down close and personal with the entered projects before making our final assessments. The project teams' demonstration of collaboration always comes through and is a major part in our assessment of the entry. Projects that are represented by an informed and enthusiastic team are a step ahead.

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

Tottenham Hotspur Football Club, New Stadium

© Hufton + Crow

The Premier League's newest stadium has a 62,000 all-seater capacity and a sliding pitch to allow it to host non-football events.

It takes some teams a season or two to adapt to playing at home in a brand-new stadium, but Tottenham Hotspur made a seamless transition earlier this year, winning its opening three fixtures.

The club's new home, constructed on a site that overlaps much of the old – now demolished – ground's footprint has been designed as an iconic structure and a benchmark for stadium design.

The stadium is a tight atmospheric bowl, and feels and looks like a traditional, albeit very modern, football stadium with its single tier home end. All of this helped Spurs feel immediately a home in their new surroundings.

Maximising its use, the stadium features a sliding pitch that will allow other events, such as concerts and American football matches to be held on a regular basis, without damaging the important football turf surface.

© Hufton + Crow

The construction of the stadium was undertaken during a four-year programme, which included the phased demolition of the existing White Hart Lane ground.

The project team used structural steelwork to form the majority of the stadium, and the scheme included the erection of five key steel features, that are said to represent elegance as well as pure industrial engineering and fabrication.

These steelwork elements, consist of the East Stand Y-columns and transfer structure; South Stand tree columns; South Stand transfer structures; North Stand cantilever structure, and the West Stand atrium structure.

"The long span nature of many areas in the new stadium are virtually unachievable in any other common construction material and the shapes and forms created using steel are both elegant and robust," says BuroHappold Engineer Chris Shrubshall.

"Also, the construction programme was such that steel provided a significantly reduced erection period, to the point where some areas were changed from concrete to steel construction at a late stage."

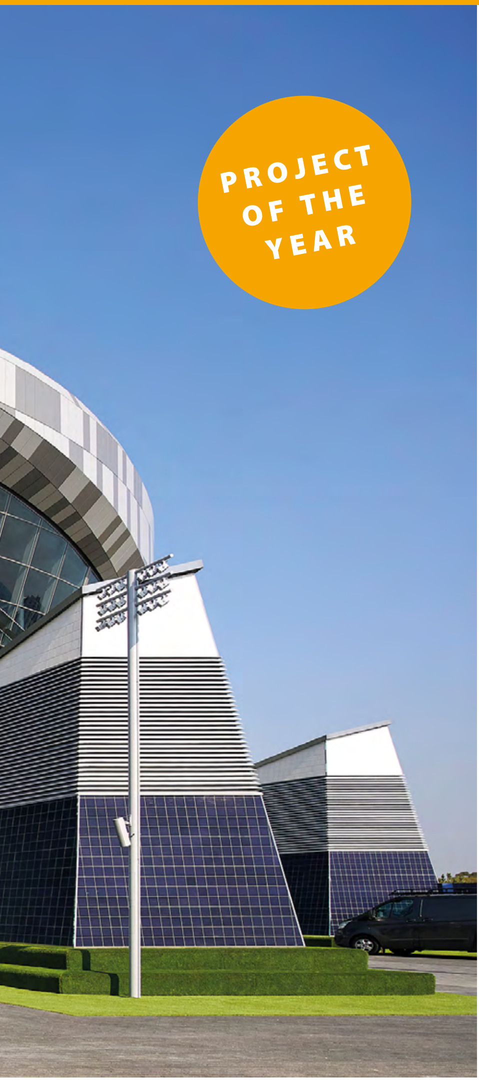
Supporting level three of the East Stand, the Y columns were one of the first major pieces of structural steelwork to be erected at the new stadium.

They provide an atrium at the entrance to the stand and reduce the number of columns coming to ground level by collecting a column on each branch. They also allow the façade to be cut back in to the building producing a dramatic overhang.

Fabricated from plate steel forming two box sections, with a clear gap between them, the exact geometry of each Y column varies on each grid. The separate box sections are connected at the knuckle by a single gusset plate.

Above the Y columns, an additional level of transfer structure is provided in order to create column-free space at level 3. Formed by using sloping steel columns to reduce the span and improve the dynamic performance of the stand, the transfer truss is two-storeys deep and spans 30m.

The South Stand tree structures were created to provide an elegant method



FACT FILE
Architect: Populous
Structural engineers: BuroHappold Engineering, schlaich bergermann partner
Steelwork contractor: Severfield
Main contractor: Mace
Client: Tottenham Hotspur Football Club

of transferring the 17,000 seat South Stand over the sliding pitch below. The culmination of elegant architectural design, robust structural engineering and careful fabrication, the trees are the main feature of the South Stand.

Beneath the South Stand there is a series of mega transfer trusses, spanning in three sections across the sliding pitch. These trusses have been coordinated and integrated with the architecture such that the concourses, toilets, concessions and vomitories are all as uninterrupted as possible.

The connection design of these trusses was complex, due to the size of the loads and the location of the some of the splices.

"Minimising site durations was key in the design and fabrication. Where possible, bolted connections were used, even in heavily loaded areas. In visible areas, hand holes and recessed cover plates allowed internal bolted connections to be used, reducing the need for site welding and shortening site durations," says Mr Shrubshall.

The loads in some of the structure are significant and connection design was incredibly complex. The combination of heavy sections and high loads meant that splice connections had to be carefully located.

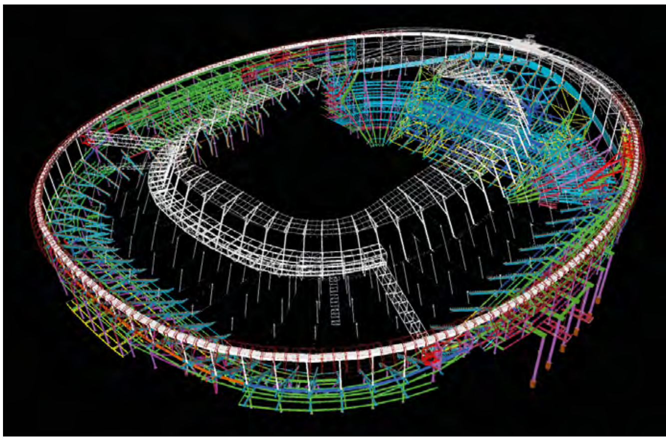
"Additional constraints such as the distance between the sliding pitch surface and the splice connections meant that even the orientation of the bolts was considered," adds Mr Shrubshall.

The North Stand cantilevers 10m over the tier below. This is formed using box section rakers. The load is delivered into the reinforced concrete cores, using pre-stressed high strength bars. Significant dynamic analysis has been carried out to justify the performance of the stand. There are significant service penetrations with the North Stand, which allow the distribution of services around the space below.

Meanwhile, the West Stand is supported on a series of slender steel box sections columns, which are 21m-tall. These columns create a spectacular atrium space below. There are also several propped cantilever balconies and escalator platforms, which are hung from the structure above.

The judges say, the new stadium is not just for football but provides a multi-function entertainment facility. The complex new building was constructed on the confined urban site of Spurs' old stadium thus providing continuity for fans and community.

The steelwork, which has been finished to a very high standard, plays an integral part in the form and architectural expression of the new building.



Coal Drops Yard, London

A bespoke curving steel-framed roof structure straddles two restored buildings and provides a new retail destination with its crowning glory.

Located within the King's Cross redevelopment programme, said to be one of Europe's largest regeneration schemes, the Coal Drops Yard is London's latest world-class retail outlet.

Two long brick and cast iron Victorian buildings, known as East and West Coal Drops, built in the 1850s for receiving and sorting coal as it arrived in London by train, form the scheme.

The buildings, which are approximately 150m-long and 120m-long respectively, sit side-by-side while splaying outwards in a southerly direction. A new roof structure straddles the area between the two structures, towards the northern end where the gap is about 30m-wide.

Numerous constraints, particularly the size of the building footprints led the project team, directed by Heatherwick Studio, to reach a design solution whereby the two structures became linked at roof level, by creating a new floor that 'floated' over the central yard space below – creating an ideal location for an anchor unit.

While English Heritage and Camden Council gave their permission to link the roofs via a bridge like structure, they requested to connect the roof in a way which maintained the idea that the East and West Coal Drops were two separate entities.

The request lead to the unusual architectural design of the 'kissing point' in which the two inner roofs stretch toward one another and delicately touch high above the central courtyard.

The roof structure is approximately 75m-long on one side and 65m-long on the other. It curves inwards, from the south and north ends, and then rises up in the middle to a maximum height of 25m.

Two 'ribbon' trusses, sat atop of each building, help form the undulating shape of the roof structure.

"So as not to overload the existing Coal Drops buildings, new independent steel frames have been erected carefully within the existing brickwork structures to support the roof steelwork," explains BAM Construction Manager Ewen Hunter.

The trusses are fabricated from 610mm CHS members with 508mm circular hollow sections (CHS) verticals and bracings made from 219mm CHS sections.

"To create the complex geometry of the sweeping roof structure, steel was the only choice and CHS sections were used as they could be bent to form the curved ribbon trusses," says Arup Senior Engineer Simon Bateman.

The trusses are both created from four individual segments [eight in total], each one bespoke, due to the curvature of the roof and the splay of the buildings.

To form the segments, 20 individual components were brought to site by steelwork contractor Severfield and then bolted together before being lifted into place by a 500t-capacity mobile crane.

In order to minimise the amount of working at height activities, Severfield also carried out paint touch-up and purlin installation on the ground.

A series of temporary trestles were installed to support the truss segments during the erection sequence. The trestles remained in place until the roof structure and its supporting steelwork was complete.

Above the trusses the new roof is primarily supported by a compression-tension system, spanning the distance between the Coal Drops buildings.

This is supported on new steelwork at each end within the east and west buildings. The compression aspect of the system is made up of four fabricated box 'giraffe' girders (they look like giraffe necks in 2D elevation).

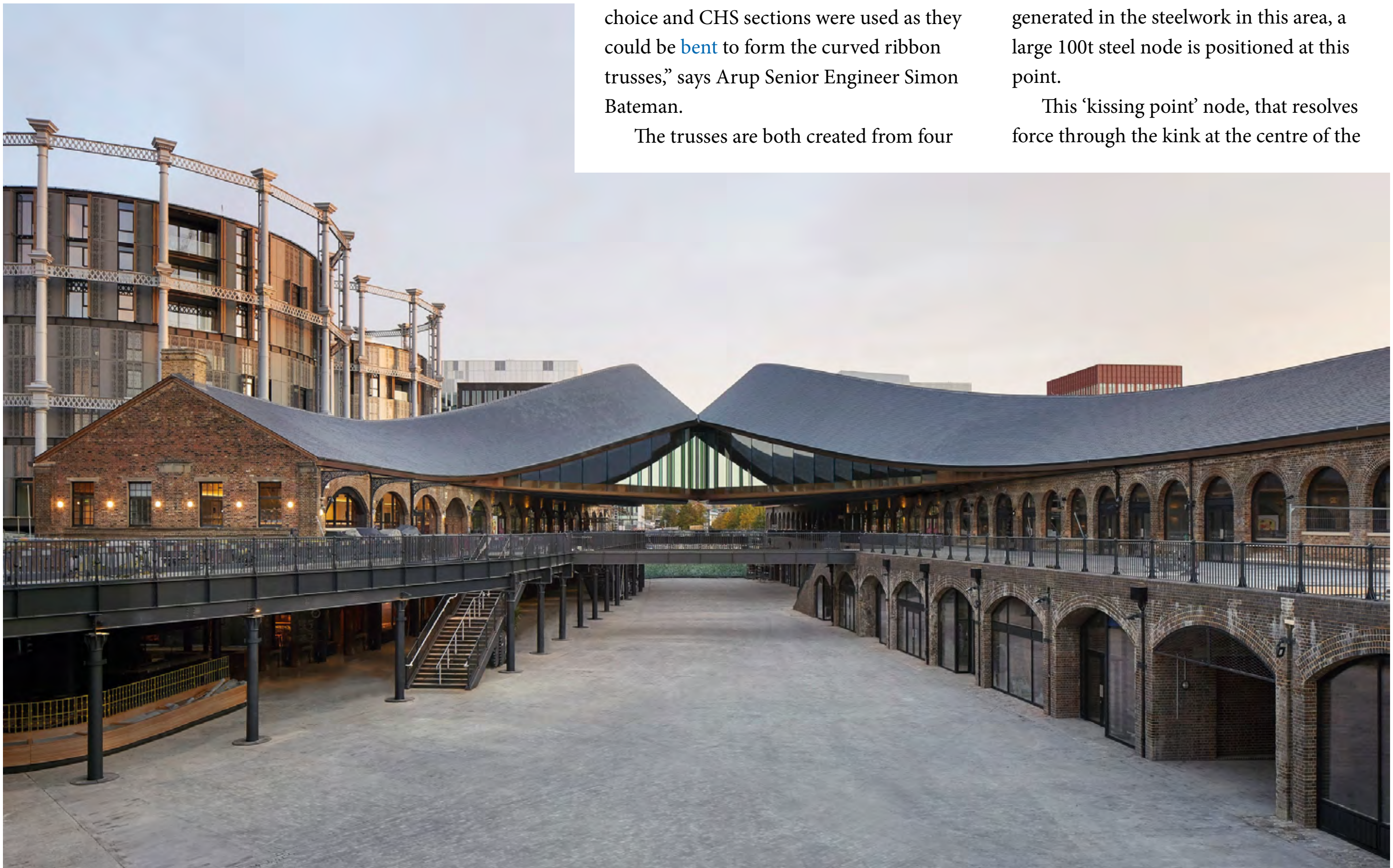
The 'giraffe' girders, which span 50m from building to building, are 1,000mm-deep × 600mm wide with 40mm flanges.

The tension is taken through a single tie (made from a series of plated steel elements), that is connected to the bases of the 'giraffe' girders.

At the middle point of the roof, there is a large kink where the two sides nearly meet - this is the 'kissing point.'

As there are huge bending moments generated in the steelwork in this area, a large 100t steel node is positioned at this point.

This 'kissing point' node, that resolves force through the kink at the centre of the



© Hufton + Crow

FACT FILE
Architect: Heatherwick Studio
Structural engineer: Arup
Steelwork contractor: Severfield
Main contractor: BAM Construction
Client: King's Cross Central Limited Partnership

© John Sturrock

roof is tapered from 900mm to 1,300mm deep at the centre, and has 80mm flanges.

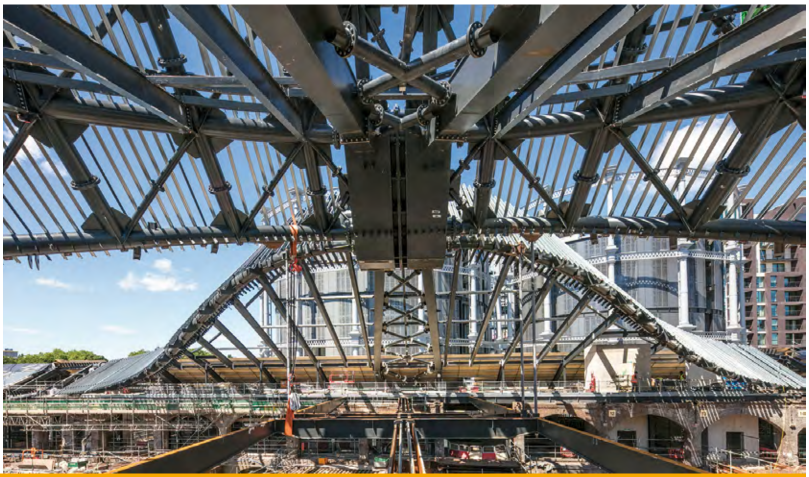
Meanwhile, the roof steelwork is doing two jobs, as well as spanning the void between the existing buildings, it also supports a new column-free upper level of the development.

