MARCH 2021

NSC

Leicester touch down for steel

Steel stars in Manchester

Steel defines Chelsea tower

Science opts for steel in Salford

Cover Image
Hotel Brooklyn, Leicester
Main client: Marshall CDP
Architect: BMS
Main contractor: Marshall Construction
Structural engineer: Cundall
Steelwork contractor: Caunton Engineering
Steel tonnage: 750t

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NSC

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Steel ready to lead towards sustainable future

Nick Barrett - Editor

Construction, like much of industry, is still on the back foot after a year when the only surprise is that COVID-19 and Brexit didn't do as much economic damage as many feared. Government investment on a scale unprecedented in peacetime acted as a strong bulwark against strong tides that at times looked capable of sweeping away everything that we regard as 'normal' life.

But the outlook has lifted considerably in even the few short weeks since the last issue of NSC, with great progress being made in the UK's vaccination programme and a government roadmap announced to chart a way ahead out of lockdown. 'Freedom Day', when all parts of the economy will be reopened, could be as early as 21 June.

Ending the furlough scheme, even though it could be extended to the summer in the 3 March Budget, is expected to cause unemployment numbers to rise, but hopefully that will be a temporary phenomenon and predicted economic expansion will create new job opportunities. Business groups across the economy have pressed the Chancellor to maintain his economic support, investor confidence seems to be returning, and an economic boom is confidently predicted as we come out of lockdown.

Constructional steelwork is soundly placed to meet the anticipated upturn from government spending, which as we pointed out in last month's NSC, will create demand in the education and healthcare sectors, where steel has a long and successful track record. Other traditional areas of steel strength like logistics facilities have performed well in recent years and will continue to do so as online shopping strengthens its grip.

Against this promising background, attention will inevitably increasingly turn to sustainability, as the world aims to build back 'cleaner' and better. The drive towards zero carbon will only pick-up pace and the steel sector is already well placed to demonstrate a strong sustainability case, especially as the message about whole life carbon continues to spread - the BCSA's Steel Construction: Carbon Credentials publication set out steel construction's case last year.

The 'circular economy' is the real world that the whole construction industry and its clients have to operate in and, thanks to its recycling and reusability properties, steel has a stronger case than rival materials. Steel's reusability and adaptability will come into its own as the world adapts much of its office and shopping and other buildings to new, post-COVID-19 uses. Clients of new buildings are unlikely to fail to notice that steel-framed buildings more easily extended their working lives thanks to being so easily adaptable. Surveys from consultancies like Kearney are revealing that circular economy principles are allowing companies to outperform rivals in costs savings and revenues, and materials more suited to yesterday's take-make-waste economy will inevitably lose ground.

As BCSA President Mark Denham reveals in his President's Column in this issue of NSC, the steel construction sector is not resting on its laurels, and a lively programme of sustainability-related projects are underway. For example, a pan-steel sector group has been formed to make sure all of the sustainability support tools are updated and refreshed as required, and new initiatives launched including a Roadmap to net-zero carbon and new carbon footprint tools. When the new 'normality' arrives, which will surely be a sustainability-driven normality, the steel construction sector is determined to take a lead.

Tata Steel updates Blue Book for hollow sections

Tata Steel has partnered with the Steel Construction Institute (SCI) to produce a brand-new updated version of their 'Blue Book' software tool (www.tatasteelbluebook.com).

The Tata Steel Blue Book provides all sectional properties and tables of resistance for the full range of both hot finished and cold-formed hollow sections.

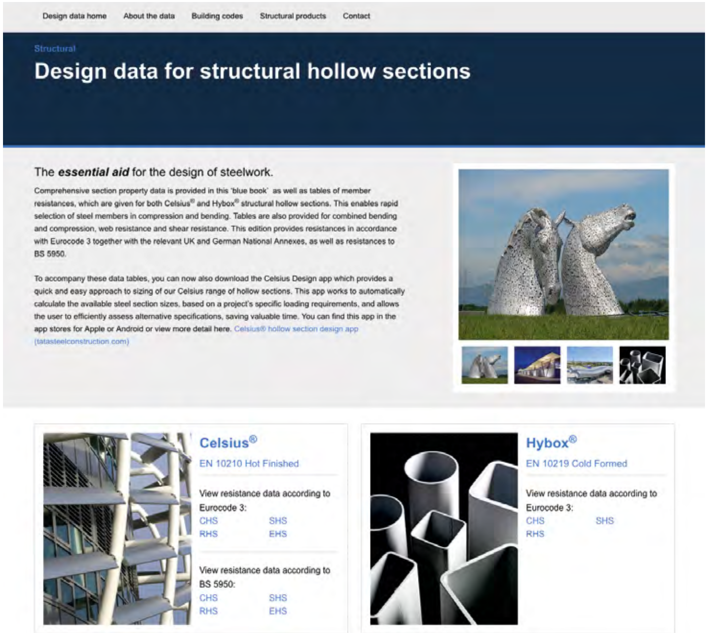
The updated version now includes new sizes as well as new grades. For instance, the size range for Celsius S355NH now extends to 17.5mm thickness, while the inclusion of S460NH reflects the growing demand for higher strength steel.

"Hot finished hollow sections in S460 have the additional advantage of a more advantageous buckling curve, as specified in Table 6.2 of BS EN 1993-1-1," said Tata Steel Marketing Manager Graeme Peacock.

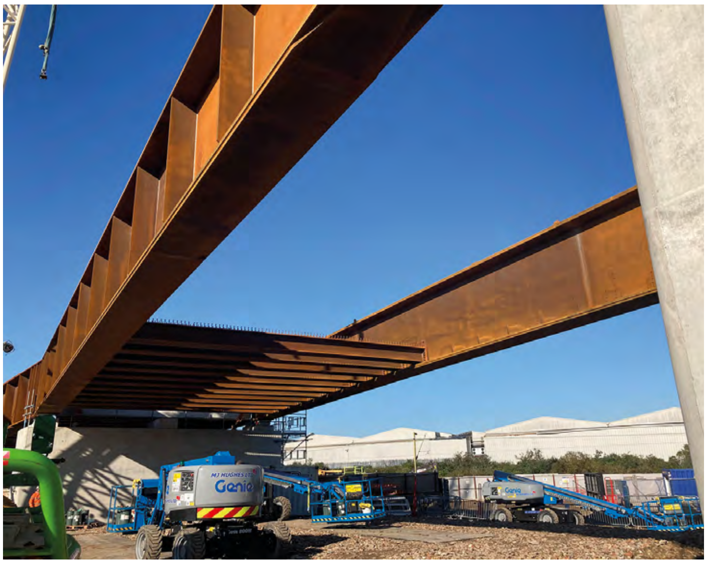
The updated range in the Blue Book is reflected in the Tata Steel Celsius Design app for mobile devices which has also been updated to include the same ranges and material strengths.

Developed to aid structural engineers, the Design app automatically calculates the available steel section sizes, based on a project's specific loading requirements, and allows the user to efficiently assess alternative specifications, saving valuable time.

According to Tata Steel, the updated app helps to improve accuracy, providing results based on actual effective lengths input by the user. The inclusion of S460NH in the app now allows simple side-by-side comparisons of suitable sections across the different steel grades.



Steel viaduct for major east London rail extension



Structural steelwork is playing a pivotal role in the Barking Riverside extension, which will add 4.5km to the London Overground railway network, taking it from Barking to a new station at Barking Riverside.

Forming a major part of the railway scheme is a 1.5km-long viaduct, which is supported on 57 piers and requires Severfield to fabricate, supply and erect approximately 3,500t of steelwork.

A total of 10 spans of the viaduct, measuring up to 40m-long, are formed with steel. The steelwork for each span is delivered to site piece-small, with individual plate girders weighing up to 130t each.

The erection process, some of which is over operational railway lines, requires the use of cranes with capacities up to 1,200t.

The final girder installation on the viaduct will take place during the Easter holidays and civils work on the viaduct is expected to be completed in July 2021.

The railway extension will serve Barking Riverside, the largest housing development in east London, with planning permission for up to 10,800 new homes, as well as healthcare, shopping, community and leisure facilities.

Working on behalf of Transport for London (TfL), the extension is being delivered by the MSVF joint venture, which consists of Morgan Sindall Construction & Infrastructure and VolkerFitzpatrick.

Leeds Bradford Airport to expand with new terminal

Plans for a new terminal building at Leeds Bradford Airport have been approved by Leeds City Council.

The new terminal will replace an outdated building and forms part of a wider expansion plan that includes increasing the number of daytime flights from the airport.

The new terminal will be a three-storey, 34,000m² structure. The Airport claims the completed project will support more than 12,000 permanent jobs across the Leeds region.

A council spokesperson said: "The council recognises that the Leeds Bradford Airport planning application has been the subject of much public debate and, from the moment it was first submitted, full and proper attention has been paid to the evidence and arguments put forward by supporters and opponents alike. It should also be noted that the application was assessed on its own individual merits as part of the council's normal planning process.