As Severfield Project Manager Dominic Charlton explains: "A new suspended floor is hung from the bottom chord of the ribbon trusses. It is constructed from tapered composite beams, with a 150mm slab over the top. At one end the floor beams are supported on new structure within the footprint of the existing coal drops buildings, while at the other end, it is supported by solid steel hangers."

Mr Bateman adds: "As well as providing small and light elements for the long span, steel made it straightforward to collaborate in 3D between the design team and contractor, which was vital in this case due to the complexity of the geometry.

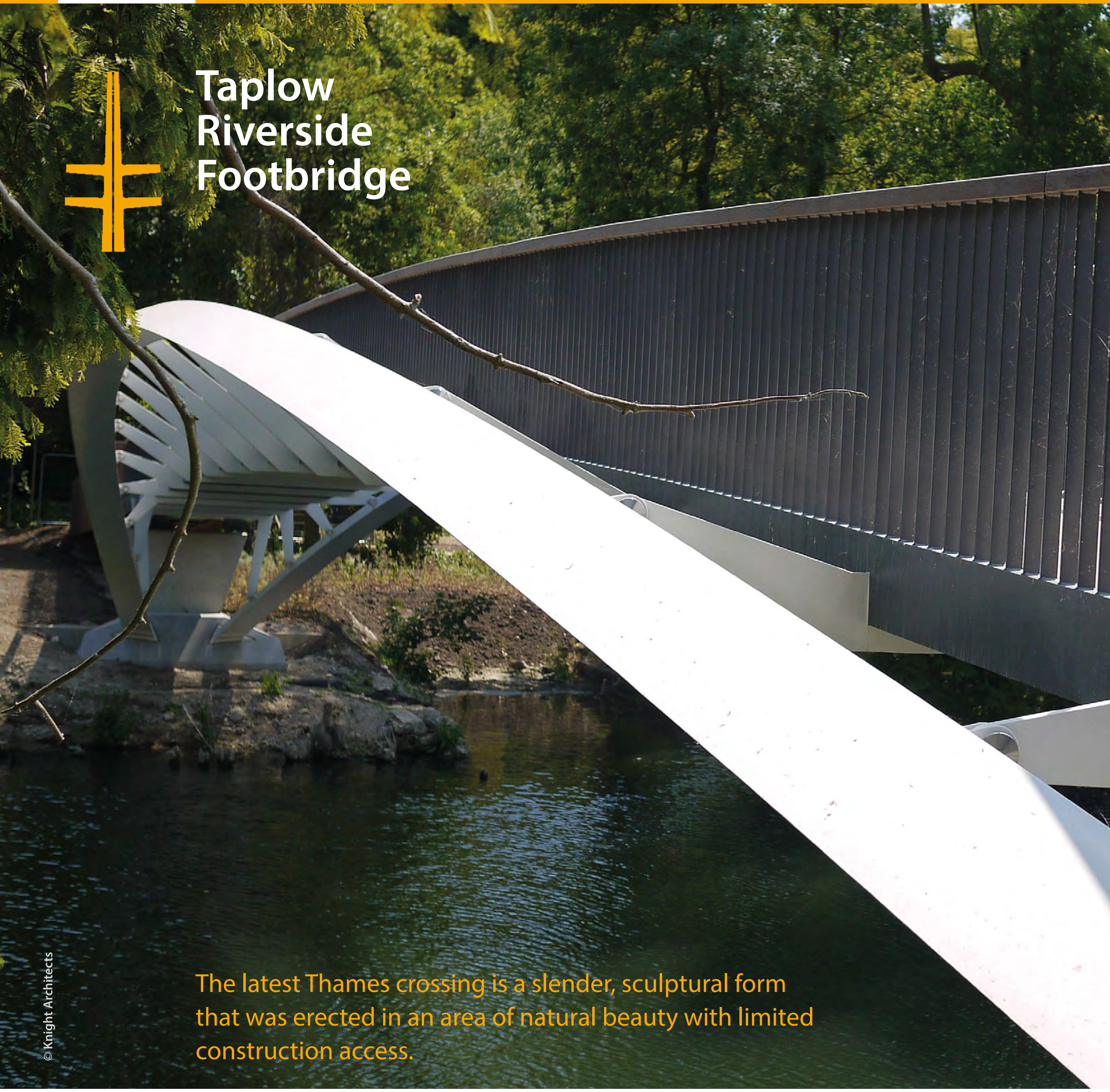
"The major components were all fabricated offsite, brought to site in individual sub-assemblies and bolted together at ground level and lifted into place, maximising both safety on site and quality of the finished product."

In summary, the judges say the kissing roof that links the two original Coal Drop buildings led to a solution of three steel bowstring frames all working together, shaped to reflect the ribbon roof. New exposed steel at deck level is extremely well integrated and carefully detailed to be in keeping with the original structure, strengthening and extending it to suit its new purpose.



© John Sturrock

Taplow Riverside Footbridge



© Knight Architects

The latest Thames crossing is a slender, sculptural form that was erected in an area of natural beauty with limited construction access.

Opened in November 2018, the Taplow Riverside Footbridge is the latest crossing of the River Thames and provides a new pedestrian link in the Thames Path to connect a riverside development with Maidenhead.

Spanning 40m, the shallow arch form of the design is inspired by Brunel's nearby Maidenhead Bridge and is echoed in the slender steel box structure.

Fabricated triangular-section box girders form the twin structural arches that support the deck, while slender steel hangers complete the composition and ensure the structure is lightweight and transparent in river views.

Initially a truss-type footbridge was proposed for the site, but this was criticised by local residents, who felt the design was industrial-looking and out of character with the area.

This prompted Berkeley Homes to appoint Knight Architects and COWI to develop a slender and elegant design to suit the natural beauty of the site and enhance user experience while still being cost-effective.

"The site for the bridge presented numerous access challenges," explains COWI Project Manager Clare Taylor.

"The only viable access route for construction was the river and so it was important to design a bridge that could be constructed easily and safely from the water without compromising the bridge aesthetics within this picturesque setting."

This challenge was solved by using steel as the primary material as it allowed the bridge to fabricated offsite in one piece.

Another important consideration was steelwork's high structural strength and stiffness as it provided the only possible material to realise the architect's vision of a very slender bridge for this site.

The steel structure was designed with structural efficiency in mind but allowing a clear architectural identity to be developed. It consists of three key features: the arch, deck and flat plate hangers.

The arches are triangular in cross section

FACT FILE
Architect: Knight Architects
Structural engineer: COWI
Steelwork contractor: S H Structures Ltd
Main contractor: Land & Water
Client: Berkeley Group

and lean outwards to produce a dramatic visual effect, opening up the views from the bridge of the river and surrounding landscape.

The arch geometry was devised to avoid double curvature to facilitate fabrication from sheet steel, and the triangular shape results in a much greater transparency, emphasising the slenderness of the design.

White was chosen as the colour of the arch as it stands out within the natural backdrop, while adding to the slender appearance and giving an attractive profile along the river.

"The arches support a remarkably slender composite steel-concrete deck formed by a steel tray comprising the edge beams and bottom plate, which was filled with in-situ concrete after the bridge was installed," says Ms Taylor.

"Transverse stiffeners are revealed below and extend outwards to form the hangers. This composite construction results in improved structural behaviour, particularly from the point of view of dynamic response and acoustics, but also facilitated easy construction."

The flat plate hangers, with expressed pinned joints at their ends, provide lateral stability to the arch, enabling greater slenderness than if wire strands had been used.

The shortest hangers experience some out-of-plane bending due to relative longitudinal movement between deck and arch. To keep the same thickness and maintain the desired transparency, which was a key architectural desire, the designers used higher grades of steel for these hangers.

Offsite fabrication by S H Structures was a key factor in the project as this enabled a high-quality finish to be achieved and allowed for a trial assembly to be carried out, ensuring a more efficient on-site build.

"Installation was the most significant challenge with limited access to the site. This meant a conventional crane could not be used and so the bridge had to be delivered by river," says S H Structures Sales Director Tim Burton.

The structure was transported in three parts by road to a laydown and assembly yard a short distance downstream of the bridge site.

The bridge was assembled on temporary works, before the entire steel structure was then lifted onto a pontoon, floated upriver and installed using hydraulic jacks in a single one-day operation.

The use of steel was key to permitting this method of installation, which significantly reduced the time, energy, cost, disruption and environmental impact of more traditional methods. All aspects of the project were driven by the need to simplify installation as much as possible. This included designing the parapet to be installed with the offsite steelwork to provide a safe environment for all subsequent construction activities on the bridge deck.

Durability was another important aspect of the bridge's design. The careful detailing of the structure facilitates easy long-term maintenance. The entire structure is also painted to a high standard, including the arches which were designed from the start as a sealed, painted section.

The ends of the arches have a simple end plate detail, with a knuckle arrangement, which allowed rotation during concreting of the deck to reduce bending effects and minimise plate thicknesses. This was then cast into the abutment on completion to act as a fixed end for live load effects, avoiding the use of a bearing at these points for a maintenance-free solution, which is particularly crucial as they are below flood level.

The judges say, this elegant bridge comprises twin steel arches, triangular in section, with the deck suspended via inclined steel plate hangers. The result is a distinctive, slender structure providing a valuable link between communities and fitting in sensitively with its environment. The steelwork is beautifully detailed, and trial assembly helped ensure trouble-free installation, using barges on the river, despite challenging conditions.

Tombola HQ, Sunderland

Exposed steelwork and floor slabs adorn the interior of a new multi-million-pound headquarters building for a leading IT company.

Said to incorporate the three main structural design principles of architecture, mechanical & electrical (M&E) and structure, North East-based software producer Tombola's new £7M steel-framed headquarters in Sunderland has already received numerous plaudits from the local media.

Accommodating nearly 500 employees, the 2,300m² office building features an exposed steel frame, along with an integrated heating and cooling system that has been cast into the exposed concrete floor slabs.

S h e d Managing Director Marc Horn says the exposed steelwork has been aesthetically detailed to a standard rarely seen on commercial projects.

"Most commercial schemes have all their steelwork connections hidden in ceilings or floor zones. The majority of the steelwork at Tombola is visible and had to enhance all the other parts of the design."

Therefore, the project team needed significant periods of collaboration to ensure that all the detail elements were seamlessly integrated into the design. Very few standard 'Green Book' connections have been used.

Mr Horn adds that Tombola, like many IT-based businesses struggles to keep talent in the North East, as the lure of larger centres like London and California's Silicon Valley prove to be too enticing.

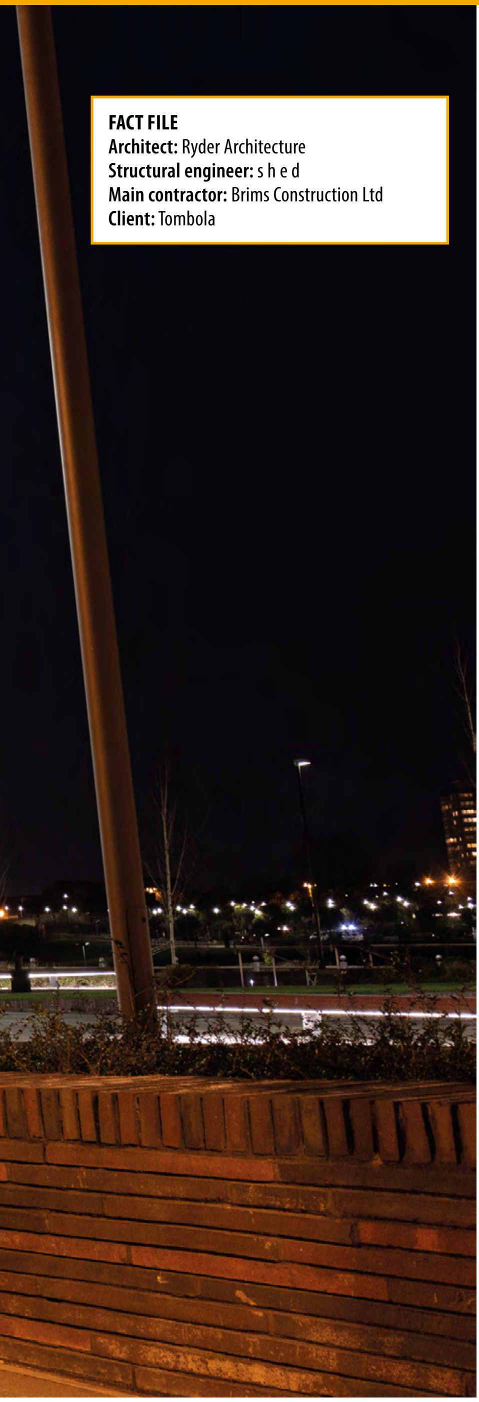
"By creating this superb new HQ building they will be better placed to retain talent, as the impact of this is often underestimated. By keeping jobs and therefore associated spending power within our local economy the effects go far beyond just Tombola employees.

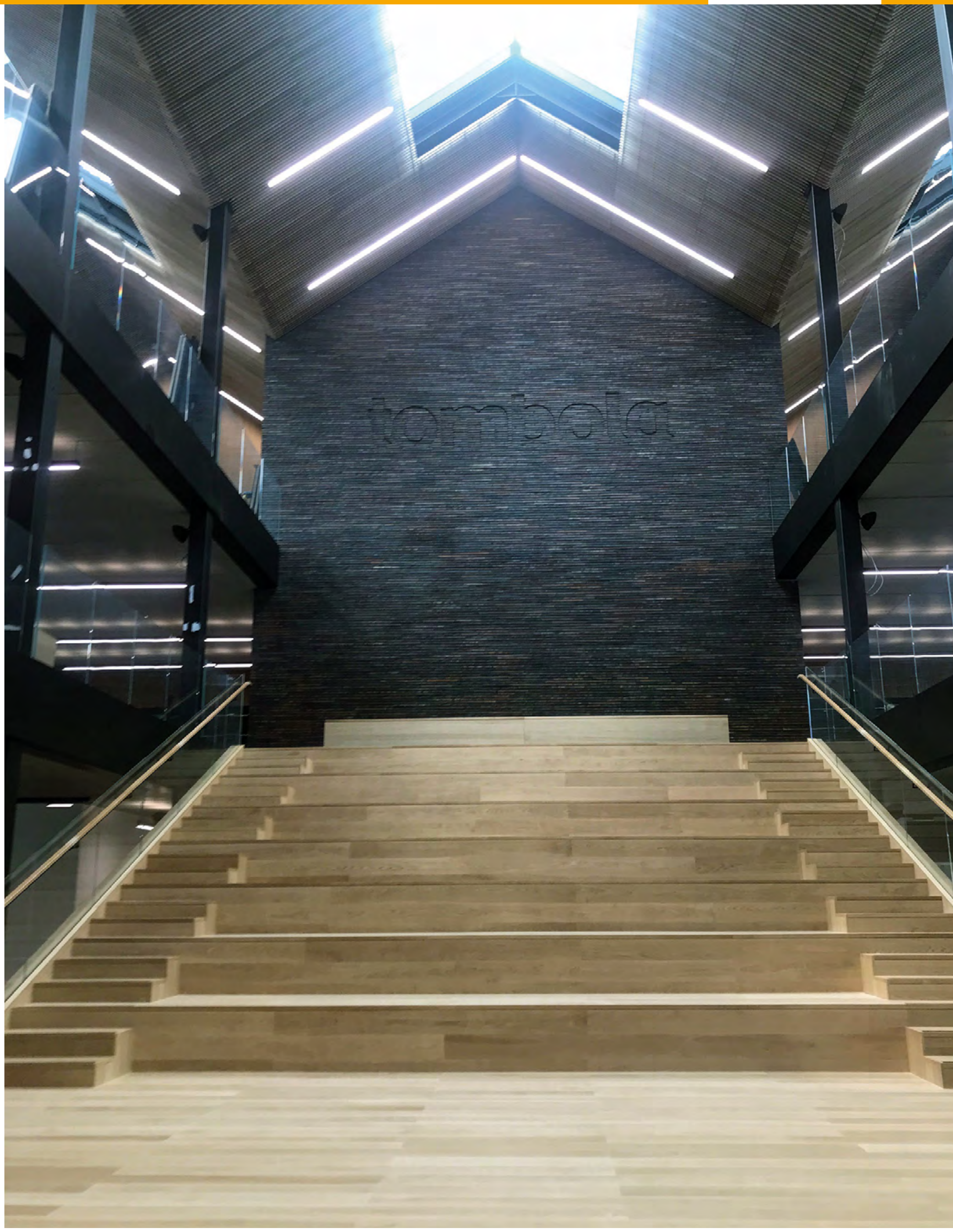
"Being able to attract talent to the North East, through the power of a phenomenal place of work is also a major attraction and boost for the local economy."

To this end, Tombola's new glazed headquarters boasts modern open-plan offices throughout its uppermost first and second floors, while a full-height centrally-positioned atrium will flood the inner parts of the structure with natural light.

The ground floor has a reception area, bistro and gym for employees, with

FACT FILE
Architect: Ryder Architecture
Structural engineer: s h e d
Main contractor: Brims Construction Ltd
Client: Tombola





bleacher-style stairs leading to the modern open-plan upper floors.

The building also boasts a diverse range of informal training and presentation suites with the latest AV/video conferencing technology.

The three-storey structure's steel frame is braced for stability, but also incorporates moment frames, which create the building's dramatic overhang and cantilevers along its eastern façade.

The office floorplates are long-span areas with exposed concrete soffits providing radiant heating and cooling. In order to allow the floors to appear to float and the fenestration to span fully to the soffits, all supporting columns are detailed as box sections with plates supporting the slabs above.

The building's main columns are also box sections, and Mr Horn says this is to keep their size to a minimum and keep the sleek lines of the building to continue from the horizontal to the vertical.

A series of rectangular hollow section (RHS) edge floor beams are arranged to support the brickwork façade, thereby providing a solution that is said to be very efficient in terms minimising the overall number of steel members.

The building's audio/visual and fire alarm systems are hidden within the hollow section structure, using them as containments systems to keep the sleek and uninterrupted finish

The roof appears to float which is made possible by utilising another moment frame. All of the steel roof structure is within a shallow construction zone, with purlins placed inside the depth of the column section rafters.

"The building's size and roof complexity meant that steel would have been involved somewhere even if an alternative framing option had been economical. A steel frame allowed a single structural solution to be employed for the whole frame and provided a simple and fast construction programme," says Mr Horn.

Brims Construction's Director Richard Wood agrees and says: "Overall the building could not have been delivered in its amazing form without using a steel-framed superstructure, as the material allowed us to achieve the required long spans and open spaces."

In summary, the judges say this project exemplifies how, with a dedicated client and a top-class team, structural steel can produce cost-effective yet beautiful results that are much loved by its users. Through simple yet sophisticated design and rigorous attention to detail, this wonderful headquarters building exhibits exceptional quality and value. It is a clear Award winner.

Wimbledon No.1 Court

This year the home of lawn tennis unveiled a new retractable roof, allowing uninterrupted play, irrespective of the weather, on its second most-important court.

The centrepiece of the Wimbledon No.1 Court redevelopment, which has increased the capacity of the arena with two additional tiers with 900 seats, added hospitality facilities and improved public catering areas, is a new retractable roof similar in design to the one spanning Centre Court (an SSDA winner in 2009).

The project is said to have thrown up some unique logistical challenges due to the fact that nothing could get in the way of the all-important tennis taking place during its annual allotted two-week period.

Consequently, the project was completed over three phases, with two breaks in the schedule to allow The Championships in 2017 and 2018 to take place. The final steel roof elements were installed this Spring, allowing the construction programme to be completed a month before the 2019 Championship began.

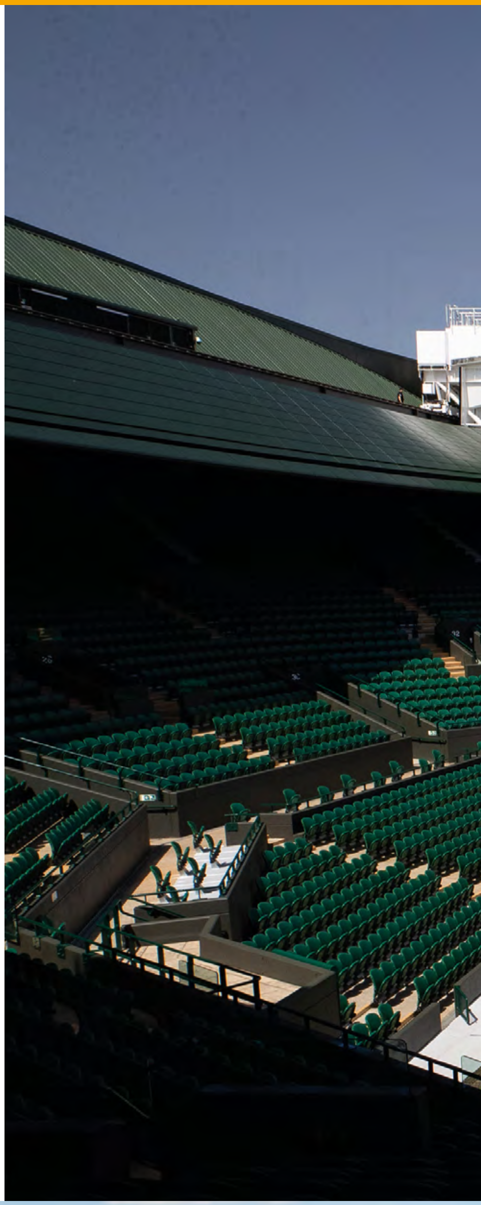
The sequencing involved a large logistical exercise, whereby all construction equipment and materials were decamped for the duration and then brought back a fortnight later. All areas where construction work had taken place had to be made safe, to allow spectators full use of the prestigious tennis venue.

The new roof is based on a concertina design with two main sections that meet in the middle. The structure covers an area of about 5,500m² and can be deployed or retracted in around eight minutes. It consists of 11 steel trusses, each spanning 75m across the top of the court, and each having an overall height of 6.5m.

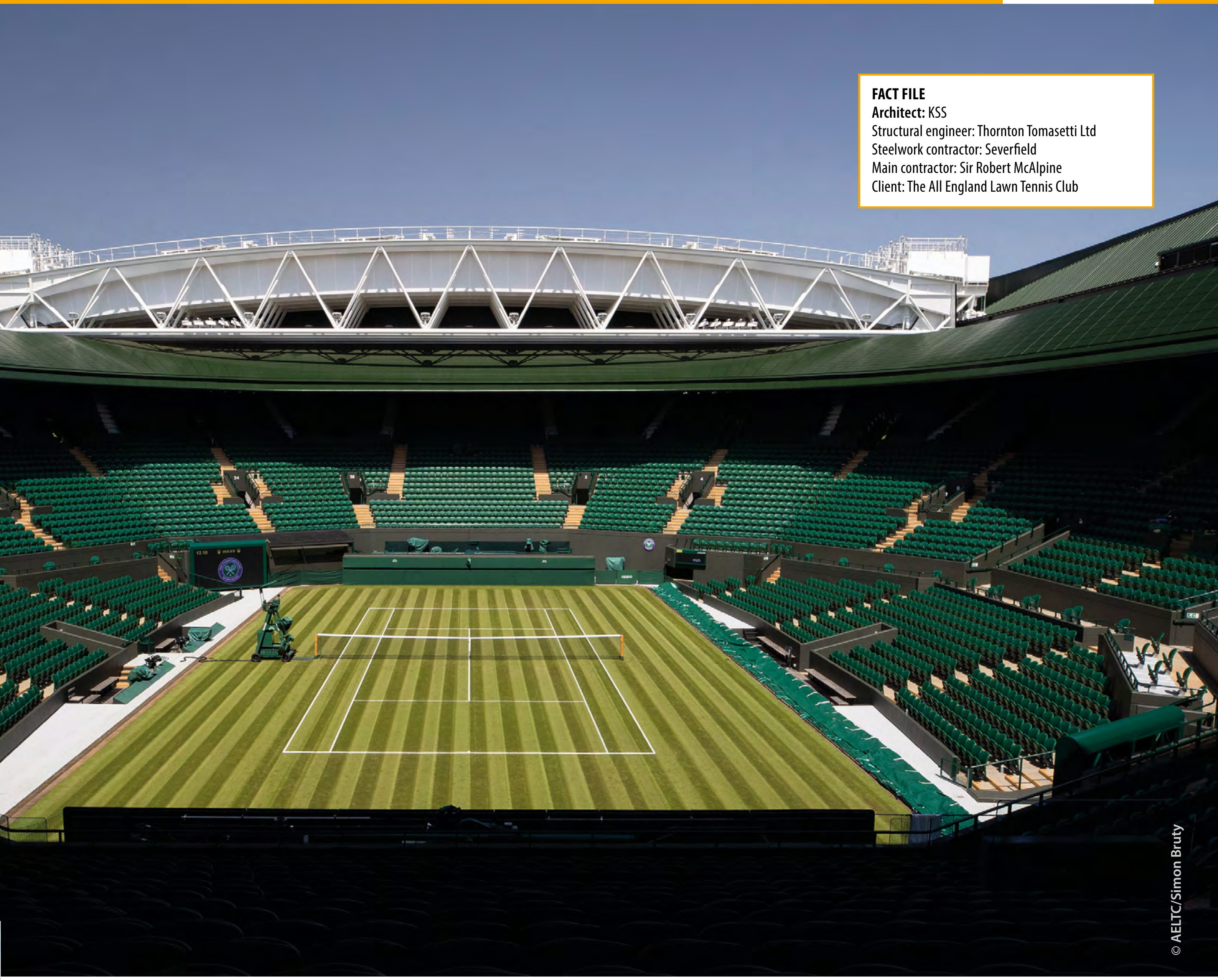
Ten of the trusses are identical prismatic sections, but one, the most southerly, is rectangular in shape and slightly heavier at 65t instead of 60t.

"Ordinarily five trusses are parked at the north end and six at the south, and when deployed they all move inwards to cover the court," explains Thornton Thomasetti Associate Director Michael Roberts. "However, to maximise the amount of sunlight on the grass, all of the trusses can be moved to the north end with the eleventh rectangular truss being the last in line.

"Having no fixed restraining arms attached to the surrounding fixed roof, this truss needed to be a different shape."



© AELTC/Joe Toth



© AELTC/Simon Bruty

Allowing the roof to move, the ends of each truss are supported on a wheeled bogie that moves along rails that are fixed to the new superstructure of No.1 Court. This superstructure includes five more trusses that surround the arena, with two of them, east and west, primarily supporting the retractable roof.

The east and west trusses are both 80m-long and weigh 490t and 555t respectively.

These trusses were constructed on temporary works and the booms were incrementally welded together to form the full truss and then laced together via a bracing structure.

Truss boom sections vary in size, from 8t up to 22t and consisted of CHS sections ranging in length from 8m to 15m. Stability and support for the trusses is provided by eight existing concrete cores and three jumbo 1,083mm-diameter CHS columns, that were threaded through the stands and founded on the concrete sub-structure.

Two of these large columns are positioned either end of the east truss, with the third supporting one end of the west truss. A fourth jumbo column could not be installed as there are ground level water tanks in the area where this section would have been founded. Instead a 40m-long × 11.5m-deep north-west truss had to be installed, acting as a bridge over the obstructions and helping to support the other end of the west truss.

The steel package also included the installation of some cantilevering steelwork that will form new hospitality and access walkways around the upper external levels.

Fixed inner roof elements that adjoin the east and west trusses were also installed. This steelwork consists of a plated box section tension ring with a combination of tapered plate girders and lattice trusses tying back to the main trusses on each face of the structure.

"The tension ring installation required a combination of pre-welded assembly units and site welding to complete the ring. This inner roof structure is then braced using a mixture of tubular and I-sections," says Severfield Project Manager John Calland.

The inner roof serves a number of functions essential for the implementation of the No. 1 Court redevelopment. On the east and west sides, the inner roof contains the 'grass nozzles' which are required to condition the atmosphere around the playing surface. They have to be a certain distance away from the court surface, and this dictates the extent of the roof in these areas.

Around the rest of the roof, the inner structure provides locations for gutters to help drain the roof, a surface for lighting and air conditioning, as well as helping provide a weather tight seal against the moving roof.

Summing up, the judges say installing a moving roof over No.1 Court involved the adaption of the 1997 building without interrupting the annual tennis Championships.

This extraordinarily complex work was carried out over three seasons with minimum public awareness. Large movable steel trusses installed to very exacting tolerances over the existing building provide a roof that can shelter a match from rain within minutes.

Battersea Arts Centre

FACT FILE
Architect:
Haworth Tompkins
Structural engineer:
Heyne Tillett Steel
Main contractor:
8Build Limited
Client:
Battersea Arts Centre

Following a devastating fire in 2015, a steel-framed roof structure has been installed to transform a Grade II* listed arts centre in London.

A 12-year programme to extend and refurbish the Battersea Arts Centre includes a new steel-framed roof spanning the facility's Grand Hall and replacing a structure that was destroyed in a conflagration that blighted the scheme four years ago.

'The main structural challenge was designing a new roof structure to fit the spatial and structural constraints of the existing brick walls that survived the fire," explains Haworth Tompkins Associate Martin Lydon.

"It also had to respect the building's heritage while providing additional load capacity for new theatre equipment, technical systems and the enhanced roof envelope."

Heyne Tillett Steel Project Engineer Ella Warren adds: "We had to recreate the original roof trusses in form and size and provide for many more functions with minimum impact on the existing fabric of the building."

To this end, a steel solution was adopted as the material has a high strength, which allows for smaller lightweight sections to be utilised making it a versatile material choice, especially for long span structures such as roofs.

For this project, a series of slender members was utilised to form roof trusses that created a clear 17.5m span across the hall.

The trusses are 10.5m-high and 900mm-wide, and were installed through removable sections in the temporary scaffold roof.

"Because we used steelwork for the roof, the steelwork contractor was able to construct the trusses in three sections offsite and bolt the pieces together once they were craned into place," says Ms Warren.

"This minimised working at height and aided transportation to site."

The original roof trusses had deep, plated haunches which were built into brickwork buttresses. The buttresses are two storeys high and incorporate brickwork arches over the hall's side corridors.

The new roof's design required a significant increase of load and thrust to the buttresses, and with the increased build-up of finishes there was a subsequent decrease in depth and stiffness of the truss haunches.

To overcome this, the team developed a design utilising elastomeric bearing pads on one side of the trusses that allowed them to 'relax' during the initial loading of the roof.

These movements were monitored during construction and the bearings locked in place once 50% of the roof build-up was installed. This ensured the thrust on the buttresses would not exceed the original case, while minimising live-load deflections. Using this technique avoided any time-consuming and costly strengthening works to the original masonry structure.

The project also includes some other steelwork elements such as demountable side galleries - which required slender steel beams hidden within a new acoustic floor build up, modifications to the balcony to support an organ, rebuilt dressing rooms, and a new stage roof.

The judges say, following a fire, the parameters of the original ceiling and roof finishes were set. However, the need to meet current regulations and improve plant provisions resulted in the roof truss needing to be slimmed down at its pinch point.