Planning approved for new City commercial tower

The City of London Corporation has granted planning permission for a 30-storey office-led development in the City of London; the square mile's first tall building approval of 2021.

Developer Tenacity's scheme at 55 Gracechurch Street, located between Monument station and Leadenhall Market, is said to embody many of the emerging trends for post-pandemic office space – delivering a 'workplace destination' alongside extensive retail, cultural, public art and open space.

The new office areas will include social and breakout zones to promote collaboration and innovation, and the building's floorplan offers space for large businesses as well as SMEs and growth stage companies.

Seeking to achieve a BREEAM 'Outstanding' rating, the first tall building in the City Cluster to do so, the development includes sustainability measures such as reusing and recycling building materials, being highly energy-efficient and innovative systems which allow for free cooling for most of the year.

An ambitious urban greening approach including extensive green walls, green roofs and tree planning will reduce noise and air pollution while providing access to nature and biodiversity.

A free-to-access garden terrace, offering a suspended treetop walkway and panoramic views across London, will also be made available to the public. An innovative ceiling system will harvest rainwater to simulate rainfall to irrigate the plants.

Renovation begins on 115-year old Newport Transporter Bridge

Steelwork contractor Cleveland Bridge is returning to renovate the Newport Transporter Bridge, a structure it helped to build at the start of the 20th Century.

The company will deliver the restoration of key steel components of the transporter bridge, which was originally opened in 1906.

The bridge, which has a span of 197m and is a Grade 1 listed structure, crosses the River Usk and was built to provide access to the Orb Steelworks from the city centre.

Cleveland Bridge's work includes the restoration of the gondola, which carries cars, buses, lorries, cyclists and pedestrians across the river, and replenishing all worn wooden and steel parts.

It will also restore lost architectural features and repair the bridge's cross beams and anchorage housing, as well as replacing rotting timbers and worn anchor pins and cables on the main booms.

The restoration of the bridge will start in March with completion planned for the start of 2022.

Chris Droogan, Managing Director of Cleveland Bridge said: "Having been awarded the contract to build the Newport Transporter Bridge in 1902, we are exceptionally proud to have secured the restoration project almost 120 years later.

"It has an important place in the history of our business as one of the many iconic bridge structures we have built in the UK and around the world.

"Therefore, in addition to applying the skills and expertise of our Bridge Rehabilitation Team, we feel we have a duty of care to ensure that this bridge continues to be an essential part of the area's transport infrastructure for the next 100 years."

The bridge previously underwent a major two-year refurbishment between 2008 and 2010, when a number of the original steel elements were replaced with new bespoke members (see NSC October 2010).

NEWS IN BRIEF

Kloeckner Metals UK | Westok have been awarded BCSA Sustainability Charter Gold Standard status on the back of their BES 6001 certification. The objective of the Charter is to ensure structural steelwork is a sustainable form of construction in terms of economic viability, social progress and environmental responsibility.

Ardmore has been appointed by Hammersmith & Fulham Council and their JV partners A2Dominion, as their delivery partner for Hammersmith Civic Campus, a major new mixed-use scheme in west London. It will include 1,300t of structural steelwork to form a 'Glass Box' that will sit above the existing and refurbished town hall, supported on a series of 15m-high stilts that punch down through the building and courtyard.

Bon Accord Aberdeen shopping centre hass lodged a planning application for a new four-screen cinema development. Craig Stevenson, Centre Manager at Bon Accord said: "We are delighted to submit a planning application for a new cinema development at the centre. These plans come as part of our ongoing strategy to repurpose vacant retail space and continue to deliver a thriving retail and leisure destination in the heart of the City.

St. Modwen Industrial & Logistics has submitted detailed plans for the first phase of development at St. Modwen Park Derby, following the grant of outline planning permission in September 2020. The developer's submission includes plans for three high-quality business units of 3,600m², 5,000m² and 7,300m² which, if approved, could bring around 300 jobs to the immediate area.

Viridor has unveiled proposals for a multi-million-pound energy recovery facility (ERF) south of Larkhall in South Lanarkshire, Scotland. The Overwood ERF will transform up to 330,000t per annum of non-recyclable municipal, commercial and industrial waste into energy in the form of heat and electricity.

PRESIDENT'S COLUMN

Brexit and COVID-19 combined were always going to make life very difficult in a heavily saturated market. Although market conditions are still challenging, many can now see a rosier future going forwards. I was listening to a leading economist, Roger Martin-Fagg earlier this week. He was talking about money supply and that, for the most part, many households have more spare cash now than they've ever had. This means that when lockdown restrictions are lifted, people will spend like they've never spent before, and the country will move into a "boom" period. He is expecting this to start from around April and I think this will mean that most steelwork contractors will be busy from Q3/Q4 onwards this year. The "boom" should last for a good year, before spending patterns return to normal.

A deal was done for Brexit, but this is only the beginning of the Brexit process. Some analysts predict that it might take five years for the process of Brexit to be seen as completed. If we listened to the UK media, we could easily become very despondent, "a lost decade" or whatever, but perhaps the situation isn't quite as bad as we think. The asset value of the UK as a whole is said to be in the order of £10 trillion and the UK owes £2.2 trillion. If the UK was a company, would you say it was financially over leveraged? Probably not. There will be challenges going forward, but they are not unsurmountable and, the financial "boffins" are expected to let inflation increase to say four to five percent over the next couple of years, which will eat away at those borrowings.

Despite valiant work done by the BCSA on Reverse VAT over the last two years, we will have failed to stop this legislation coming into force at the time of publication. This will be a drain on cash flow at a terrible time for our industry. This, coupled with an upsurge of work, could very easily lead to companies running out of cash during the "boom", and more importantly the financing of this "boom", prior to being paid for the work.

One current area of BCSA activity is on sustainability, specifically carbon, which remains the hot topic of conversation. The BCSA has not been idle, having formed a pan-steel sector group to update and refresh all of the sustainability support tools and materials that have demonstrated steel's excellent sustainability credentials as a framing material in the past and that will continue to do so through the "boom" that is coming.

These new sustainability support tools include a consolidated Roadmap to net-zero Carbon by 2025 for the constructional steelwork sector, a revised BCSA Sustainability Charter which will include commitments to address the climate emergency and a range of carbon footprint tools that allow companies to determine both their company's carbon emissions and individual project carbon emissions. These tools will be launched later this year and are sure to help BCSA members demonstrate the very positive steps our industry is taking to tackle climate change.

Mark Denham
BCSA President

Steel completes on major Edinburgh educational facility

Working on behalf of McLaughlin & Harvey, BHC has completed the erection of 922t of structural steelwork and the installation of 7,951m² of metal decking for the King's Buildings Nucleus project for the University of Edinburgh.

Comprising teaching space, a 400-seat lecture theatre, plus a further three smaller theatres, student services, a shop and a variety of catering outlets, the Nucleus is located in the heart of the campus and will enhance the learning and teaching facilities for the university's undergraduate students.

According to the University, the Nucleus project, which forms the initial phase of a larger development, will allow for the expansion of undergraduate teaching facilities while also providing a new focus to the campus heart.

The building will also create an attractive place of study and learning to enhance the student experience and provide facilities for students to spend more time on campus.

The project is due to complete in 2022.

Steel up for Olympic-level climbing centre

Oldham town centre is the location for a new Olympic-level climbing centre, being built by The Stoller Charitable Trust.

Climbing is one of the world's fastest growing sports and it will debut at the next Olympic Games.

The steel-framed 1,850m² centre in Oldham is being constructed on a sloping site and its design has incorporated the gradient to form a structure with three levels.

As well as the entrance, the upper ground level will accommodate bouldering, a soft play area, two 'ValoClimb' walls that use interactive gaming technology, together with changing rooms and a café, overlooking the activity zones. The clip 'n' climb, which will be the tallest and biggest in the North of England, is located on the mid-level mezzanine, while the main climbing walls – used for speed climbing and lead climbing - are on the lower ground level taking advantage of the structure's full 18m height.

Leach Structural Steelwork has erected 170t of structural steelwork for the project, which is due to open in August.

New rail manufacturing hub for Humberside

Siemens Mobility has awarded the £40M contract to build its new rail manufacturing site at Goole to Yorkshire-based GMI.

In addition to the main manufacturing facility, GMI will also construct the four and a half kilometres of rail track needed to connect the site to the main railway network.

The first trains to be manufactured at the Goole facility will be new Tube trains for London's Piccadilly line.

Sambit Banerjee, Managing Director of Siemens Mobility Rolling Stock & Customer Services said: "Our goal is to really put Goole on the map. We want to create more than just a rail manufacturing factory, this is about generating long-term investment, skills and jobs.

"We are actively looking for as many UK suppliers as possible to contribute to Goole's success. The appointment of GMI as main contractor, with shared values and growth ambitions for the local area, is a clear step in the right direction.