Chiswick Park Footbridge

A three-span arched footbridge provides a key pedestrian link between a west London business park and a local underground station.

© Jill Tate

Numerous challenges were overcome during the design stage for the Chiswick Park Footbridge; a new three-span arched structure that connects a business park with Chiswick Park Underground Station.

The team had to incorporate a dominant 45m-long span over Network Rail Overground lines with the necessary design constraints and approvals; allow for a restricted landing site at one end of the bridge that includes a 4.5m drop in level; and include a minimum road height clearance for double decker busses in the central span.

Added to the above, the bridge had to curve along its entire length and be built in a complex urban environment, hemmed in by train lines, roads and residences, as well as the adjacent Gunnersbury Triangle Nature Reserve.

According to Expedition Engineering Project Manager George Oates, the use of steel was instrumental in the successful delivery of this bridge, as construction of the scheme in an alternate material would simply not have been possible.

The curved nature of the deck and arches required parametric modelling to create geometry and analysis models, in turn creating the geometric definition of every single steel plate in a format that was passed directly to steelwork contractor Severfield for the basis of its fabrication model.

A lightweight solution was also needed to ensure that the 45m-long Network Rail span could be lifted into place from nearby Chiswick Park. The span was fully fitted out and incorporated a steel deck, which was considered to be lighter than a concrete alternative.

The arch was designed as a network arch (close-centred crossed cables), as this is said to produce a highly efficient structure, one that acts as a stiff mesh to control pedestrian dynamic effects and enables the bridge to be slender. This is said to be only the second network arch footbridge constructed in Europe.

"The construction of network arch bridges can be a complex undertaking due to the numerous cables involved. At Chiswick Park the stressing of the cables was achieved via a self-stressing sequence using the self-weight of the bridge, rather than a more conventional multi-pass stressing procedure using tensioning jacks. This saved considerable time and effort," says Mr Oates.

The bridge is designed and built around whole life costing. This lead to all materials being chosen for maximum lifespan and minimum maintenance requirements.

"Weathering steel was used as it offered a 120-year life span for the structure," says Severfield Assistant Project Manager Stuart Haslam.

"Steel provided the necessary strength, while also satisfying the architect's vision for a slender footbridge that blends perfectly into the business park environment."

Meanwhile, stainless steel was used for the hanger cables due to the material requiring less maintenance compared to more standard zinc galvanized cables. Stainless steel was also used for the architectural metalwork to minimise maintenance and for its visual appeal.

In summary, the judges say brilliantly conceived, beautifully made and ingeniously erected, this project provides not only a much-needed physical link for the community, but also a remarkable local landmark.

FACT FILE
Architect: Useful Studio
Structural engineer: Expedition Engineering
Steelwork contractor: Severfield
Main contractor: Lendlease
Client: Blackstone

Fen Court, London

A 15-storey office and retail scheme in the City of London was built around and without disrupting the operations of an on-site high street bank.

Offering 39,000m² of floorspace, the 15-storey-high Fen Court is one of the latest additions to the City of London's skyline.

Featuring a distinctive crown-shaped design, the building includes spacious office floorplates, a rooftop restaurant and what is said to be London's first publicly accessible roof garden.

With its modern steel and glass design, combined with the natural green space of the rooftop garden, the structure provides a welcome contrast to the surrounding City environment.

The upper office floors have a double-skin passive façade, with dichroic glass in the outer panes, giving this section of the building a changeable appearance. The high-performance façade also includes motorized blinds, giving occupants the option to easily reduce solar gain during summer.

The project's basement was designed to keep an existing high street bank, which occupies part of the site, in operation, while demolition and construction works took place.

In order for this existing tenant to remain operational, the previous building was demolished around the existing bank, and the bank's new premises then had to be constructed in advance of the main Fen Court structure.

William Hare says it was able to build the new bank premises and facilitate the move, without disrupting services to the public.

The challenging build of the high street bank premises involved a top-down construction sequence for a small portion of the site, in which plunge columns were driven into the ground and a small area of the basement slab was cast.

This allowed William Hare to construct the steel frame above at the same time as the excavation of the three-level basement was taking place below.

Once excavation was complete, and the two cores constructed, William Hare began a traditional bottom-up erection process of the main steel frame. The column grids are between 6m and 9m up to level 1, where the structure then changes to a 3m grid pattern.

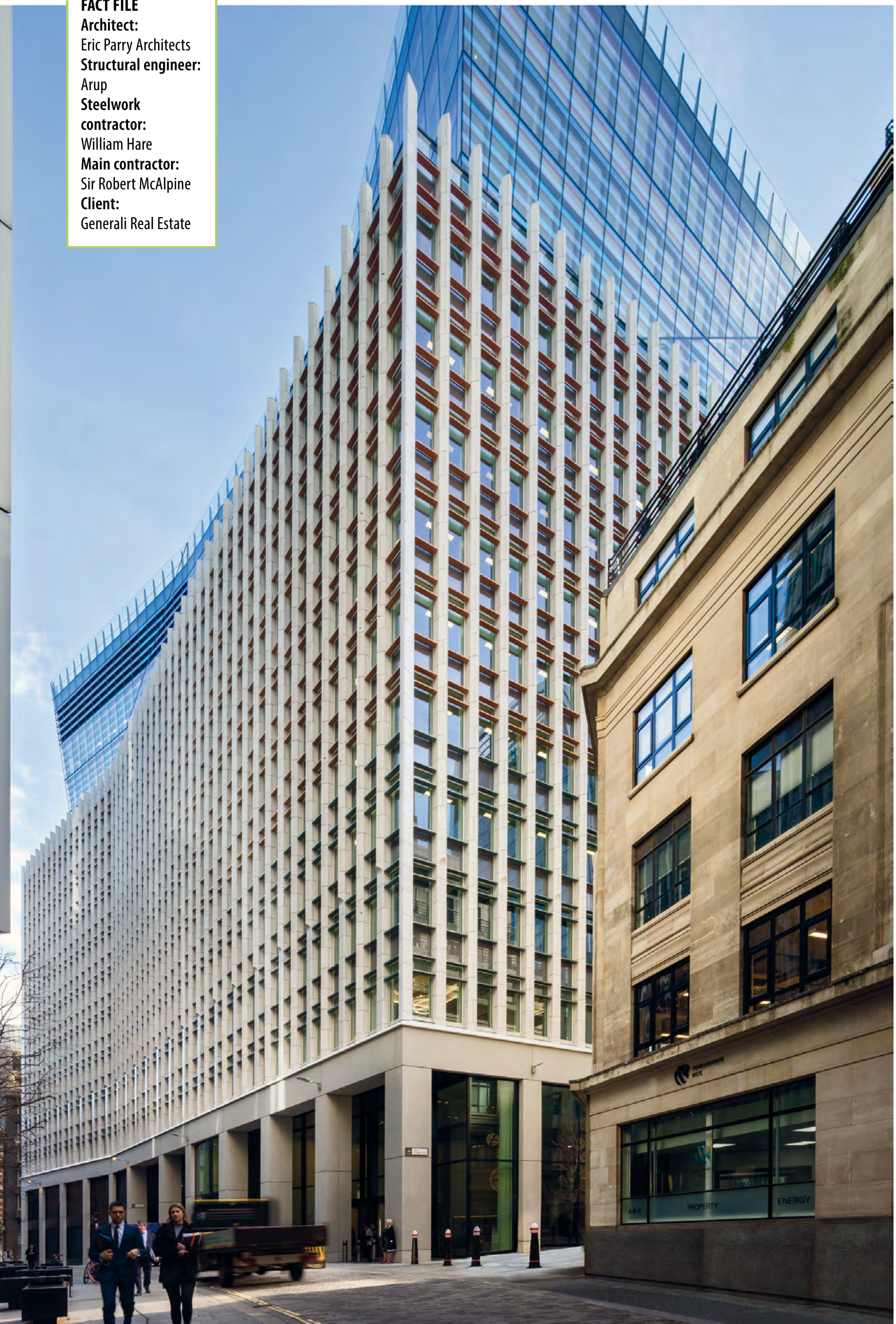
This means that floor 1 is a transfer level, formed with a metre-deep plate girder acting as a continuous ring beam.

William Hare said that in order to achieve the tight programme of 23 weeks for the erection of 6,300t of steelwork, it installed a series of welded frames around the perimeter, comprising two × two-storey-high columns, and a couple of perimeter floor beams.

Effectively, this turned the need for four individual crane lifts, into only one, thereby saving precious time.

In summary, the judges say a challenging construction sequence was required to accommodate the relocation of a high street bank that was operational on site throughout the works.

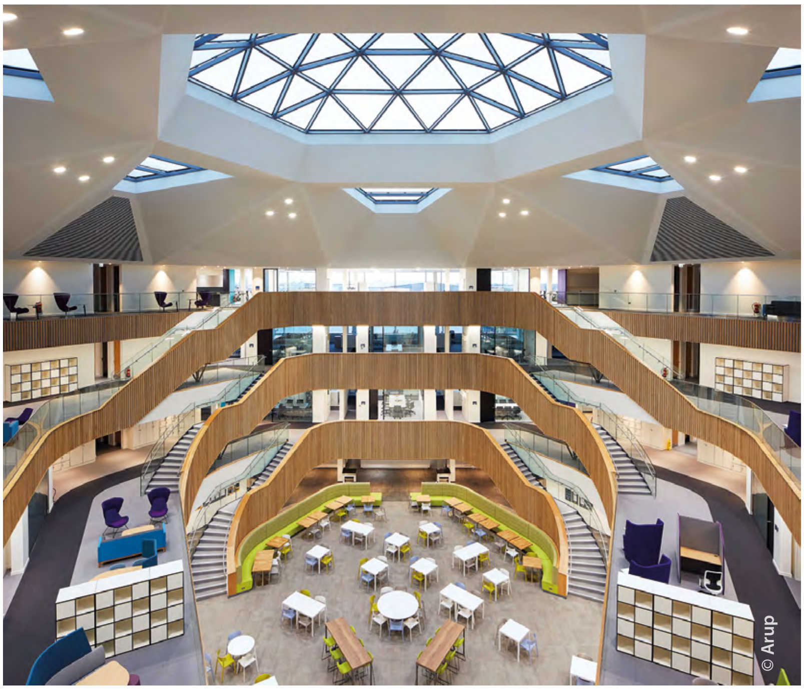
FACT FILE
Architect: Eric Parry Architects
Structural engineer: Arup
Steelwork contractor: William Hare
Main contractor: Sir Robert McAlpine
Client: Generali Real Estate



© Eric Parry Architects

Ingenuity House, Birmingham

A headquarters building for a leading construction firm forms the catalyst for a regional regeneration programme.


© Arup

FACT FILE
Architect: Sheppard Robson
Structural engineer: Arup
Steelwork contractor: Billington Structures Ltd
Main contractor: Interserve Construction Ltd
Client: Interserve Construction Ltd

Topping out at five-storeys, Ingenuity House is the new regional headquarters for the support services and construction firm, Interserve.

Located next to Birmingham International Airport, Birmingham International Railway Station and the proposed HS2 Interchange Station, it is a key element of 'UK Central' which forms a catalyst for the regeneration strategy of the area.

The 12,000m², energy-efficient building will bring together approximately 1,200 Interserve and RMD Kwikform staff, who are currently spread across five regional offices.

The project was designed by architect, Sheppard Robson to create a collaborative, inspirational working environment. The exterior is characterised by the building's stepped structure, producing a strong form that translates into a range of internal spaces.

The stepped floorplates are all constructed using cellular beams allowing the horizontal distribution of services within the depth of structure, which delivers a clean ceiling plane and maximises clear height; use of BIM ensured accurate and efficient co-ordination between structure and services engineering.

The architectural form is said to have presented some distinct structural challenges, each requiring creative solutions. These include the stepped floor plates, the column-free entrance and the 38m-span atrium roof.

A series of raking columns with external cantilevers and internal transfer beams supporting stepped vertical columns were found to provide the optimal balance of structural efficiency and spatial planning.

One of Interserve's principle requirements was for a building that could adapt and flex over time in response to changing business needs, with each floorplate having the ability to accommodate a variety of working modes.

While being primarily a bespoke building for Interserve and working within the physical constraints of the site, the design does allow for potential future subdivision with services in each core serving particular areas of floorplate, facilitating a degree of subdivision both vertically and horizontally.

A total of 1,710t of structural steel was supplied and erected by steelwork contractor Billington Structures, including a 30t roof level truss, supporting the roof and fourth floor above the feature recessed entrance area.

External structural members are all galvanized to provide robust corrosion protection and where fire protection is required, an intumescent coating has been applied to achieve the required rating.

Billington says it used a 'just-in-time' approach to procurement of material, fabrication, delivery and erection of steel. This was deemed to be the best way to serve Interserve's overall phased construction programme and to minimise storage time on-site. It also ensured the steel was erected in the best possible condition with no exposure-related degradation of pre-applied finishes.

The judges say, the intelligent use of steel has delivered a triangular building, reflecting site constraints, stepped to give environmental benefits to the offices within and a cohesive grandeur to the whole.

© Jack Hobhouse

Neuron Pod, London

Linked by a bridge to an existing building at Queen Mary University of London's Whitechapel campus, an unusual steel-framed structure provides a multi-functional space for live science shows, workshops, films and exhibitions.

FACT FILE
Architect: aLL Design
Structural engineer: AKT II
Main contractor: Total Construction
Client: Queen Mary University of London

Known as the Neuron Pod, this steel-framed structure was designed for the client as a multi-functional space for events and as an educational zone. Accessed via a bridge from an existing building on the University campus, this standalone structure has also been described as an art installation.

Created from weathering steel, the Pod consists of an external structural skin stiffened by internal steel ribs. These internal ribs run in both directions to provide stiffness and rigidity to the structural skin.

Inspired by a zeppelin shape, both in plan and elevations, it is supported by three legs.

The overall shape presents a curved surface, resembling the central part of a neuron, while the dendrites are shaped in the form of numerous spikes scattered along the external surface of the Pod.

Constructed using a process similar to the construction of a ship's hull, the structure has been designed and engineered by AKT II as an 8mm developable external plate, welded on an internal series of vertical and longitudinal steel ribs.

"This system was optimised in the design to minimise plate thickness and maximise the spacing of the internal ribs, which reduced the fabrication time," said Queen Mary University of London Head of Operations Akmol Hussain.

The Pod has been created with weathering steel members, as its natural patina negates the requirement for additional paint coatings.

"Similarly, the galvanized steel connecting bridge structure does not have any additional paint coatings," adds Mr Hussain.

According to project engineer AKT II, the materials used provide a lasting durability to the structure, while retaining the aesthetic quality the architect envisioned. The structure makes effective use of land and is designed to bear load onto the structure of the basement below – thereby not requiring any additional substructure materials, which minimised the impact.

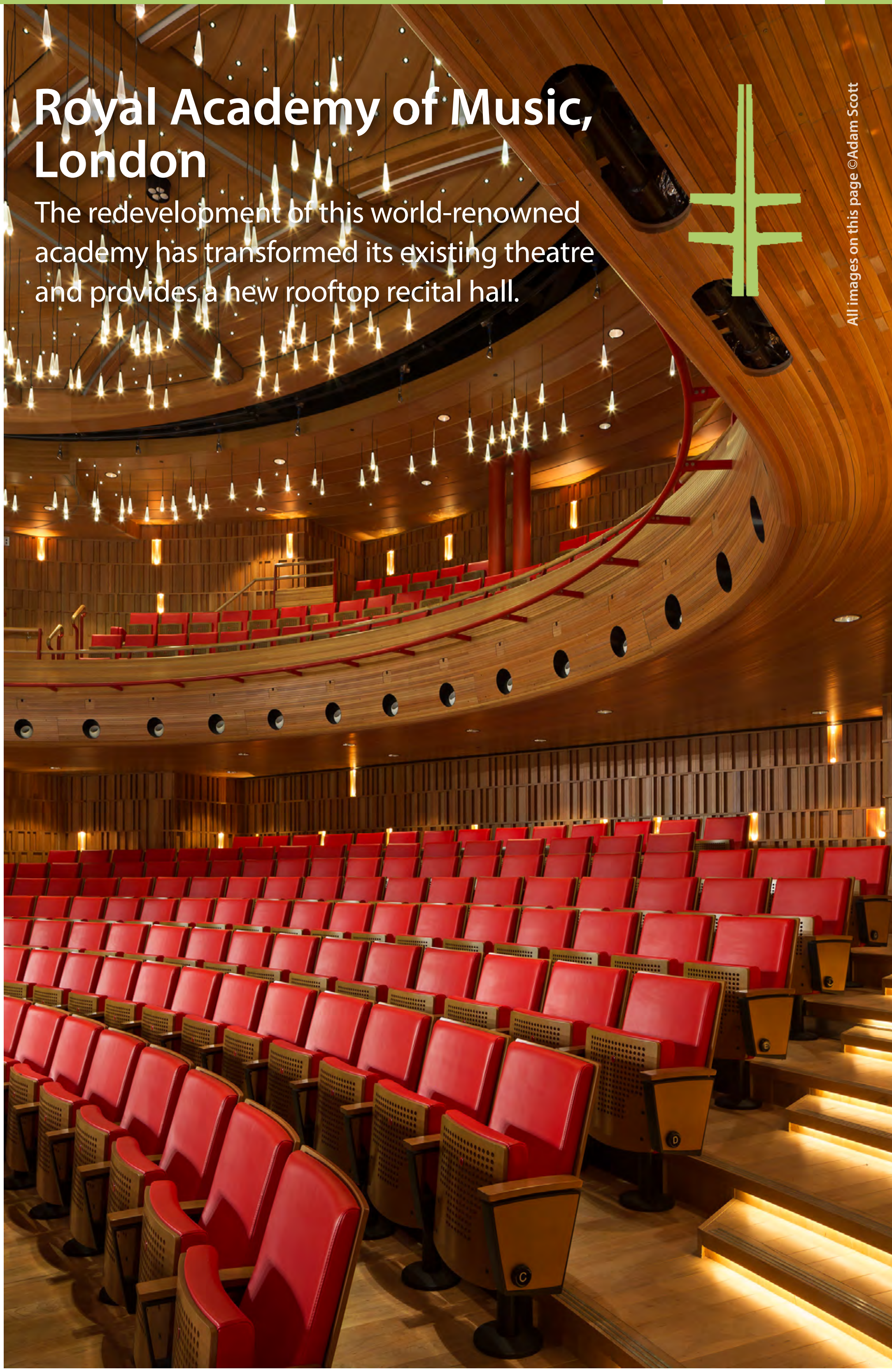
The project was designed, analysed and produced using a bespoke workflow to produce a full set of construction drawings designed to achieve high levels of precision in the final fabricated form.

The judges say, this latest addition to the Queen Mary University of London Cell Education Centre, surprises in its animal form, is fun and colourful. These qualities meet the brief of inspiring and hopefully attracting future scientists.

This contemporary work of craftsmanship in weathering steel succeeds in striking a whimsical note with serious scientific educational intent.

Royal Academy of Music, London

The redevelopment of this world-renowned academy has transformed its existing theatre and provides a new rooftop recital hall.



All images on this page ©Adam Scott

A number of innovative structural steelwork solutions were used in the redevelopment of the Royal Academy of Music's historic Grade II listed buildings.

The works, carried out on a site surrounded by operational buildings used by students and staff, included the replacement of the existing theatre superstructure, the addition of new cantilevered balcony seating, the introduction of a flytower (with main plant room above), an enlarged orchestra pit, insertion of new vertical circulation routes, and a box-in-box rooftop recital hall with its own glazed foyer.

The existing theatre was considered to be ill-equipped and badly shaped and has been remodelled to provide a 40% increase in seating capacity.

A slender cantilevered horseshoe 100-seat balcony has been introduced into the theatre, the structure of which mainly consists of a system of steel beams cantilevering off hidden two-storey steel columns, which in turn sit on the existing stalls concrete bowl slab.

A feature auditorium ceiling has been introduced to provide a visual focus and to maximise the acoustic volume of the theatre. This ceiling is created with a system of downstand secondary, tertiary and quaternary beams facetted on plan and clad in curved timber.

The roof and flytower are in turn supported by a deep upstand plate girder to the rear of the balcony, and two novel hybrid storey-height combined steel trusses and plate girders. These give space at the edges of the spans at rooftop level for circulation space and a plant room.

To each side of the stage, two-level theatre technician perches were installed, utilising steel beams within the depth of timber joist floors to minimise the structural depth, with the beams in turn supported by a mixture of steel posts and hangers to reduce the impact on the stage.

Above the redeveloped theatre, the opportunity was taken to add a new, partially exposed, steel-framed 100-seat flexible recital hall, entirely isolated acoustically (slab and walls) from the surrounding structure.

Located next to the Recital Hall and flytower is a circulation space with a glazed roof. It is formed by tapered twin steel fins that are supported by closely spaced stainless steel cables, inspired by the aesthetics of string instruments. The cables are supported by the Recital Hall and plant room and for almost all of its length the fins do not require any structural support from the original rear façade of the Academy's main building.

Commenting on the use of steelwork, WSP Project Engineer Daniel Cowan says: "Structural steelwork has provided a high quality, lightweight, flexible solution to this challenging redevelopment project with the creation of long-span structures seamlessly integrated with the architecture and services installations.

Jonathan Freeman-Attwood, Principal of the Royal Academy of Music adds: "The spaces are stunningly beautiful and inspiring. They will raise the bar and challenge the students and staff in every possible form of music to reach higher and search further."

Summing up, the judges say a highly-integrated design of the steel roof trusses has allowed the team to squeeze in a rooftop recital space without compromise to the auditorium below.

FACT FILE
Architect:
Ian Ritchie Architects
Structural engineer:
WSP
Main contractor:
Geoffrey Osborne Ltd
Client: Royal Academy of Music

G W Annenburg Performing Arts Centre

Forming the heart of a new cultural quarter of a prestigious college, a new circular-shaped theatre has been built into a sloping site in order to blend into its natural surroundings.

The G. W. Annenburg Performing Arts Centre is a new theatre at Wellington College, one of the UK's leading independent schools. Seating 900, and with a total capacity (in College Assembly mode) for 1,200 people, it is said to be a unique circular theatre, built into a gently sloping site.

Linking the new theatre with the existing Christopher Lee Theatre in a clear, column-free span is the Cultural Living Room (CLR).

Besides forming the main foyer to the theatre, this space has been created to provide an open public space for ad-hoc performances and the display of arts and crafts produced by the college students.

Inside the theatre, the 33m-diameter roof spans over the auditorium where the curved plan of the building is said to fully complement the internal arrangement of seating and structure around the focus of the stage.

High-level walkways within the roof not only give access to the lighting galleries, but also form the backbone of the roof support structure, formed by a rectilinear arrangement of cambered Warren/Vierendeel hybrid trusses.

Designing a round building with a heavy roof (for acoustic reasons), yet which still has a clear span presented problems for both the design and construction teams.

The solution PBA designed transferred the vertical loads of the roof and external walls back into the building through the balcony support structure, then to the ground through lower level columns hidden within the various internal ground floor walls.

The structure also faced complications adjacent to the CLR where there were no internal columns, to allow for efficient circulation. This was accommodated through the introduction of a storey deep back-spanning cantilever curved truss, laterally restrained by the first-floor slab and angled balcony structure.

Innovative and extensive structural transfer systems were developed throughout to enable the architect's vision for this complex building. However, the overall complexity did not translate into complex steel fabrication details, as the building was designed to be a collection of simpler structures. This was achieved in part by keeping the perimeter column spacing and internal floor spans to a minimum, thereby reducing the overall load applied to each transfer beam.

According to PBA Senior Engineer Gwyn Owen, steel was the only viable material that could be used to form the theatre, the design of which was highly constrained by its large roof spans, high loads, limited structural zones and extensive ventilation requirements.

In summary, the judges say this quietly assured and successful project is a credit to all involved. Resolution of the circular building form with the functional and acoustic requirements of the auditorium was impressive. The engineer and steelwork contractor have rationalised the project into a very economic steel solution, enabling the architectural intent to be realised.

FACT FILE
Architect: Studio Seilern Architects
Structural engineer: PBA now part of Stantec
Steelwork contractor:
Advanced Fabrications Poyle Ltd
Main contractor: Beard Construction
Client: Wellington College

Greatham Creek Seal Hide, Middlesbrough

The use of steel allowed a geometrically complex structure to be built on a constrained site on top of a flood defence embankment.

All photos on this page © Vicky Matthews

FACT FILE
Architect: Abstract Machine [Leeds Beckett University]
Structural engineer: BMMJV [Bam Nuttall/Mott MacDonald Joint Venture]
Steelwork contractor: S H Structures Ltd
Main contractor: BMMJV [Bam Nuttall/Mott MacDonald Joint Venture]
Client: Environment Agency

Located in an area of Teesside renowned for its wildlife and a popular destination for birdwatchers and people wishing to photograph seals, an observation hide has been constructed during the building of new flood embankments.

Overlooking the sea at Greatham Creek, the steel-framed hide replaces an old timber structure and has been described as a legacy structure to be enjoyed by those visiting the area for years to come.

Explaining the choice of steelwork for the new hide, Mott MacDonald Technical Principal Adrian Douglas says: "The structure sits at the top of the flood defences, with no access for cranes adjacent to the site. A relatively long radius lift was required for erection which limited the weight of the individual parts of the final structure.

"To satisfy the need for lightweight material and to achieve the durability required by the brief the only options were steel or in-situ concrete. The latter is said to be inappropriate for the functional requirements of a bird hide and expensive to be made architecturally interesting. The use of corrosion resistant weathering steel both resolved the need for repainting the structure and naturally provided a suitable colour.

"Using steel also enabled an interesting architectural form to be executed within the access constraints of the site," adds Mr Douglas.

Funding for the scheme was secured through engagement with Royal Society for the Protection of Birds (RSPB) and Teesside Environmental Trust, with a contribution from the Landfill Communities Fund.

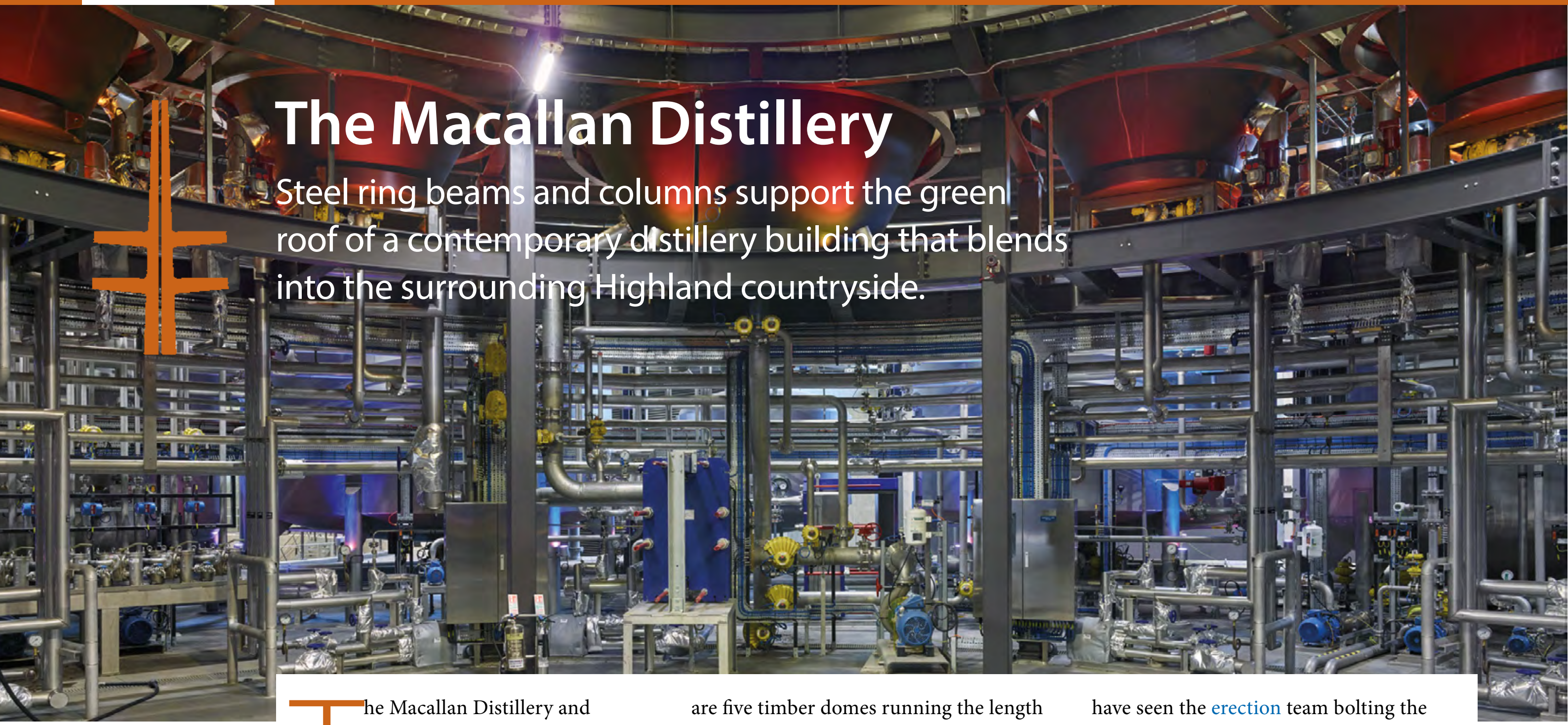
Together with an additional donation from local business the budget available for the hides increased significantly from the original £25,000 to over £100,000, allowing the project team to design a more substantial and aesthetically-pleasing hide.

Several universities were approached about getting involved in the design of the hide, with Leeds Beckett University's School of Architecture eventually being awarded the job.

Several final year students visited the site in December 2017 and started work on individual concept designs which were presented to the wider project team, including representatives from RSPB and Teesside Environmental Trust in February 2018.

The initial designs were very well received and work then progressed on developing a final option. The undergraduates and alumni of the university worked with Mott MacDonald's specialist structures team and appointed steelwork supplier S H Structures to progress the design to a final, fully designed and costed solution.

The judges say an enlightened client, and an innovative response from architecture students at Leeds Beckett University, has resulted in a truly unique hide structure. The existing conventional wood hides had to be removed as part of a flood alleviation scheme. Their replacement is formed from sculpted weathering steel and provides a legacy to be enjoyed by visitors to this vibrant wildlife area.



The Macallan Distillery

Steel ring beams and columns support the green roof of a contemporary distillery building that blends into the surrounding Highland countryside.

The Macallan Distillery and Visitor Experience was designed to deliver a unique structure that would reveal its production processes as well as welcome visitors, while remaining sensitive to the rural setting.

Structural steelwork is an integral part of the building, as ring beams and columns support the timber green roof, while curved steel process tables hold up the copper sills that are used in the distilling process.

A series of steel trusses bridge over the delivery road to provide fire egress and an incoming route for the delivery of materials.

The biggest challenge for the team was the building's roof as S H Structures Sales Director Tim Burton explains: "The interface with the timber gridshell roof demanded achieving very onerous dimensional tolerances with brackets being positioned in space to +/- 1mm."

The roof design is based around a repetitive use of a dome form. The primary geometry is formed from a timber grillage of downstand beams at 3m centres. There are five timber domes running the length of the building, with the most southerly portion of the roof running flat over the main exhibition space.