Siemens Mobility's Goole development will create up to 700 direct jobs, with a further 250 roles created during the construction phase and an additional 1,700 indirect supply chain opportunities. It is scheduled to open in 2023.

Prestigious central London mixed-use scheme completes

Make Architects said it has completed Derwent London's largest-ever project, a mixed-use scheme combining reuse and new build elements to provide 30,000m² of office space and 4,100m² of residential accommodation including social housing.

Located at 80 Charlotte Street in Fitzrovia, the project is said to be inherently urban in its integration of the city and street context, both in its massing and composition. The inclusion of a small new public garden and retail add to this civic quality.

Project architect Jason McColl said: "This is a site-specific project, reusing existing elements and combining with new for a real crafted 'artisan' feel; it's not a homogenous scheme or an 'off-the-shelf' design. There's real honesty in the structural expression, the steel frame and concrete floor slab are visible throughout, and the building form harnesses the character of Fitzrovia. The result looks like a number of different blocks rather than one. This is a piece of city-making which will stand the test of time."

Working on behalf of main contractor Multiplex, Bourne Steel erected 3,200t of structural steelwork for the project.

Approval given for new Somerset surgical centre

The government has given final approval for the funding of a new surgical centre at Musgrove Park Hospital, Taunton, Somerset.

Designed by BDP and being delivered by contractor Kier, the £87M state-of-the-art centre will replace the current theatres and critical care unit, which were built during the Second World War as part of a temporary casualty evacuation hospital for the D-Day landings.

Procured through the Department for Health and Social Care's P22 framework, the new surgical centre will include eight operating theatres, six endoscopy rooms with a patient recovery and clinical support area, as well as a critical care unit with 22 beds, specifically catering for level 2 and 3 critical care patients.

Much of the new centre will be steel-framed and it has been designed to increase capacity and ensure patients are cared for in a more modern and comfortable environment.

Nick Fairham, Principal at architecture practice BDP said: "In line with the wider modernisation and transformation of Musgrove Park Hospital, patient, staff and visitor experience is at the heart of the new surgical centre's design."

A cost-effective solution for Low Value Disputes

CIC BUILT ENVIRONMENT PROFESSIONS TOGETHER

On 1st May 2020, the Construction Industry Council ("CIC") published the new CIC Low Value Disputes Model Adjudication Procedure ("CIC LVD MAP"), 1st edition.

"This new adjudication procedure – which is Construction Act compliant – aims to provide a simple and cost-effective procedure to make adjudication more accessible for SME's and others involved in lower value claims," said SUM Limited Director Tom Flannery

The CIC LVD MAP sets out a streamlined adjudication procedure for "Low Value Disputes" (£50,000 or less) and links the Adjudicator's fee – which is fixed - to the amount claimed, on a sliding scale, e.g. for a £25,000 dispute the Adjudicator's fee is £3,500 (normally paid by the losing party). It is also clear from the procedure that it is intended that Parties may self-represent, rather than incur additional fees in that respect also.

If the Parties agree, or the relevant construction contract adjudication provisions are Scheme compliant, any Party wishing to use the procedure may apply to an Adjudicator Nominating Body such as the CIC or RICS (the appointment fee is the same irrespective of which participating nominating body you choose, at £300), and request the appointment of an Adjudicator in the usual way, using the appropriate application form indicating that you wish the CIC LVD MAP to apply.

"Reports suggest that the CIC LVD MAP has been well received and is already being utilised. Further details of the CIC LVD MAP can be found at www.cic.org.uk/services," added Mr Flannery.

Diary

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

Wed 24, Thu 25, Wed 31 March and Thu 1 April 2021
Portal Frame Design
Online course
The course is dleivered in 4 × 2-hour sessions and aims to provide in-depth coverage of the major issues surrounding the analysis, design and (crucially) the detailing of portal frames. The course covers frame design to BS EN 1993-1-1.

Tue 20 April 2021
Fire Resistance of Light Steel Framing
Webinar
SCI/BCSA Members only
This 1 hour webinar gives an introduction to the design for fire resistance of light steel framing. The webinar will introduce how light steel framed buildings should be designed and detailed to provide fire resistance in accordance with the Building Regulations.

Work underway on Outstanding London office scheme

Work has started on a 10-storey BREEAM 'Outstanding' steel-framed office development at 33 Charterhouse Street in central London.

Located adjacent to Farringdon Station, opposite the future Museum of London, the 18,500m² scheme will provide technology enhanced office space as well as three terraces with extensive views across central London.

Set to become one of Farringdon's first smart buildings, the scheme will feature an integrated digital platform that will improve the building's operational efficiency and support the workspace wellbeing experience for its occupiers, through an employee engagement app.

Main contractor Mace said its team will apply its sustainability expertise to reduce the embodied carbon through a variety of measures including low carbon materials and sustainable design measures, such as a connection to Citigen's district energy network to supply heating and cooling demand, solar PV panels and a biodiverse green roof.

Photo: Jack Hobhouse

William Hare is fabricating, supplying and erecting the project's steelwork, and 33 Charterhouse Street is expected to complete in September 2022.

Cheltenham mixed-use scheme to create new community

St. Modwen has been chosen by Midlands Land Portfolio Limited (MLPL), the property development arm of Severn Trent (represented by CBRE), as its development partner for a 154-acre site to the west of Cheltenham, which is part of a wider mixed-use development known as The Golden Valley Development.

The site is adjacent to the Government Communications Headquarters (GCHQ) and the National Cyber Security Centre and forms part of a key strategic allocation within the Joint Core Strategy.

It includes the delivery of approximately 3,000 new homes, a mixed-use Cyber Central Cluster bringing together leading cyber businesses and innovators alongside academic facilities dedicated to cyber and technologies, and significant infrastructure improvements.

Guy Gusterson, Managing Director of Strategic Land & Regeneration at St. Modwen said: "The Cheltenham development presents a unique opportunity to shape and deliver a new community next to a globally-recognised hub for cyber security.

"We will work with local stakeholders to deliver a diverse new community where new homes will sit amongst green shared spaces as we deliver a vibrant, sustainable and richly deserving scheme."

Contractor named for Inverness National Treatment Centre

Balfour Beatty has been awarded a £32M contract to build a new, world-class Ophthalmology and Orthopaedic health facility in Inverness on behalf of NHS Highland.

The contract award will see Balfour Beatty construct the 8,305m² National Treatment Centre, including 24 inpatient rooms, five operating theatres, clinics and outpatient departments. In addition, the company will build minor operation and procedure rooms, consulting rooms, a café, children's play area and office support rooms.

The new facility will provide elective orthopaedic surgery and full ophthalmology services to surrounding communities, helping to reduce the waiting times for patients across the Highlands.

Hector Macaulay, Regional Managing Director of Balfour Beatty's UK Construction Services business in Scotland & Ireland, said: "We are proud to be collaborating with NHS Highland to deliver a world-class National Treatment Centre that will improve the experience of patients through improved services and facilities."

Deborah Jones, Director of Strategic Commissioning, Planning and Performance for NHS Highland, said: "NHS Highland are delighted to be working with Balfour Beatty again in developing this critical new facility which will deliver critical elective

treatment for people in the Highlands and surrounding areas."

Early works commenced in Summer 2020 with completion scheduled for 2022. At peak construction, the project will employ a workforce of 300, as well as several work experience placements.

A guide to steel production equipment

Steel manufacturing equipment and its producers play an essential role within the structural steelwork sector.

Steel manufacturing equipment is indispensable and extensively used in steelwork contractors' workshops as well as by steel stockholders, helping the companies produce structural steelwork efficiently and cost-effectively.

One of the most notable innovations of late has been the push towards fully automated equipment and robotics, that have reduced the reliance on manual operations, improved output and reduced labour.

In this article, NSC looks at some of the common functions carried out by this equipment, developments within the sector and the close ongoing working relationships between steelwork contractors and machinery suppliers.

Cutting and drilling

In the fabrication factory or steel service centre, one of the first operations is to cut the sections to length and profile the plates to the desired size or shape. This can be done in a number of ways using a range of automated machinery; band saws which are generally used for cutting to length, oxy/gas cutting which can be used to cut components from thick steel plate; components can also be cut efficiently by plasma arc systems. To maximise efficiency, all holes are pre-drilled or punched using automated equipment in the fabrication factory, which allows components to be rapidly bolted together on site.

Blast cleaning and auto-painting

For many steelwork contractors, sections and plates are blast cleaned prior to fabrication, although some choose to carry out the blast cleaning after the sections are cut to length. Shot is fired at the steel surface which displaces dirt and mill scale, and also mildly indents the steel creating a "rough" surface. Manufacturing equipment with auto-painting functions mean that prefabrication primers can be applied immediately after blast cleaning. This immediate application maintains the reactive blast cleaned surface in a rust-free condition through the fabrication process until final painting can be undertaken.