The undulating grillage is supported by steel portal frames. Each timber dome, spanning a clear distance of 27m, lands onto a steel ring beam, which in turn is supported on inclined V-columns, that spring from concrete buttresses.

The circular hollow section ring beam resists the broadly uniform thrust from the domes in tension, thereby maximising the suitability of steel for this element. By portalising these frames, the overall stability to the roof, in all directions, is said to be guaranteed. Each ring beam has connecting plates, welded along it surface at 3m centres, to receive the timber beams of the roof.

The key nodes where the ring beam meets the columns required reinforcing to cope with the full effects of pattern loading. Internal stiffeners were inserted into the node to ensure the required strength was fully developed.

The initial design for the roof would have seen the erection team bolting the relevant sections together on site. However, at the suggestion of S H Structures, this was changed to site welding the nodes. Despite the challenging environment in which this had to be done, it was considered to be the best way of meeting the tight overall tolerance requirements.

Working closely with the timber contractor and the design team, S H Structures says it was able to ensure that the roof steelwork met the demanding erection requirements without significant problems and maintained the overall construction programme.

Summing up, the judges say a portalised arrangement of steel ring beams and V-shaped columns supports the undulating roof, while the open mesh steel mezzanine floor wraps around the production plant, and is supported on a series of steel portals arranged on a circular grid.

This demanded very close integration between steel erection and plant installation, yet was executed to a very high standard.

FACT FILE
Architect:
Rogers Stirk Harbour + Partners
Structural engineer:
Arup
Steelwork contractor:
S H Structures Ltd
Main contractor:
Robertson Construction
Client:
The Macallan

Telford Central Footbridges

Replacing an older structure that had reached the end of its working life, Telford's Central Footbridge replacement scheme provides a new and important link between the railway station and town centre.

Two steel arched structures with an underslung suspended deck connected by a central hub provide a new and improved link between Telford railway station and the town centre.

Previously the route, which crosses both railway lines and a road, had been served by a single span steel truss structure, but this bridge had reached the end of its working life and was too costly to maintain.

The use of steel as a structural solution for the new structures was recognised early in the design stage as the material has an efficient span-to-weight ratio and it benefits from safer, cost-effective offsite construction techniques.

The selected cranked alignment, parallel to the existing link, enabled the new bridge to be built while maintaining the use of the existing structure, thereby causing the minimum amount of disruption to its users.

The new structures are both based on a single-span lenticular space truss roof, fabricated from steel circular hollow sections. The railway structure is 27m-long and the larger highway structure is 90m-long.

The steel decks are supported from the truss system on hangers. For the larger bridge, the deck also acts together with the roof truss and raking end members to create a tied arch supported on piled concrete abutments, faced with blockwork.

A brickwork clad steel structure connects the two bridges.

"Coordinating the multiple interfaces between the various materials used on the structures was a significant challenge. The bridges feature a primary tubular steel arch structure with a tensile fabric roof, a GRP soffit and glazed sides, all of which had to fit to exacting tolerances," explains S H Structures Sales Director Tim Burton.

Installing the structures on this busy and constrained site was a major challenge.

The Balfour Beatty team worked closely with the client and other agencies to develop a suitable logistics plan. Assembly areas were established adjacent to the railway and Rampart Way where the two substantially prefabricated bridges were erected on bespoke temporary works.

The smaller railway span was successfully installed during an overnight road and rail closure in July 2018. The client and main contractor promoted the project in the local press and via social media and this resulted in a large crowd gathering to watch the spectacular installation of the larger road span. This structure was successfully lifted into place on 17th September 2018.

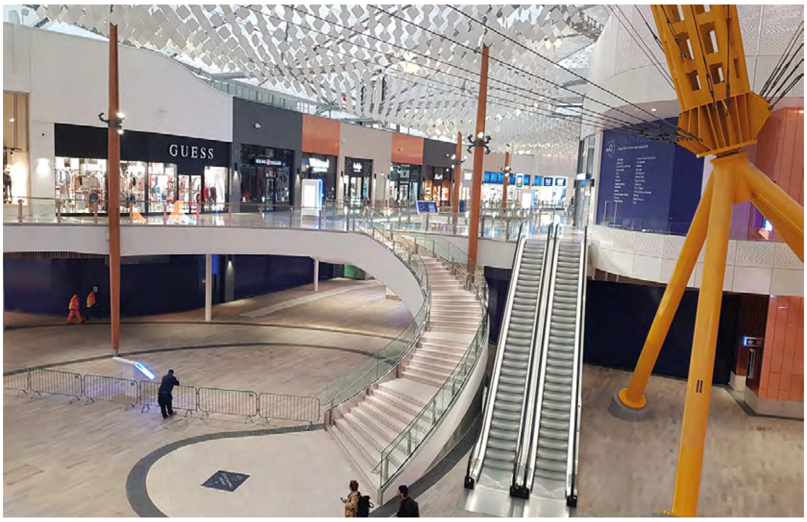
"Lifting the larger 90m span bridge into place during a limited night-time operation was a challenge which required meticulous planning and attention to detail to ensure the structure was installed safely and within the allotted time slot," says Mr Burton.

Summing up, the judges say these new footbridges provide a modern sleek welcome to visitors arriving from the railway station. Crossing busy roads and a railway line on a tight site presented major challenges, but disruption was kept to a minimum and the judges were impressed with the team's efforts to engage and involve the public, resulting in a proud sense of ownership by the local community.

FACT FILE
Architect: Nicoll Russell Studios
Structural engineer: Jacobs
Steelwork contractor: S H Structures Ltd
Main contractor: Balfour Beatty
Client: Telford & Wrekin Council

© Stuart Brown

Project Mint at The O2



Project Mint completes the ring of tenant units surrounding The O2 Arena and was designed and installed around the steel masts and tie wires that support the tented dome structure. The project utilises a steel structure originally constructed in 2006 for a super casino, demonstrating the versatility of steelwork and minimising waste.

The project can be divided into two separate parts, a two-storey element and a single storey element. Both are connected, although a movement joint with a row of double columns forms a boundary between them.

The single storey retail area is built on top of the existing structure, which is topped with a series of trusses creating a large column-free space. The trusses support lightweight metal decking to form a roof, which was constructed to make sure the casino was watertight if the Dome's fabric roof was ever removed.

As the slab was built with just a casino in mind, the overall floor-to-ceiling height was much greater than that required in a modern retail outlet. Consequently, in the area where the slab meets the two-storey steel frame, the upper level gradually slopes down by 1m.

FACT FILE
Architect: CallisonRTKL
Structural engineer: BuroHappold Engineering
Steelwork contractor: Bourne Steel Ltd
Main contractor: ISG
Clients: AEG, Crosstree

Kettner's Townhouse & Soho House Greek Street

The project team have expanded and remodeled the original Soho House on Greek Street, London, while simultaneously revitalising the iconic Kettner's Restaurant with the addition of a new 33-bedroom boutique hotel above.

A new-build, bronze-clad pavilion was then inserted into the courtyard, creating both physical and visual links between the different spaces. The massing of the pavilion was formed to reveal a series of terraces and lightwells that each relate to their adjacent plots, not only bringing light and outdoor space to all levels, but ensuring maximum usable area is achieved.

According to project architect SODA, without the use of steel, the alignment of the new pavilion floors and terraces with the varying existing floor levels (almost each of the 15 plots having unique floor levels) would have been difficult to achieve, not least due to the restricted floor-to-ceiling heights and limited structural floor depths.

FACT FILE
Architect:
Studio of Design & Architecture (SODA)
Structural engineer: EngineersHRW
Main contractor:
In House Design & Build Ltd
Client: Soho Estates Ltd

Ely Southern Bypass

Describing this project, the judges say the low-profile design of the two bridges sits comfortably within the fenland landscape. The palette of weathering steel and fair-faced concrete integrates the scheme well into its rural context.

The inclusion of a public footway with the river crossing provides welcomed connectivity between the foot and cycle path network either side of the river.

Tony Gee & Partners Principal Engineer Ken Lam says, the two road bridges made up a quarter of the 1.6km road scheme.

"Steel was the natural and appropriate choice for the main structural elements for the given spans, as it reduces the dead load to give a more efficient structure. For the railway bridge speed of construction was essential, which steel offered as large prefabricated sections could be lifted in.

"The use of weathering steel throughout also improved the appearance by reducing the apparent depth in sympathy with the surrounding environment and views, as well as enhancing sustainability, given its low maintenance."

FACT FILE
Architect: Knight Architects
Structural engineer: Tony Gee & Partners
Steelwork contractor: Severfield
Main contractor: VolkerFitzpatrick Ltd
Client: Cambridgeshire County Council

Aga Khan Centre, London

This self-effacing ten-storey building in the Kings Cross redevelopment is constructed to the highest quality with the greatest attention paid to fine detailing and materials, say the judges

Passers-by will be forgiven for remaining unaware of this store of treasures of Islamic art and literature, and the variety of internal and external spaces contained within this London centre for the Aga Khan Foundation.

According to Expedition Engineering Associate Alessandro Maccioni, an integrated structural steel and services solution was chosen as it minimised storey heights, while maintaining floor-to-ceiling heights, compared to a comparable concrete solution.

"The composite frame also permitted the use of a raft foundation, the first at Argent's development at King's Cross, which provided significant programme and cost savings compared to a piled foundation solution.

"Steel also provided a minimal-sized vertical structure installed to high tolerances, which allowed the external wall build-up to be minimised – in line with the architectural intent."

© Edmund Sumner

FACT FILE
Architects: Maki & Associates, Allies and Morrison
Structural engineer: Expedition Engineering
Steelwork contractor: Severfield
Main contractor: BAM Construct UK Ltd
Clients: AKDN, Argent

160 Old Street, London

The former post office administrative building on London's Old Street has been converted into a modern commercial scheme with the aid of steel construction.

The 1970s-built six-storey concrete-framed structure has had a major makeover, with an extensive refurbishment that delivered open-plan office space within an expanded structural envelope.

The project team have added three floors to the building, infilled lightwells and extended all of the elevations with new steelwork.

"Structural steelwork offered us the required lightweight solution with lots of scope for prefabrication and service integration," says Heyne Tillett Steel Director Mark Tillett.

"We also added up to 40% additional load onto the existing frame and foundations without any strengthening."

This was achieved through pre-contract geotechnical investigations and testing, including pile core samples, boreholes and confirmation of the existing pile length.

By using structural steelwork, the new floors were easily adapted to tenant requests, including the positioning of stairs.

Lightweight steel solutions have maximised the value of this mid-20th Century commercial building with additions of up to three new storeys, say the judges.

FACT FILE
Architect: Orms
Structural engineer: Heyne Tillett Steel
Steelwork contractor: Bourne Steel Ltd
Main contractor: Wates Construction
Client: Great Portland Estates plc

Connection design in trusses

A general article about steel trusses which touched on choice of members and their orientation but did not go into detail about designing connections was published in 2017[1]. In the present article Richard Henderson of the SCI illustrates the implications of such choices on the connection design.

Introduction

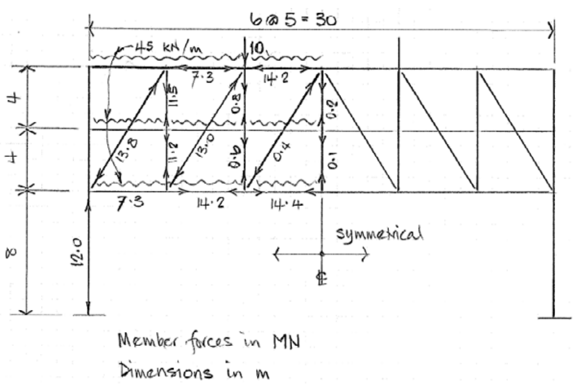
The selection of members and their orientation and the impact on the design of connections in a truss is best illustrated with an example. The arrangement of the truss, the magnitude of the forces and the orientation of the members all have an impact on the form of the connections. A fundamental part of achieving an efficient joint design is establishing an understanding of the flow of forces through the joint. This is only possible if the forces provided for the design of the joint are in equilibrium. If envelope forces are provided, this compromises the designer's ability to develop an efficient connection design. In what follows connections between open section members will be considered.

As an example, consider a transfer truss spanning 30 m supporting two columns at third points, each carrying 10 MN from floors above. The truss is divided into three bays of 10 m width by the columns. The building storey height is 4.0 m and each floor in the truss will carry a uniform load of 45 kN/m. The chords are restrained out of plane by floor beams perpendicular to the plane of the truss.

Truss arrangement

An early decision is what the depth of the truss should be. The maximum bending moment is 100 MNm from the columns and about 5 MNm from each floor. If the truss is one storey deep (ie a span to depth ratio of 7.5), the maximum chord force is 27.5 MN which exceeds the axial resistance of the largest UC section. In this example, a two-storey truss is chosen, giving a maximum chord force of about 14.4 MN which can be carried by a UC. The truss can be conveniently divided into 5 m panel widths. An N-frame or Pratt truss has shorter vertical members in compression and longer diagonal members in tension. The connections in the tension members are likely to prove the most difficult to detail and the tension forces in the bracing could be reduced by orienting the bracing so that the diagonal members are in compression and the verticals in tension (Figure 1).

Figure 1: Truss arrangement diagonals in compression



It can be seen from Figure 1 that the length of the bottom chord carrying a force above 14 MN is more than 20 m long and will need a tension splice for transportation. Adopting a conventional N-frame is therefore considered to be preferable as the necessary splices can be located in elements with lower forces.

A truss with a single storey depth could be shop-fabricated and transported to site in three pieces with two bolted site splices. Erection time would be reduced but crane lifting capacity and transportation would need to be considered if this option is contemplated. The truss arrangement chosen, member forces and some member sizes are shown in Figure 2.

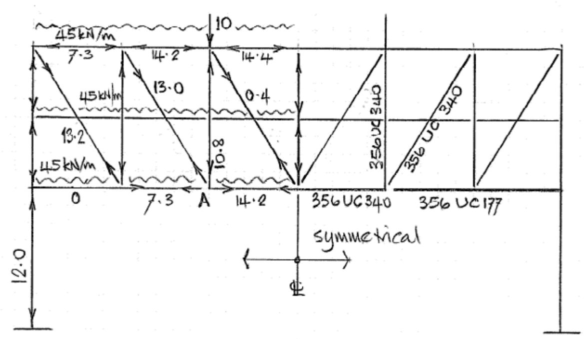
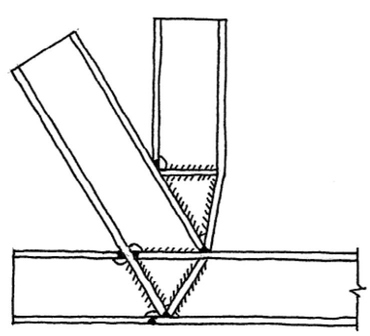


Figure 2: Truss arrangement diagonals in tension

Example connection design – orientation of members

Consider the joint at point A at the base of the column carrying 10 MN. The bottom chord member could be detailed as one fabricated assembly with a joint at each end to connect to the column, diagonal brace and the continuing chord member. At this joint, there is a tension in the central section of bottom chord of about 14.2 MN and a tension diagonal carrying about 13 MN. The chord member carries about 40% of the tension in each flange and 20% in the web. A conventional orientation of the members might be considered with the webs vertical as in Figure 3.