Multi-function machinery and workshop design

Equipment manufacturers are increasingly offering multi-function machines, which combine a number of the processes outlined above. In addition to offering multi-function machinery, manufacturers of steel fabrication equipment work closely with steelwork contractors, planning the workshop design and layout with real time simulations using advanced software to find the best flow of materials and maximise production, based on the required output.

Investing in the most modern and up-to-date manufacturing equipment has helped BCSA steelwork contractors stay at the forefront of the construction industry.

CNC Machinery

Computer Numerically Controlled (CNC) machinery is the standard in structural steel fabrication today and is seamlessly integrated into each stage of the fabrication process. Such integration has been assisted by the steel construction sector's experience and track record having used 3D design software for over 25 years.

The process may vary between each steelwork contractor, but will generally commence with the efficient and seamless transfer of 3D model information from the design office to the equipment in the workshop. Prior to the adoption and integration of CNC and advancements in automated steel fabrication, manual methods were limiting, laborious, more costly and less accurate. CNC machinery provides a number of added value benefits to the steelwork contractor including; less material wastage, faster production and increased safety through reduced material handling.

To maximize the efficiency of CNC machinery it is best to specify: single end cuts, arranged square to

CNC machinery has made steel fabrication more cost-effective.

the member length, eliminating set up time needed when changing to another angle or cut; one hole diameter on any one piece, which avoids the need for drill bit changes; and alignment of holes on an axis square to the member length, holes in webs and flanges aligned, reducing the need to move the member between drilling operations.

Scribing marking technologies

The structural steelwork sector is also seeing the adoption of modern scribe marking technologies. This software allows for full or partial contours to be scribed directly onto the steel to indicate the position of the parts that need to be welded, saving valuable time and minimising errors. In addition, information can be marked on the steel indicating quality, traceability, welding information and assembly details. The ability to use modern scribe marking has many benefits including supporting the structural steel sector's contribution to tackling the climate emergency through providing information on steel sections within buildings that could be reused in the future which supports the sectors move towards circular thinking.

Robotics

The sector is moving towards the adoption of full automation of all processes on the factory floor, utilising robots or cobots (collaborative robots) where humans and robots work together with direct interaction in a defined workspace to reduce material handling and welding. Some steelwork contractors are already moving into robotics. It's a natural progression due to the early adoption of 3D computer modelling by the sector as a whole.

The close working relationship of the machinery provider and steelwork contractors to plan their workshops becomes evermore important as robots require room. Specifically, they require open floor space to accommodate all their axes of movement and additionally require protection, be it by light curtains or fencing for employee safety.

The use of robotics in steel fabrication can save time and the nature of the technology also lends itself to tasks that require repeatability. In addition to the operational and economic benefits, it can also ensure workers are safer by handling some of the tougher tasks.

Post-sale support

After sales is another area which has seen a number of advances in recent times. Once a customer has invested in a new machine or processing line, it wants to be sure it works and continues to work properly. To this end equipment manufacturers now employ more technicians to help with after sales support.

In addition to the standard warranty, which comes with any new piece of machinery, equipment manufacturers also offer a range a service contracts. The basic elements of each contract usually include the servicing of machines, restoration of factory settings, reduction in the cost of spare parts and a full-service history for the machine.

Not only do such contracts provide customers with peace of mind, but they also have the option of deciding exactly what level of service they require, allowing the servicing costs to be accurately budgeted in advance.

Remote diagnostics is now integral as it allows technicians and service engineers to repair equipment without actually visiting the customer. As long as there is a computer link, a technician can fix an item of machinery from anywhere in the world. This saves time and means repairs are executed faster. This has also been an essential aspect of maintenance during the current pandemic.

Training is an important element for any new piece of machinery. Manufacturers often offer a training programme for a customer, which may also include a visit to the production facility. This allows the future operative the chance to see the machine being built as well as observing it in full production mode.

Summing up, Ficep UK Managing Director Mark Jones says: "Investment in automated technology can add many advantages to a business, it helps attract employees, provides future opportunity for the current workforces, improves productivity and quality, as well as giving a reduction in overhead costs and availability of better production data from software implementation." ■

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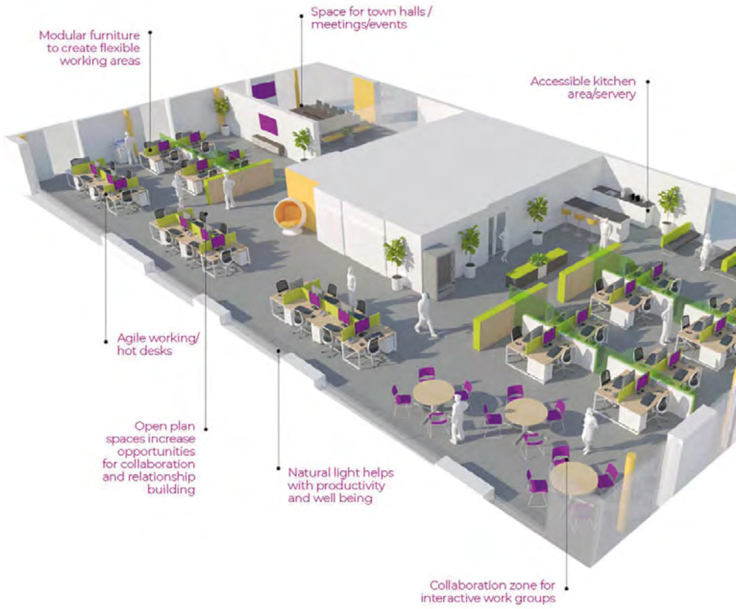
Steel design blossoms at business park

An exposed steel-framed design has given maximum flexibility to the Project Violet scheme, which is providing office space for scientific research and innovation at Sci-Tech Daresbury.



A typical office floor plate of the largest building - V1.

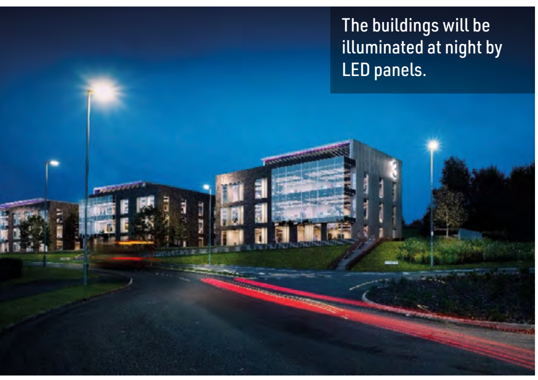
FACT FILE
Project Violet, Daresbury
Main client: **Sci-Tech Daresbury JV**
Architect: **Seven Architecture**
Main contractor: **Willmott Dixon**
Structural engineer: **Arup**
Steelwork contractor: **Leach Structural Steelwork**
Steel tonnage: **400t**

Prior to the COVID-19 pandemic, demand for office space was soaring throughout the UK and in many areas the demand far outstripped the availability.

Like many sectors, during the past year the commercial office market has seen a downturn. However, many schemes are still progressing as demand is expected to bounce back once the pandemic is over and lockdown restrictions ease.

One example is a project being undertaken by Willmott Dixon at the Sci-Tech National Science and Innovation Campus, which is between Runcorn and Warrington, in the borough of Halton. This expansion of the park consists of three steel-framed high-spec office buildings that will offer a total of 3,900m² of floor space.

Explaining the importance of the project,



The buildings will be illuminated at night by LED panels.

John Downes, Chairman of Sci-Tech Daresbury joint venture says: "We're now home to over 140 businesses, including international firms such as IBM Research and Hitachi, and well-known UK businesses looking to establish a strategic northern base, alongside the internationally-recognised Daresbury Laboratory.

"The importance of such technology businesses will become only more crucial in the fightback from COVID-19, both in developing the required products and solutions in the battle against the COVID-19 virus, but also new solutions to meet the needs of industries looking to work more agilely in the pandemic. Violet will be the perfect location for such high-growth and innovative businesses to flourish."

Being built on a previously vacant plot close to the campus main entrance, the high-spec design of the office buildings is not just to attract the desired tenants, but is also intended to create landmark buildings that signpost the development.

"The palette of materials for the buildings has been designed to reflect the high-tech quality of the other buildings on Sci-Tech Daresbury, while having their own distinct character," says Seven Architecture's Steve Kendall.

"The materials selected will provide a hard wearing and robust finish that will ensure that the quality of the buildings is maintained into the future. The main elevational treatment is to be a mid-dark grey brickwork with expressed brickwork reveals to create depth to the elevations, which contributes to the reduction in solar gain, particularly to the south elevations."

Highlighting the project even more, the structures will have ornamental panels positioned between windows to provide contrasting diffused natural daylight. The panels will have LED light fittings to illuminate the buildings in the evening.

Willmott Dixon Senior Building Manager Mark Samuels says: "Steelwork was chosen for this scheme as it offered the most economical solution and suited the aesthetics of the design.

"The steelwork is left exposed within the buildings as a modern-looking environment was desired. Cellular beams accommodate the building's services and are fully exposed in the finished scheme, while aesthetically-pleasing CHS members have been used to support each of the building's feature cantilevering glazed front facade."

As the uppermost floors are slightly off-grid with columns in different positions to the floors below, transfer beams have been used to support this level and the lightweight roof. In buildings V2 and V3, deeper – than have been used elsewhere in the scheme - 9.2m-long beams support the third floor's columns at mid-span, while the V1 structure requires slightly shorter transfer beams.

Commenting further on the project's choice of framing method, Arup Principal Engineer

"We looked at a number of options, but steel offered a lightweight solution and a quicker construction programme. It also complemented the aesthetic seen across the wider campus."

Positioned at the entrance to the campus, the three buildings are designed as a signpost to the development.

David Almond adds: "We looked at a number of options, but steel offered a lightweight solution and a quicker construction programme. It also complemented the aesthetic seen across the wider campus."

Steelwork contractor Leach Structural Steelwork completed the steelwork erection in February. Beginning with the largest of the three buildings, V1, they then moved onto the identical and smaller buildings, V2 and V3. The steelwork programme was completed during the winter and the project team say this was another advantage of using steel. Other than high winds, inclement weather, such as rain or snow, is never a hindrance to steel erection, as it can be to other forms of construction.

All the buildings are four-storey structures, including ground floor, with each building featuring a recessed uppermost level that occupies approximately one half the footprint. The lower three floors will accommodate office research space, while the smaller uppermost level is designed as ancillary space, containing toilets, showers, changing rooms, storage areas and an enclosed plant room. This floor is said to be expressed as a contrasting vertical element, with metal planks with a coloured soffit providing a restrained highlight of colour to the overall exterior.

The three buildings have a similar design, with building V1 longer than its two neighbours. V1 is a rectangular structure measuring 36m-long × 20m, while V2 and V3 are 25m-long × 20m.

Their steel design is based around a column grid pattern that consists of perimeter columns spaced at 7.5m and 9m intervals and internal spans of up 9.1m-long. The cellular beams support metal decking and a concrete topping to form a composite flooring solution.

The diaphragm action of the completed floors provides much of the stability for the buildings, along with vertical bracing which is predominantly positioned around a centrally-located braced circulation space that contains a lift, precast staircase, toilets, lobby and entrance area.

Once complete, it is envisaged that small businesses will either take one floor of a building, or a portion of a floorplate.

"Using a steel-framed solution gives the buildings flexibility, whereby multiple tenants could be accommodated on each floor, by adding partitions, which could then be removed at a later date if the occupancy changed," adds Mr Samuels.

Aiding this flexibility and open-plan design, each building only has two internal columns.

The three Violet buildings are due to be complete by the end of this year. ■

Steelwork erection begins on the V1 building.

Crowning glory

A signature steel roof, known as the halo, creates an architectural highlight of a 25-storey London residential tower.

The East Tower has a similar steel roof design to its previously completed neighbour; the West Tower.

A Halo roof structure section is lifted into position

Forming part of the Lots Road Chelsea Waterfront development in West London, structural steelwork is playing an important role in the topping out of the scheme's 25-storey residential East Tower.

The prestigious scheme, which has been master planned by renowned architect Sir Terry Farrell, will include two residential towers, East and West (the latter being 37-storeys), three riverside buildings arranged around landscaped gardens and the redevelopment of the historic Lots Road Power Station.

"Lots Road Chelsea Waterfront is a 420-unit development comprising both high-end residential and affordable accommodation with 260 units contained within the existing power station. This project has taken a disused and aged building and turned it once again into the focal point of the local community," explains JRL Group Project Director Donal Reale.

Overlooking the River Thames, the development will also include shops, restaurants and bars together with a residents' health and fitness club.

"As part of this development we are constructing the East Tower, which is a 25-storey apartment block comprising 40 high-end residential properties and capped off at level 25 by an impressive steel roof structure," adds Mr Reale.

"This steel structure has defined the complex shape and finish of the tower and could not have been formed by standard concrete construction. Appropriately named the halo as it forms a fully lit ring in its permanent position. This oval shaped building will be a stand-out structure for the local community."

Both of the residential towers are topped with similar sloping steel roof structures; architectural features that also accommodate the uppermost penthouses, maintenance access and BMU support areas.

The West Tower was completed in 2019 by a different contractor, but the project team say they learnt a lot from visiting this project during its construction and discussing its steelwork design. This has ultimately enabled the East Tower's roof, which tops out 12-storeys lower than its neighbour, to be erected quickly and effectively.

J Reddington Engineering Manager Mark Urbinati explains: "As both buildings have a similar steel roof, we were able to use the lessons learnt from the West Tower when it came to this tower. This especially helped us, when it came to working out the best erection sequence and making sure all of the temporary works were in place."

"Erecting steelwork on both towers was challenging because of the height and that's why steel was chosen for the roof structures. Steelwork is lighter than other materials and can be prefabricated into erectable elements, cutting down on the number of crane lifts and limiting the amount of work at height."

Starting at level 20, the East Tower's steel Halo roof is bolted to the top of the in-situ concrete superstructure and, following the building's stepped design for its upper floors, it slopes upwards to form a peak that is approximately 7m above the tower's level 25.

It is formed by a series 24 perimeter trusses that straddle either side of the tower's central core. Towards the top of the halo, infill steelwork connects the trusses and provides some extra stability, while also forming the roof to the uppermost floor.

The trusses are typically 2m-wide x 1.05m-deep and vary in length from the longest at 11.5m to the shortest at only 1.5m-long.

Prior to the steelwork programme beginning on site, temporary works had to be installed to ensure a safe working environment for the erectors. A series of screens were attached to the completed concrete floors on the levels above storey 20. These were cantilevered around the building by 0.5m to ensure there was enough room for the steel trusses to be lifted into place.

The steel erection was carried out using

The Halo roof structure reaches a peak 7m above level 25.

FACT FILE
Lots Road Chelsea Waterfront, East Tower
Main client: **CK Asset Holdings**
Architect: **Farrells**
Main contractor: **J Reddington (JLR Group)**
Structural engineer: **J Reddington**
Steelwork contractor: **Bourne Steel**
Steel tonnage: **75t**

J Reddington's tower cranes so it was essential that the individual prefabricated truss sections did not exceed the crane's capacity. The heaviest lift was 6.7t, while the average lift was in the region of 3.2t.

After the decision was taken to install much of the cladding to the trusses offsite, again to limit the amount of work at height, the combined weight of each element was re-assessed to ensure there were no lifting issues.

According to Bourne Special Projects Divisional Director Craig Galway, once a full trial erection had been discounted, due to programme constraints, the priority was to ensure that the trussed fitted together, first time, when lifted into position.

"Once we began our connection design, modelling and detailing of the frame, which is incredibly complex in its geometry, it became apparent that there would be significant amounts of butt welding in the connections, with an associated risk of heat distortion.

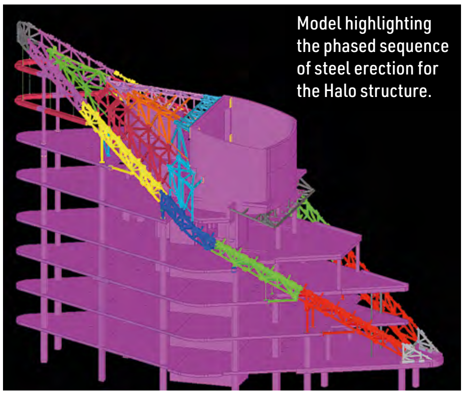
"Where possible, the trusses were trial fitted during fabrication, but where the programme dictated that this was not practical, advanced survey techniques were employed to ensure the pieces matched when on site. During erection, not a single piece had to be lifted twice or modified, which was a fantastic achievement.

Controlling the position of the trusses, which form the central area that goes around the core was another challenging task. Because the trusses are curved and not flat, they are on different planes in each segment and some ends of the trusses are splayed in five different angles.

Bourne's erection team considered each lift in detail so that it could be rigged and slung so that it arrived in its final position in the correct orientation and angle.

Mr Galway concludes: "Given the nature of the structure, Bourne are immensely proud to hand the frame over in its design location ahead of programme. The relationship with J Reddington has been truly collaborative and this has played a huge part in the project's success."

The East Tower is due to be complete by end of 2021. ■



Model highlighting the phased sequence of steel erection for the Halo structure.

The completed East Tower will offer unhindered views across the capital's skyline.

The steel frame forms a V-shaped structure, with the widest part facing the stadium.

Hotel checks in with steel frame

The expansion of facilities at the home of Leicester Tigers Rugby Union Club is continuing with the construction of a steel-framed hotel.

Having previously erected the adjacent stand, this is the second project Caunton Engineering has undertaken at Leicester Tigers Welford Road ground.