Figure 3: Bottom chord joint - webs vertical

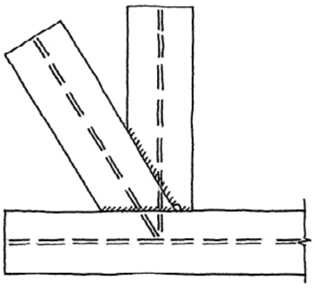


▶38

▶36 A path for transferring the flange forces from the chord to the bracing member is necessary (because the forces are obviously too large to transfer through the webs) and an additional load bearing stiffener is necessary to carry the resultant force at the change in direction. As the forces are in tension, full strength welds would be required. The butt welds between the flanges are substantial and require cope holes through the web to achieve them. The webs would need to be checked for shear as well as axial load in the joint zone. This arrangement is not favoured.

Rotating the members so their flanges are vertical (Figure 4) provides a more direct path for the flange tension forces.

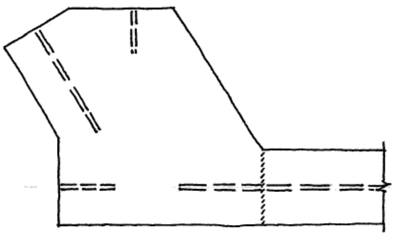
Figure 4: Bottom chord joint - flanges vertical



The connections between the members in the node can be made by butt welds between the edges of the flanges. The flow of force through the joint is smoother but the web force still needs to be transferred, and the junction where the webs of the three members come together is complicated.

A refinement of this arrangement, using two plates to form the node, separated by intermittent webs is the favoured solution (Figure 5).The plates toward the centre of the joint are wide enough to carry half the chord force so a web is only required close to the connecting member to transfer the web force into the plates. The plates are butt welded to the chord flanges and the tension diagonal is connected using a bolted splice. The column member is connected using a bearing splice.

Figure 5: Bottom chord joint – splice plates



Joint design

The tension splice in the bracing member will be effected using M30 preloaded bolts of category B in double shear, of grade 10.9. The slip resistance assumed for design is for a friction coefficient μ = 0.5 and is 357 kN.

The member is a 356 UC 340 with 42.9 mm thick flanges and 26.6 mm thick web and has an area of 433 cm². The area of one flange is 40% of the total and carries 5.2 MN in tension. The number of bolts required is indicated in Table 2:

	Force (MN)	No of Bolts	Adopt
Flange	5.2	14.6	16 bolts
Web	2.6	7.3	8 bolts

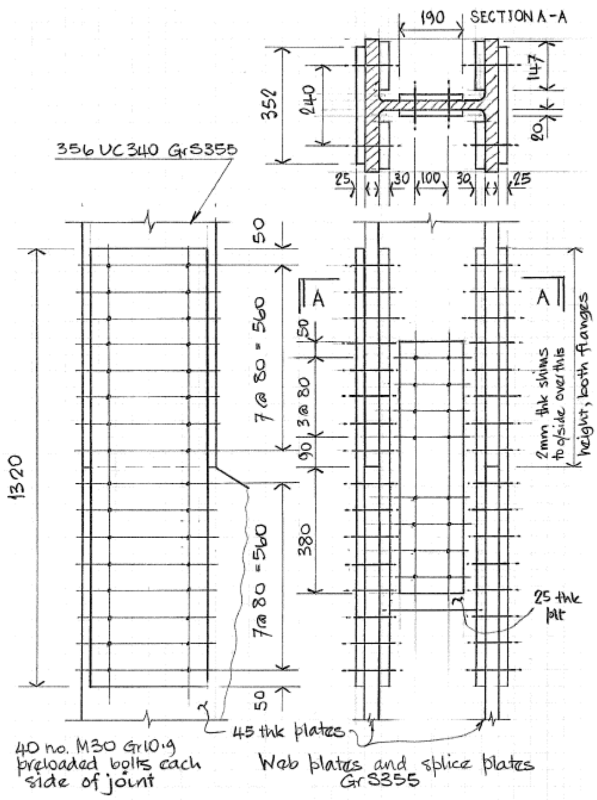


Figure 6: Bolted splice arrangement

The flange splice plates are chosen to provide the same area of metal as the flange with half the area on each side to balance the force on each shear plane in a bolt. The splice arrangement is shown in Figure 6. All bolts in the truss will be M30 grade 10.9 preloaded assemblies, category B.

The inside face of the plates in the node are arranged to line through with the inside face of the element flanges. Externally, shims are provided to reduce the difference in thickness to less than 1 mm.

The bearing splice in the column member must be designed for 25% of the maximum compression ie 2.7 MN. Dividing by the double shear resistance gives 7.6 bolts and four bolts will be used in each flange.

The tension connection for the continuation of the bottom chord will be detailed in a similar way to the tension diagonal with ten bolts in the flanges and six bolts in the web. The difference in flange thickness in this part of the joint is 21 mm and is achieved with two shims of 15 mm and 6 mm thickness.

The connection between the bottom chord and the node plates is required to transfer 14.2 MN in tension. The node plates will be butt welded to the bottom chord member. The force in the web will be transferred by welds to the node plates; either fillet welds or partial penetration butt welds can be used. This can be achieved either by stripping both flanges off the member to allow the web to project between the node plates or by butt welding an extension plate to the web. Short web plates are required between the node plates at each bolted connection to receive the web force and transfer it into the node plates through fillet welds.

The node plate geometry is such that the stress in the plates reduces rapidly away from the interface with the connected members. The resistance to compression from the vertical column must also be considered. A buckling check of the compression force in the node plates should be carried out. The final joint arrangement is shown in Figure 7.

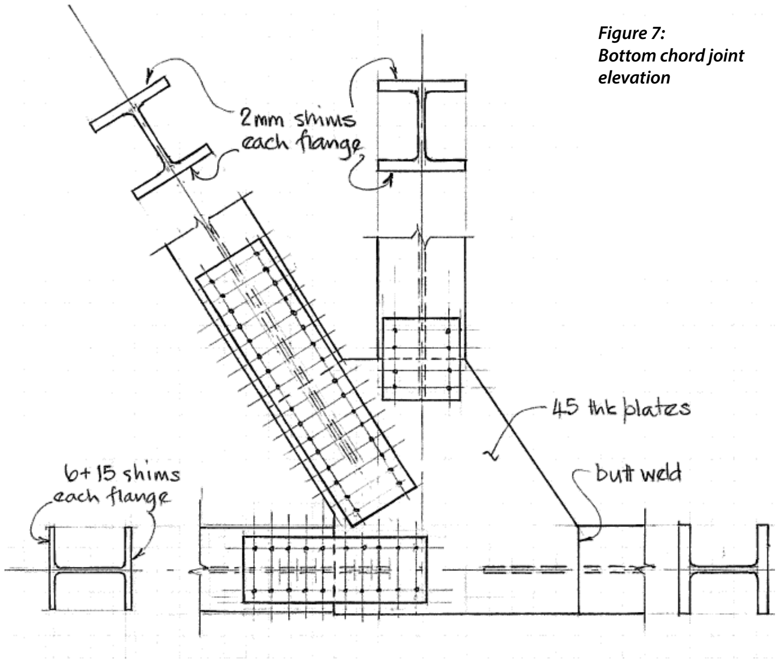


Figure 7: Bottom chord joint elevation

Conclusions

1. Early consideration of the form of members in the truss (rolled or fabricated) may influence the depth adopted. Transportation, craneage, erection and the proportion of shop fabrication also influence the truss arrangement.
2. The flow of forces through the joint is clear if the forces are in equilibrium. The orientation of members (webs vertical or horizontal) affects the need for and nature of welds required to transfer the forces.
3. Facilitating the flow of forces between the element flanges results in a joint arrangement where member stubs are not welded together but plates are provided, aligned with the member flanges to carry the forces through the joint which reduces the stiffening required and the amount of welding.
4. Fewer bolts would result if non preloaded grade 10.9 bolts were adopted (30 on each side of the diagonal member splice instead of 40) but the deflection of the truss would be more difficult to control because of bolt movement in clearance holes and bearing deformation.
5. The double shear resistance of non preloaded M30 grade 10.9 bolts is only 4% greater than grade 8.8 bolts of the same size but this can be enough to produce a smaller number of bolts. Once selected, the bolt grade and size is fixed for the whole truss.

Reference

1 Steel construction with trusses, NSC, March 2017

New and revised codes & standards

From BSI Updates September 2019

BS EN PUBLICATIONS

BS EN ISO 945-1:2019
Microstructure of cast irons. Graphite classification by visual analysis
Supersedes BS EN ISO 945-1:2018

BS EN ISO 7053:2019
Fasteners. Hexagon washer head tapping screws
Supersedes BS EN ISO 7053:2011

BS EN ISO 15480:2019
Fasteners. Hexagon washer head drilling screws with tapping screw thread
Supersedes BS EN ISO 15480:1999

BS IMPLEMENTATIONS

BS ISO 945-4:2019
Microstructure of cast irons. Test method for evaluating nodularity in spheroidal graphite cast irons
No current standard is superseded

BRITISH STANDARDS WITHDRAWN

BS EN ISO 7053:2011
Hexagon washer head tapping screws
Superseded by BS EN ISO 7053:2019

BS EN ISO 15480:1999
Hexagon washer head drilling screws with tapping screw thread
Superseded by BS EN ISO 15480:2019

CEN EUROPEAN STANDARDS

EN ISO 945-1:2019
Microstructure of cast irons. Graphite classification by visual analysis
(ISO 945-1:2019)

EN 1993-1-5:2006/A2:2019
Eurocode 3. Design of steel structures. Plated structural elements

AD 434: Validity rules for hollow section joints

This AD note concerns a significant typographical error in Table 7.8 of BS EN 1993-1-8. The table presents validity limits for welded joints between hollow section brace members and RHS chord members.

For the common case of a K or N overlap, there is a limitation under the "Gap or overlap" column expressed as:

$b_i/b_j \le 0.75$

where b_i is the width of the overlapping bracing member, and b_j is the width of the overlapped member. Thus the limit precludes bracing members of the same size, for which $b_i/b_j = 1$, and this is clearly wrong.

In fact, the limit should be expressed as:

$b_i/b_j \ge 0.75$

which prevents a narrow overlapping bracing being welded to a wide overlapped brace, but permits bracing of the same width to be used.

This limit is correctly expressed in literature published by Tata Steel, and has been corrected in the draft revisions to EN 1993-1-8.

As an aside, it may assist designers to note that definitions of some factors that appear in the joint verification expressions, such as β, λ_{ov}, n and γ are found in Section 1.5 of BS EN 1993-1-8, not in Section 7 as might be expected. Similarly the definition and dimensions of gap and overlap joints are found in Figure 1.3, rather than in the section concerned with hollow section joints.

Contact: **Richard Henderson**
Tel: **01344 636555**
Email: **advisory@steelconstruction.org**

Structural Steel Design Awards 1969

Water Tower for GKN Group Research Centre
ARCHITECTS Architecture Design Partnership
STRUCTURAL ENGINEERS Frederick J Brand & Partners
STEELWORK CONTRACTOR H J Horswell & Son Ltd
MAIN CONTRACTOR Sir Alfred McAlpine & Son Ltd

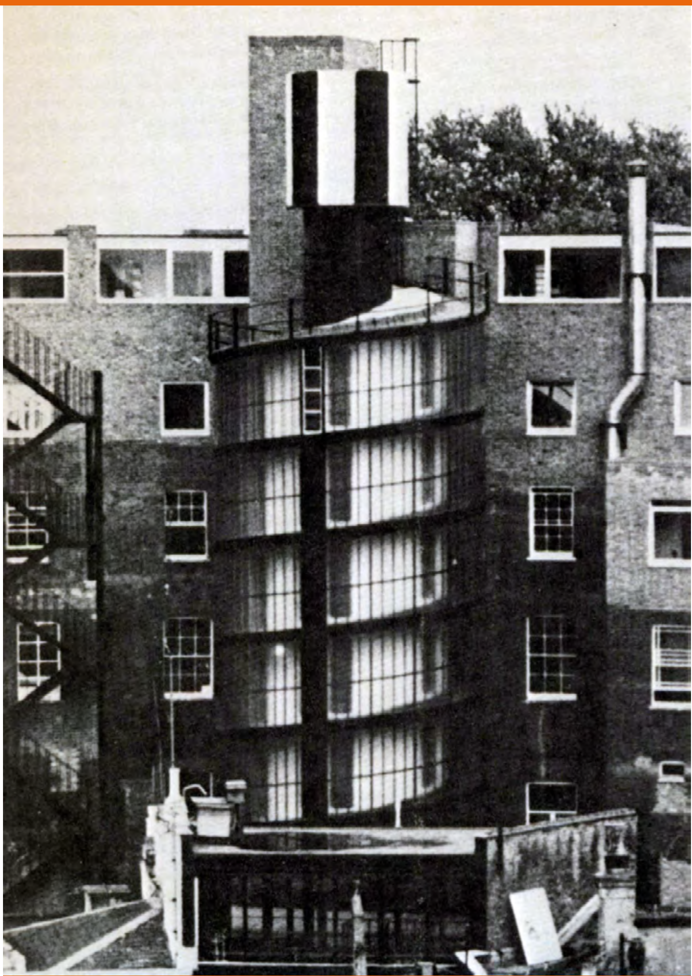
White Cart Viaduct for the Scottish Development Dept.
DESIGN OFFICE Crouch & Hogg
INDEPENDENT ARCHITECTS Cullen Lochhead & Brown
STEELWORK CONTRACTOR Sir William Arrol & Co

Winterton House, Watney Market Estate
for the Greater London Council
ARCHITECT Hubert Bennett, FRIBA, FSIA
Architect to the Greater London Council
STRUCTURAL ENGINEERS *Steel Frame:* Redpath Dorman Long Ltd
Central Core & Foundation:
W A Mitchell, FIStructE
STEELWORK CONTRACTOR Redpath Dorman Long Ltd
MAIN CONTRACTOR F G Minter Ltd

Tinsley Viaduct for the Ministry of Transport
DESIGN OFFICE Freeman Fox & Partners
STEELWORK CONTRACTOR The Cleveland Bridge & Engineering Co Ltd

efficient, economical and elegant – that is design in steel, as demonstrated by the winners in the Structural Steel Design Awards Scheme 1969

FROM **Building with Steel**
NOVEMBER 1969

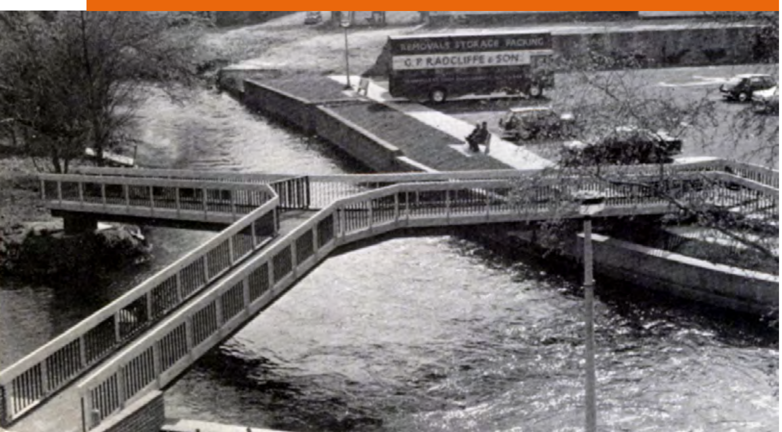


Service Tower for the International Students Club (Church of England) Ltd

ARCHITECTS Farrell/Grimshaw Partnership
STRUCTURAL ENGINEERS Ove Arup & Partners *and* W H Smith & Co. (Whitechurch) Ltd
STEELWORK CONTRACTOR W H Smith & Co. (Whitechurch) Ltd
MAIN CONTRACTOR A Bell & Sons (Paddington) Ltd

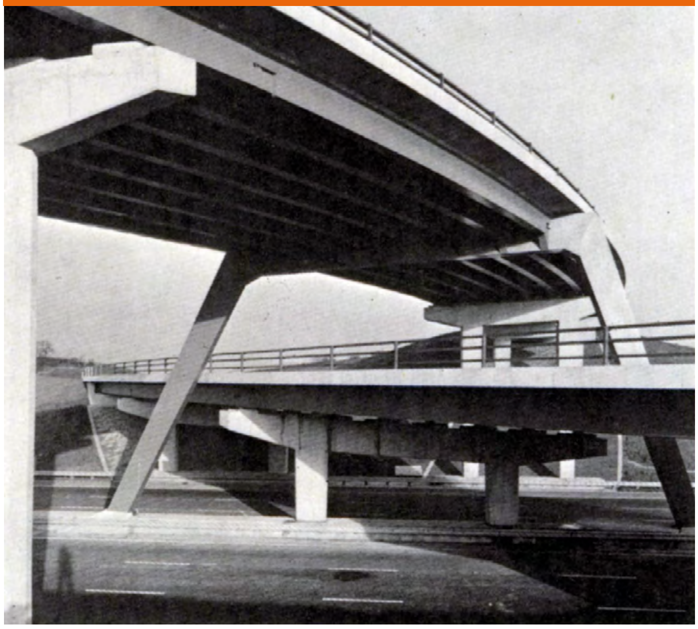
Footbridge, Riverside Shopping Precinct for Thetford Borough Council

ARCHITECTS Berry Crane and Noble
STRUCTURAL ENGINEERS Boulton & Paul (Steel Construction) Ltd
STEELWORK CONTRACTOR Boulton & Paul (Steel Construction) Ltd
MAIN CONTRACTOR May Guerney & Co Ltd



Maryville Interchange for the Scottish Development Dept.