A steel-framed hotel is the latest addition to the ongoing expansion of Welford Road, the home ground of Rugby Union Premiership side Leicester Tigers.

The £22M project is being developed by Marshall CDP, with its construction arm – Marshall Construction – acting as main contractor, and is located on a 1.7-acre site adjacent to the ground, on a plot previously occupied by the Granby Halls live music and entertainment complex.

Known as the Hotel Brooklyn, the six-storey building will have 191 guest rooms located on the upper four floors, while the ground floor level is predominantly taken up by a car park and retail units.

Sandwiched in between, the first floor of the hotel will boast 3,300m² of reception, lounge and dining areas, as well as a business centre and lobby areas. This floor will be directly connected to the rugby ground's Holland & Barrett stand via a 28m-long curved pedestrian bridge.

Interestingly, the hotel project's steelwork contractor, Caunton Engineering, also fabricated, supplied and erected the steel for the construction this stand (see NSC June 2009).

Work on this current project began in early 2020 with a thorough borehole survey of the site being undertaken, prior to the piling programme starting.

Marshall Construction Contracts Manager Paul Stokes explains: "Granby Halls had been demolished a few years ago and the site had most recently been used as a car park. However, we didn't have sufficient information about where and if there was a former basement under the site.

"The survey gave us certainty that there was

FACT FILE
Hotel Brooklyn, Leicester
Main client: **Marshall CDP**
Architect: **BMS**
Main contractor: **Marshall Construction**
Structural engineer: **Cundall**
Steelwork contractor:
Caunton Engineering
Steel tonnage: **750t**

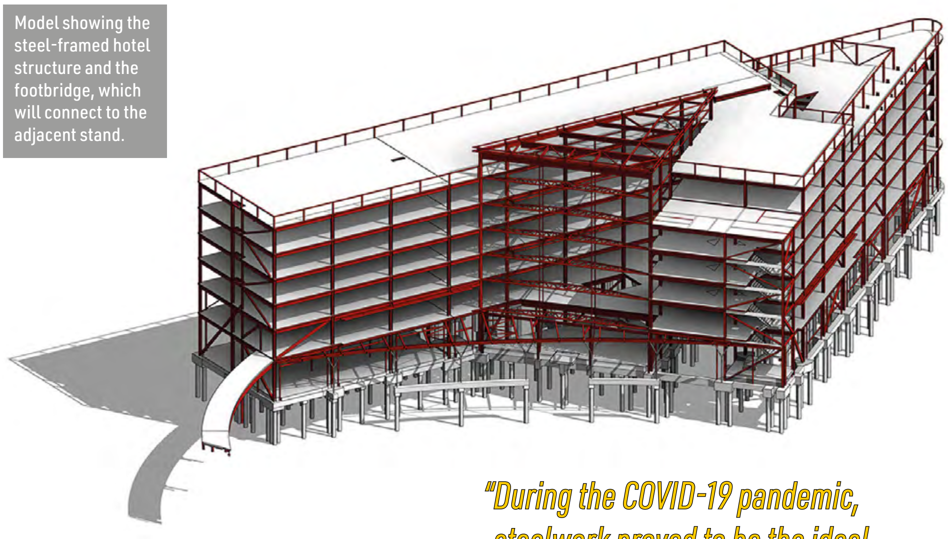
no subterranean level and allowed the piling to proceed."

Supporting the steel frame, the piled foundations are up to 14m-deep. The steel erection programme began in March and, apart from the bridge, it was completed by November 2020.

Overall, the hotel structure is wedge-shaped, which aligns with the shape of the plot. From the tip of the V-shape, two wings of the structure splay outwards, creating the widest part of the hotel directly opposite the rugby ground. Above the ground floor car park, a level that also incorporates back-of-house areas, much of the area between the two wings is a large covered void. This will be an atrium containing the first-floor reception and topped with a roof, which will sit slightly higher than the adjacent wings.

Mimicking the design of the adjacent grandstand, the front of the atrium, at the widest point between the two hotel wings, features a large glazed façade. The glazing is supported by a series of 20m-long × 1.5m-deep horizontal curved trusses that span between the wings. With the glazing positioned externally to the trusses, these steelwork elements help the façade resist wind loadings. Adding some drama to the design, as well as creating a visual highlight, they will be left exposed within the completed project and are suspended from the roof via two CHS hangers.

"We considered several options, but the project was well-suited to being a steel-framed structure," says Cundall Senior Engineer Jonny Phair. "There would have been challenges to form the atrium in any other material, especially as the façade trusses and the longest roof rafters are 20m-long."



Model showing the steel-framed hotel structure and the footbridge, which will connect to the adjacent stand.

Mr Stokes agrees and adds the speed of construction and the material's ability to form a weathertight structure quickly was another important consideration as it helped the internal follow-on trades get started earlier.

"Following government guidelines about social distancing during the COVID-19 pandemic, steelwork proved to be the ideal material as it's fabricated offsite and requires minimal people to erect it onsite."

Structurally, the entire hotel and car park is one large steel frame, with stability derived from steel moment frames, and discreetly positioned vertical bracings.

The flooring solution is a composite design throughout the building, with steel beams supporting metal decking and a concrete topping.

Either side of the atrium, steelwork for the hotel is based around a regular column grid of 7.72m. This column spacing was chosen as it was deemed adequate for the ground floor car park as well as the hotel rooms and facilities above.

"There are a couple of transfer structures to the car parking bays, where columns had to be omitted, otherwise the steel stacks up regularly right up through the building," says Mr Phair.

"During the COVID-19 pandemic, steelwork proved to be the ideal material as it's fabricated offsite and requires minimal people to erect it onsite."

The hotel bedrooms are designed in regimented blocks on each wing. Two rows of rooms are separated by a central corridor on each floor. Service lines run down each corridor and are accommodated within web openings in bespoke fabricated beams.

Having completed their main steel programme, Caunton Engineering is due to return to site this Spring to erect the footbridge.

This will be assembled onsite and then lifted into place as one 28m-long curved structure. Although it will tie into both the new hotel and the existing grandstand, the bridge will be an independent structure, supported by four columns.

Summing up, Andrea Pinchent, Chief Executive Officer at Leicester Tigers, says: "This is an important project to add to the city centre's facilities and to support the long-term vision around our stadium."

The hotel is due to complete during the summer of 2022. ■

Visualisation of the completed hotel.

A steel-framed option replaced an earlier design in order to reduce costs.

Academia embraces sustainability

A steel-framed solution has helped the University of Salford achieve its sustainability aspirations for its new Science, Engineering and Environmental (SEE) Building.

Aiming to be an exemplar model of its commitment to industry collaboration, the University of Salford is currently constructing a Science, Engineering and Environmental (SEE) Building that forms part of a much wider campus masterplan.

The four-storey, 15,550m² SEE Building will be occupied by the University's departments of Robotics, Built Environment, Civil, Aeronautical and Mechanical Engineering, Computer Science and Networking, Human and Natural Science and The Morson Maker Space (an additive and digital manufacturing hub). On completion, the schools will decamp from their current disparate sites into the new building.

Once the old buildings are vacated, it will free-up land for further new developments within the campus-wide masterplan. This ambitious scheme incorporates opportunities to develop 92,000m² of educational floor space, 500,000m² of commercial space targeted at industrial growth sectors, as well as public realms, green landscaped routes and cycleways, and 2,500 new homes and apartments.

The SEE Building will facilitate students, academics and industry partners working together on cutting-edge industry-facing projects. The environment fostered within the SEE Building will bring together world-leading research and future-facing teaching and learning to offer unique opportunities that better prepare students for life after university.

The building will incorporate high sustainability credentials, a key element of the university's pledge to reduce the environmental impact of the wider masterplan. It will be fully electric powered, supported by 154 roof mounted photovoltaic panels which will provide renewable energy.

The new structure is a braced steel frame, using a composite solution of steel beams supporting metal decking and a concrete topping to form the floors. Typically, columns are hot rolled UC members, except at the entrance where feature CHS columns are utilised. The structure is founded on 191 CFA piles, which were installed to a depth of 20m.

According to Morgan Sindall Senior Project Manager Justin Kay, the project was not always going to be built using this framing solution.

"It was originally going to be a concrete-framed building, but in order to deliver the job within budget we had to undertake a value engineering exercise, whereby the design was changed to steel."

As well as reducing the cost of project, using a steel-framed solution has enabled the design to embrace the client's wish to have an industrial-looking environment, to complement the studies which will be undertaken within the building. Consequently, the ceilings and much of the steelwork will be left exposed in the completed structure.

"The architectural design narrative for the building throughout has been to utilise engineering type materials in their natural state to highlight the buildings engineering function. This included expressing the steel frame and utilising a bold yellow colour in line with the architectural pallet to showcase the steel skeleton within the building," adds Sheppard Robson Architect Matthew Taylor.