DESIGN OFFICE Babtie, Shaw and Morton
STEELWORK CONTRACTOR Sir William Arrol & Co Ltd
MAIN CONTRACTOR Tarmac Civil Engineering Ltd



Terminal 1, Heathrow Airport, London for the British Airports Authority

ARCHITECTS Frederick Gibbard & Partners
STRUCTURAL ENGINEERS Sir William Halcrow and Partners
STEELWORK CONTRACTOR Redpath Dorman Long Ltd
MAIN CONTRACTOR Tersons Ltd

Steelwork contractors for buildings

Membership of BCSA is open to any Steelwork Contractor who has a fabrication facility within the United Kingdom or Republic of Ireland. Details of BCSA membership and services can be obtained from

Lorraine MacKinder, Marketing and Membership Administrator,
The British Constructional Steelwork Association Limited, Unit 4 Hayfield Business Park, Field Lane, Auckley, Doncaster DN9 3FL
Tel: 020 7747 8121 Email: *lorraine.mackinder@steelconstruction.org*

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, ● = Member)

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.

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A & J Stead Ltd	01653 693742			●	●					●	●			●	●		3			Up to £400,000
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
Access Design & Engineering	01642 245151					●				●	●			●	●	✔	4			Up to £4,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3	✔	Silver	Up to £4,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●									✔	2	✔	Gold	Up to £3,000,000
Advanced Fabrications Poyle Ltd	01753 653617				●	●	●	●		●	●			●	●	✔	2			Up to £800,000
AJ Engineering & Construction Services Ltd	01309 671919			●	●		●		●	●	●			●	●	✔	4		Silver	Up to £3,000,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4			Up to £1,400,000*
Apex Steel Structures Ltd	01268 660828					●	●			●	●			●	●		2			Up to £3,000,000
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2			Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●		●	●		2			Up to £800,000
ASME Engineering Ltd	020 8966 7150				●	●	●	●		●	●			●	●	✔	4		Gold	Up to £4,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●			●	●			●	●	✔	2			Up to £1,400,000
Austin-Divall Fabrications Ltd	01903 721950				●	●	●	●		●	●			●	●	✔	2			Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2	✔	Silver	Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✔	4			Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £1,400,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●		●	●	✔	4	✔	Silver	Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	Gold	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		4			Up to £3,000,000
Bourne Group Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	Gold	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●		●	●	●	✔	4			Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●				●	●	✔	4		Silver	Up to £4,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	Gold	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●		●	●			●		●	●	●	✔	3		Gold	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●		●	●	●			✔	4		Gold	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✔	4			Up to £6,000,000
Cook Fabrications Ltd	01303 893011			●	●		●			●	●			●	●		2			Up to £1,400,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●	✔	4			Up to £1,400,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £40,000
D Hughes Welding & Fabrication Ltd	01248 421104				●	●	●	●	●	●	●		●	●	●	✔	4			Up to £800,000
Duggan Steel	00 353 29 70072	●	●	●	●	●	●	●	●		●				●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	3			Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	Gold	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●			●	✔	3		Gold	Up to £3,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●	●	●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●			●		●	●	●	●	●		●	●	●	✔	3		Member	Up to £2,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●		●	●				●		2			Up to £2,000,000

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	2			Up to £1,400,000
G.R. Carr (Essex) Ltd	01286 535501	●		●	●			●			●			●	●	✔	4			Up to £800,000
H Young Structures Ltd	01953 601881			●	●	●	●	●						●	●	✔	2		● (green)	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●			●	●		●		✔	4		● (grey)	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●			●	●				●	✔	2			Up to £1,400,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●		●				●	●	✔	3			Up to £2,000,000
J & A Plant Ltd	01942 713511				●	●									●		4			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●		●			4			Up to £6,000,000*
Kiernan Structural Steel Ltd	00 353 43 334 1445	●		●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (orange)	Up to £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4			Up to £6,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		● (grey)	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	4		● (green)	Up to £2,000,000
M J Patch Structures Ltd	01275 333431				●					●	●				●	✔	3			Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £2,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £1,400,000
Maldon Marine Ltd	01621 859000				●	●			●	●				●		✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						3			Up to £3,000,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £1,400,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●			●	●				✔	4		● (grey)	Up to £2,000,000
North Lincs Structures	01724 855512			●	●					●	●				●		2			Up to £400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		● (orange)	Up to £3,000,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●							●		2			Up to £400,000
Painter Brothers Ltd	01432 374400	●			●				●	●	●				●	✔	3			Up to £6,000,000*
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £800,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●			●	●	✔	3			Up to £6,000,000
S H Structures Ltd	01977 681931	●			●	●	●	●	●	●	●	●			●	✔	4	✔	● (orange)	Up to £2,000,000
SAH Engineering Ltd	01582 584220			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (orange)	Above £6,000,000
SGC Steel Fabrication	01704 531286				●					●				●	●	✔	2			Up to £200,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●		●			●	●			●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		2			Up to £1,400,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £1,400,000
Steel & Roofing Systems	00 353 56 444 1855			●	●	●	●				●	●		●	●	✔	4			Up to £3,000,000
Structural Fabrications Ltd	01332 747400	●			●	●		●	●	●	●			●	●	✔	3		● (grey)	Up to £1,400,000
Taunton Fabrications Ltd	01823 324266				●	●				●	●			●	●	✔	2		● (grey)	Up to £2,000,000
Taziker Industrial Ltd	01204 468080	●		●	●		●			●	●		●	●	●	✔	3			Above £6,000,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●			●	●			●	●	✔	2			Up to £400,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●			●	●	✔	3	✔	● (grey)	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●	●			●			●			2	✔		Up to £2,000,000
Underhill Engineering Ltd	01752 752483				●		●	●	●	●	●			●	●	✔	4	✔		Up to £3,000,000
W I G Engineering Ltd	01869 320515				●					●					●	✔	2			Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	4			Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●		●	●	●	●	●	●	●	●				●	✔	4		● (green)	Up to £800,000
William Haley Engineering Ltd	01278 760591				●	●	●									✔	4		● (orange)	Up to £4,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (orange)	Above £6,000,000
WT Fabrications (NE) Ltd	01642 691191			●	●	●	●				●			●	●	✔	4			Up to £40,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

Steelwork contractors for bridgeworks

RQSC – The Register of Qualified Steelwork Contractors Scheme

BCSA

The Register of Qualified Steelwork Contractors Scheme for Bridgeworks (RQSC) is open to any Steelwork Contractor who has a fabrication facility within the 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, ● = Member)

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)
AJ Engineering & Construction Services Ltd	01309 671919	●			●	●	●	●	●	●	●	●	✓	4				Silver	Up to £3,000,000
Bourne Group Ltd	01202 746666	●			●	●				●		●	✓	4	✓		✓	Gold	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●	●	●	●		●	●	●	✓	4			✓	Silver	Up to £4,000,000
Cementation Fabrications	0300 105 0135	●		●	●	●	●					●	✓	3			✓	Gold	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Above £6,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	●	✓	4			✓		Up to £800,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	●	✓	3			✓	Silver	Up to £1,400,000
ECS Engineering Services Ltd	01773 860001	●			●	●	●		●			●	✓	3					Up to £3,000,000
Four-Tees Engineers Ltd	01489 885899	●			●	●	●		●	●	●		✓	3			✓	Member	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●				●				●		●	✓	4	✓		✓	Gold	Up to £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●	●	●		●	✓	4			✓	Member	Up to £2,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●	●	●	●	●	●					●	✓	4			✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Up to £4,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	Gold	Up to £2,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	Gold	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499									●		●	✓	3			✓		Up to £800,000
Structural Fabrications Ltd	01332 747400	●		●	●	●	●			●	●	●	✓	3				Silver	Up to £1,400,000
Taziker Industrial Ltd	01204 468080	●		●	●	●	●	●	●	●	●	●	✓	3		✓	✓		Above £6,000,000
Underhill Engineering Ltd	01752 752483	●	●	●	●	●				●	●	●	✓	4	✓		✓		Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●		●	✓	4	✓	✓	✓	Gold	Above £6,000,000
Non-BCSA member																			
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓	Silver	Up to £4,000,000
Centregreat Engineering Ltd	029 2046 5683	●		●	●	●	●	●	●	●	●	●	✓	4					Up to £2,000,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓		Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●	●	●	●		●	✓	4			✓	Member	Up to £1,400,000
Ekspan Ltd	0114 261 1126	●				●			●	●	●	●	✓	2					Up to £400,000
Francis & Lewis International Ltd	01452 722200											●	✓	4			✓	Gold	Up to £2,000,000
Harrisons Engineering (Lancashire) Ltd	01254 823993	●		●	●	●	●	●	●	●		●	✓	3		✓			Up to £1,400,000
Hollandia Infra BV	00 31 180 540 540	●	●	●	●	●	●	●	●		●	●	✓	4					Above £6,000,000*
HS Carlsteel Engineering Ltd	020 8312 1879									●	●	●	✓	3			✓		Up to £200,000
IHC Engineering (UK) Ltd	01773 861734	●										●	✓	3			✓		Up to £400,000
In-Spec Manufacturing Ltd	01642 210716								●	●		●	✓	4			✓		Up to £400,000
Lanarkshire Welding Company Ltd	01698 264271	●		●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Up to £2,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●			●	●	●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●		●	✓	4		✓	✓	Silver	Above £6,000,000

Corporate Members

BCSA

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
Control Energy Costs Ltd	01737 556631
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	08457 504030
Inspire Insurance Services	02476 998924
Kier Construction Ltd	01767 640111
McGee Group (Holdings) Ltd	020 8998 1101
Sandberg LLP	020 7565 7000
Structural & Weld Testing Services Ltd	01795 420264
SUM Ltd	0113 242 7390

BCSA

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.

1 Structural components
2 Computer software
3 Design services
4 Steel producers
5 Manufacturing equipment
6 Protective systems
7 Safety systems
8 Steel stockholders
9 Structural fasteners
10 Welding equipment and consumables

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

SCM
Steel Construction Sustainability Charter
● = Gold,
● = Silver,
● = Member

Company name	Tel	1	2	3	4	5	6	7	8	9	10	CE	SCM	BIM
Air Products PLC	01270 614167										●	N/A		
AJN Steelstock Ltd	01638 555500								●			M		
Albion Sections Ltd	0121 553 1877	●										M		
Arcelor Mittal Distribution - Scunthorpe	01724 810810								●			D/I		
Ayrshire Metals Ltd	01327 300990	●										M		✓
BAPP Group Ltd	01226 383824									●		M		
Barrett Steel Services Limited	01274 682281								●			M		
Behringer Ltd	01296 668259					●						N/A		
British Steel Ltd	01724 404040				●							M		
British Steel Distribution	01642 405040								●			D/I		
BW Industries Ltd	01262 400088	●										M		
Cellbeam Ltd	01937 840600	●										M		
Cleveland Steel & Tubes Ltd	01845 577789								●			M		
Composite Metal Flooring Ltd	01495 761080	●										M		
Composite Profiles UK Ltd	01202 659237	●										D/I		
Cooper & Turner Ltd	0114 256 0057									●		M		
Cutmaster Machines (UK) Ltd	01226 707865					●						N/A		
Daver Steels Ltd	0114 261 1999	●										M		
Daver Steels (Bar & Cable Systems) Ltd	01709 880550	●										M		
Dent Steel Services (Yorkshire) Ltd	01274 607070								●			M		
Duggan Profiles & Steel Service Centre Ltd	00 353 56 7722485	●							●			M		
easi-edge Ltd	01777 870901							●				N/A	● Gold	
Fabsec Ltd	01937 840641	●										N/A		
Farrat Isolevel	0161 924 1600	●										N/A		
Ficep (UK) Ltd	01924 223530					●						N/A		
FLI Structures	01452 722200	●										M	● Gold	
Forward Protective Coatings Ltd	01623 748323						●					N/A		
Hadley Industries Plc	0121 555 1342	●										M	● Silver	
Hempel UK Ltd	01633 874024						●					N/A		
Highland Metals Ltd	01343 548855						●					N/A		
Hi-Span Ltd	01953 603081	●										M	● Member	

Company name	Tel	1	2	3	4	5	6	7	8	9	10	CE	SCM	BIM
International Paint Ltd	0191 469 6111						●					N/A	● Gold	
Jack Tighe Ltd	01302 880360						●					N/A		
Jamestown Manufacturing Ltd	00 353 45 434288	●										M		
Joseph Ash Galvanizing	01246 854650						●					N/A		
Jotun Paints (Europe) Ltd	01724 400000						●					N/A		
Kaltenbach Ltd	01234 213201					●						N/A		
Kingspan Structural Products	01944 712000	●										M	● Gold	
Kloeckner Metals UK	0113 254 0711								●			D/I		
Lincoln Electric (UK) Ltd	0114 287 2401					●						N/A		
Lindapter International	01274 521444									●		M		
MSW UK Ltd	0115 946 2316	●										D/I		
Murray Plate Group Ltd	0161 866 0266								●			D/I		
National Tube Stockholders Ltd	01845 577440								●			D/I		
ParkerSteel Limited	01227 783200								●	●		D/I		
Peddinghaus Corporation UK Ltd	01952 200377					●						N/A		
PPG Architectural Coatings UK & Ireland	01924 354233						●					N/A		
Prodeck-Fixing Ltd	01278 780586	●										D/I		
Rainham Steel Co Ltd	01708 522311								●			D/I		
SDS/2 Ltd	07734 293573		●									N/A		
Sherwin-Williams Protective & Marine Coatings	01204 521771						●					N/A	● Silver	
Structural Metal Decks Ltd	01202 718898	●										M		
StruMIS Ltd	01332 545800		●									N/A		
Stud-Deck Services Ltd	01335 390069	●										D/I		
Tata Steel – Tubes	01536 402121				●							M		
Tata Steel – ComFlor	01244 892199	●										M		
Tension Control Bolts Ltd	01978 661122						●			●		M		
Trimble Solutions (UK) Ltd	0113 887 9790		●									N/A		
voestalpine Metsec plc	0121 601 6000	●										M	● Gold	
Wedge Group Galvanizing Ltd	01909 486384						●					N/A		
Wightman Stewart (WJ) Ltd	01422 823801					●						N/A