"In addition, this expression went beyond just the use of colour. Sheppard Robson worked closely with Arup and Elland Steel Structures in several areas, such as the atrium column splice

FACT FILE
The University of Salford, Science, Engineering and Environmental Building
Main client: **The University of Salford**
Architect: **Sheppard Robson**
Main contractor: **Morgan Sindall**
Structural engineer: **Arup**
Steelwork contractor: **Elland Steel Structures**
Steel tonnage: **1,100t**

connections and fin connections details, to showcase the steelwork in feature spaces."

In addition to creating the desired cost-effective and exposed structure, the use of structural steelwork has also helped the design with its various internal layouts. Although the majority of the steel frame is based around a regular column grid pattern, this was not possible throughout the scheme, due to the need for large column-free spaces. Consequently, in certain areas the primary column grid changes from 9m × 9m to a localised 12.5m × 9m pattern.

These larger span areas include the centrally-positioned atrium that is a full-height void topped with roof lights, which will allow natural light to penetrate the interior of the building.

Changing the design to steel helped with a number aspects but it did pose several challenges as well, as Arup Engineer Stewart van Ark explains: "Most prevalent was the vibration performance under footfall excitation. Our Advanced Digital Engineering team conducted an equipment survey to determine the vibration performance criteria and highlight vibration emitting sources. Alongside this, a footfall induced vibration assessment was conducted using General Structural Analysis (GSA) software."

Several structural interventions were introduced to control the vibration performance, as opposed to introducing active damping devices.

On the ground floor, there are three large column-free teaching spaces, one of which, entitled the heavy structures teaching area, is a double-height space. This area, occupying approximately one-quarter of the building's footprint, is serviced by an overhead crane. Larger column sections had to be used in this area to carry the extra loadings imposed by the attached crane rails and the anticipated crane movement loadings.

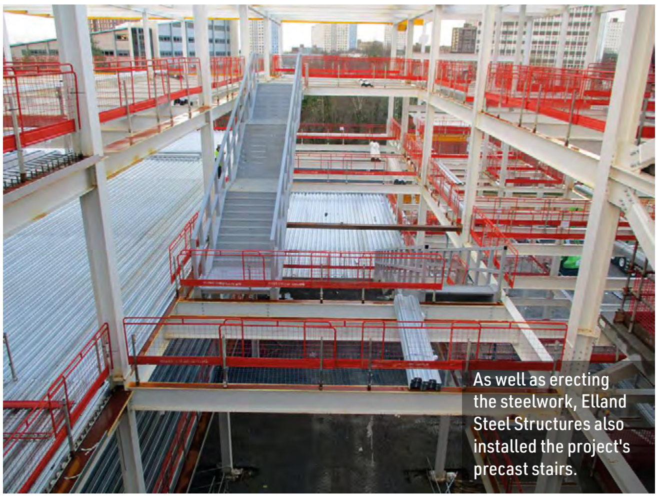
Meanwhile, on the uppermost third level, there is a series of laboratories along one half of the floorplate. Because of the equipment these facilities will accommodate, vibration management is critical, so this part of the structure is supported by three storey-height trusses positioned at second floor level. In order to further reduce the vibration, the slab thickness in this area has been increased.

Summing up, Jason Challender, Director of Estates and Facilities, The University of Salford, says: "This exciting new building will further develop and enhance our growing university campus, providing exceptional student experiences at the heart of our industry collaboration strategy."

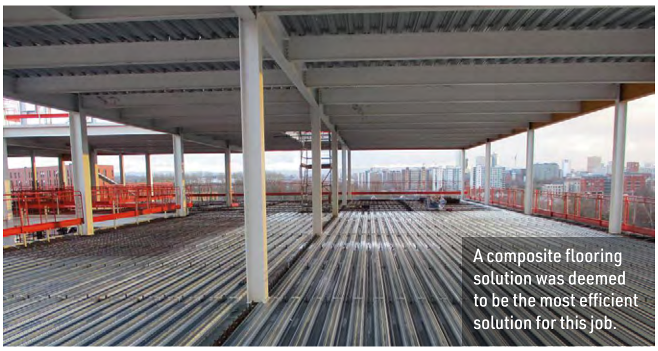
The SEE Building is due to be complete by August 2022, when a 15-week moving-in period will be undertaken by the University. ■


How the completed building will look.


The full-height atrium is topped by a steel-framed enclosure accommodating rooflights.


As well as erecting the steelwork, Elland Steel Structures also installed the project's precast stairs.

"It was originally going to be a concrete-framed building, but in order to deliver the job within budget we had to undertake a value engineering exercise, whereby the design was changed to steel."


A composite flooring solution was deemed to be the most efficient solution for this job.

Steel production at former TV studio

The office block is one of the initial parts of the much larger redevelopment of the former TV studios site.

The redevelopment of the old Granada Television Studios in Manchester is now in full swing, as the steelwork completes on one of the scheme's new office buildings.

The trusses were delivered to the project in small sections and assembled insitu.

> *"Steel provides the design flexibility to manage these (site constraints) in an economic way when compared to other forms of construction."*

Some of the UK's favourite television shows were recorded here, while a number of significant TV firsts were also broadcast from this famous site.

The Granada Studios in Manchester were once the headquarters of north west broadcaster Granada Television (later ITV Granada) from 1956 to 2013. During these years, the site became synonymous with the world's longest-running soap drama, Coronation Street, while other long-running programmes such as the quiz show University Challenge and the current affairs documentary series World in Action were also produced here.

History was made at the studios in 1962, when The Beatles made their first television performance and again in 2010 when the UK's first general election debate was filmed.

When ITV Granada, along with Coronation Street's famous terraced street set, relocated to Salford's MediaCity in 2013, the studios were said to be the oldest operating purpose-built television studios in the UK.

Jump forward a few years and developer Allied London is now reshaping this historic site into a new mixed-use neighbourhood known as St Johns.

Overall, the scheme includes new build elements alongside the refurbishment of existing buildings in order to create a thriving area of homes, workspaces – specifically aimed at the creative industries – retail outlets and leisure facilities.

The office block occupies and fills-up an extremely tight and constrained footprint.

One part of this ambitious scheme is being undertaken on the plot of the former annex building, where Bowmer + Kirkland (B+K) is constructing a new 10-storey office building.

The now demolished annex building once accommodated dressing rooms and the studio's make-up department. When B+K started work on site in March 2020, it had already been demolished, leaving behind a ground floor slab and a basement.

"We kept a retaining wall that was supporting an adjacent road, but apart from that we had to dig-out the slab and basement, and replaced it with a new lower ground floor level topped with a thicker slab to support our new building, which is higher than

FACT FILE
Granada Studios redevelopment, Manchester
Main client: **Allied London**
Architect: **3D Reid**
Main contractor: **Bowmer + Kirkland**
Structural engineer: **Curtins**
Steelwork contractor: **EvadX**
Steel tonnage: **550t**

the previous structure," explains B+K Senior Site Manager Daniel Jamison.

Beneath the reinforced concrete slab and basement, the new steel-framed 10-storey office block is supported by a total of 118 x 7m-deep piles.

Taking up the exact footprint of the old annex, the steel-framed structure measures 50m-long × 11m-wide, and it will accommodate around 6,000m² of office space, along with retail units at ground and lower ground floor.

Explaining the choice of a steelwork solution for the project, Curtins Senior Engineer Rosie Boroujerdi says: "There are a number of site constraints that needed to be managed as part of the build, to deliver the architectural aspirations of the design.

"Steel provides the design flexibility to manage these in an economic way when compared to other forms of construction. It also allows the structural design to respond to the client's aspiration for open-plan office spaces."

Creating these desired column-free and flexible office spaces, a series of Westok cellular beams spans between the building's perimeter columns, forming each of the floors without any internal support.

As well as forming the open-plan floor spaces, the cellular beams also accommodate the building's services within their depth, thereby efficiently reducing the structure's floor-to-ceiling heights.

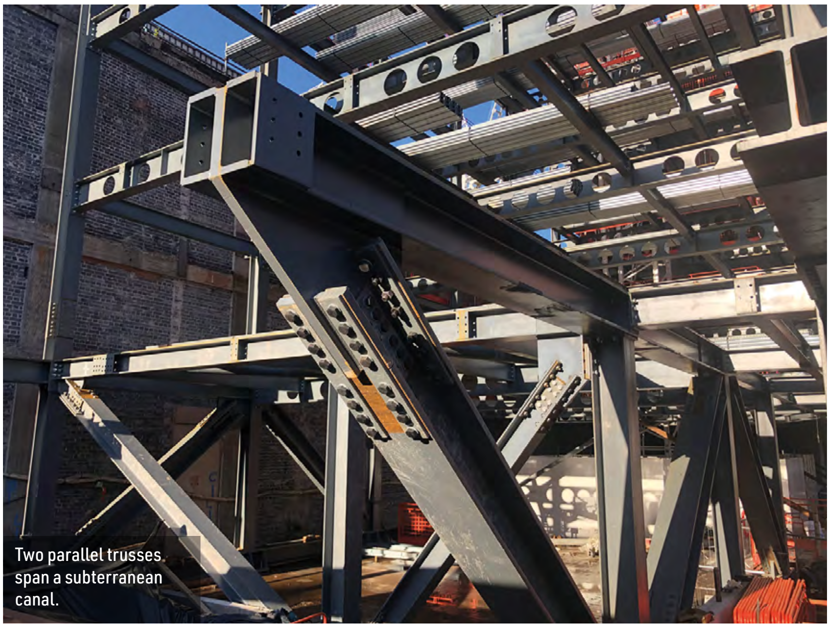
Kloeckner Metals UK Westok provided design support to Curtins, and Westok's Technical Advisory Engineer on the scheme, James Way, commented: "Great to be working once again with Curtins and Evadx on another commercial development in Manchester. The cellular beam design solution provides a neat clear-span floorplate within the strict structural zone depth limits, and delivers considerable flexibility for service integration."

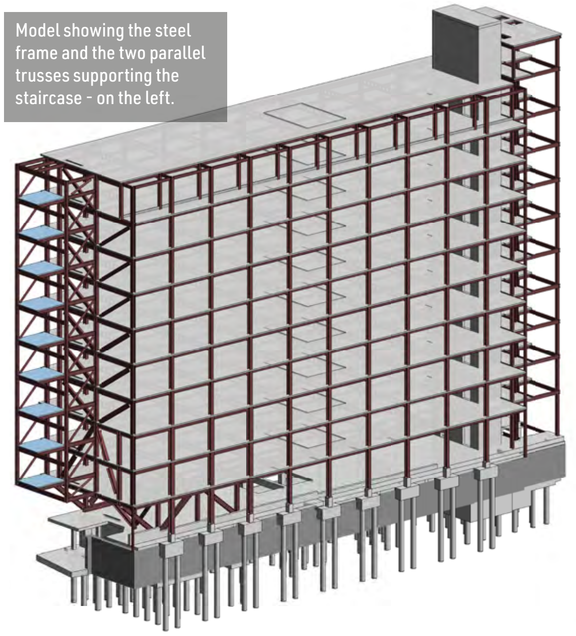
The cellular beams also support metal decking and a concrete topping to form a composite flooring solution on each of the structure's upper levels.

The steel frame is stabilised by a combination of bracing and an insitu reinforced concrete core. Lateral and longitudinal forces are transferred through diaphragm action within the insitu composite slabs to the strategically placed vertical bracings and core.

There are a number of challenges associated with the project due to the confined nature of the site. This has impacted on the steelwork erection programme as well as the installation of the floors.

"Ordinarily we would position our cranes and MEWPs outside of the footprint, but the building is bounded by existing structures on two sides and ▸24


Two parallel trusses span a subterranean canal.


Model showing the steel frame and the two parallel trusses supporting the staircase - on the left.

▸23 roads on the other two, which meant this wasn't possible," explains EvadX Contracts Manager Andrew Roberts.

"Consequently, we had coordinate our steel erection with the metal decking and concrete floor contractor, whereby we erected half the structure up to sixth floor with our equipment positioned in the other half of the footprint. We then had to wait until the erected portion was concreted, so we could use the floors as a base for our MEWPs to erect the other half of the building."

This same working sequence was then repeated for the levels from sixth floor up to the uppermost roof elements.

Another project challenge is buried deep below the southern end of the site. Here, an old disused subterranean canal crosses the site slightly beyond the building's footprint, but just below the point where an external staircase will be erected.

As no staircase-supporting columns could be installed above the canal, the project team has designed two 14m-long × 4m-high trusses. These large steel elements, positioned at ground floor and connected to the slab's rebar, support the southern tip of the building and a 4m-wide cantilevering steel-framed staircase tower from their top chords.

"The trusses transfer the stanchion loadings back to new foundations positioned within the basement footprint, away from the vaulted masonry arch of the existing subterranean listed canal structure," says Ms Boroujerdi.

"A number of solutions were explored, but the truss solution was favoured due the constraints of the site, architecture and to minimise spatial impact, as the truss chords and internal members are located within the make-up of the building's cladding."

The attached staircase has also required the entire southern gable end of the steel frame to be designed as one large braced Vierendeel truss.

"Both trusses were trial erected at our North Wales fabrication yard to make sure they fitted together seamlessly on site. We then disassembled them and delivered the steelwork to site in small pieces of up to 6t. This allowed the steelwork to be transported and then lifted into place with the available craneage," sums up Mr Roberts.

The office block is due to complete in October. ■

The design of nodes in major trusses

David Brown of the SCI comments.

Transfer trusses invariably carry high loading, leading to large members and complex connections - the trusses at the Granada Studios redevelopment are no exception. As can be seen, the truss was detailed to be bolted together on site, demanding a careful approach to the connections. The nodes themselves were welded in the workshop, with a continuous thick plate replacing the web in the chord members and forming the gusset for connection to the diagonals. In significant members such as these transfer trusses, slip is to be avoided – the unpainted faying surfaces can be seen, showing the site connections were completed with preloaded assemblies.

The connections to the gusset plates have perpendicular plates which are the same thickness as the flanges of the diagonals, which facilitates the use of internal and external cover plates. This has the advantage of doubling the number of friction planes which obviously helps reduce the number of bolts required and produces a more compact connection. The substitute flanges must be long enough (and the welds sufficiently capable) to transfer the load from the member into the gusset plate.

The members and cover plates must be verified when in tension – even if the connection is Category C (non-slip at ULS) the net cross section at bolt holes must be verified. In compression, the buckling resistance of the plates in compression must be verified. The longest buckling length is usually the spacing across the joint itself. Note 2 to Table 3.3 of BS EN 1993-1-8 provides advice when the check is required and the buckling length which is to be used in the design check.

Trusses like those at the Granada Studios redevelopment must be fabricated precisely if the erection and assembly is to proceed smoothly on site. These trusses were trial assembled in the workshop – the EvadX LinkedIn posts include many photographs of the fabrication of these trusses, showing the connection details, the trial assembly – and the considerable welding required. The site photos are also interesting, including one diagonal being located in position.

An alternative approach to the design of major truss nodes was covered in *New Steel Construction*, October 2019, where it was possible to turn the chords and internal members through 90°. The article considers a similar concept utilising relatively thick plates to form the node and completing bolted splice connections clear of the node.

Verification of beams subject to a hogging bending moment

David Brown of the SCI considers the solutions to this complex situation

What's the problem?

In buildings, beams are generally designed as simply supported. Even composite beams are assumed to be simply supported - when we readily appreciate they are not. Just occasionally, designers are faced with a member where the bending moment reverses at some point within the member length. In continuous floor beams there will usually be restraints to one flange only, so there will be a length where the other flange is unrestrained. The bending moment diagram for a continuous beam is of the form shown in Figure 1.

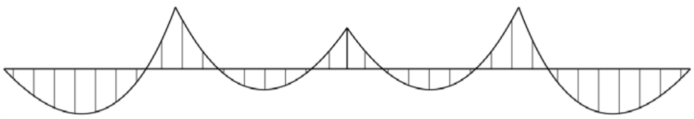


Figure 1: Continuous beam bending moment diagram

In this case, the top flange of the beam is usually restrained, possibly at intervals, but more commonly a continuous restraint to the top flange. In the hogging portions of the bending moment diagram, the bottom flange is in compression and unrestrained. The challenge is to verify this length.

"It's easy, the point of contraflexure is a restraint"

This is a common assumption, which the SCI is occasionally asked to endorse when applied to the floor beam considered in Figure 1. The idea comes from assumptions made in the design of portal frames, with the suggestion that this can be applied to floor beams. After all, the beam does not know if it is in a portal frame or in a floor.

The practice of assuming the point of contraflexure to be a "virtual lateral restraint" to the bottom flange has been enshrined in portal frame design for many years. The advice is found in clause 5.5.5 of BS 5950 and in SCI publications P252 (BS 5950) and P399 (Eurocode design). There are certain requirements to be met, which are clearly related to the idea of an "inverted U-frame", which has been covered in other *New Steel Construction* articles. The purlins must be sufficiently stiff – manifest as the rule that they must be at least 25% of the rafter depth. The connection to the flange must be sufficiently rigid – manifest as the rule that the connection from purlin to rafter must have at least two bolts. These rules had their origins in the 1970's, when purlins were hot rolled and rafters had tapered flanges. When discussing this question, Professor Horne commented "...even the small torsional restraint obtained with a continuous rail and two bolts in the cleat, but without a web stiffener, is sufficient to prevent the spread of torsional failure from a length of member with the outstand flange in compression to part of the member with the outstand flange in tension".

P399 subtly notes that the assumption of a virtual lateral restraint to the bottom flange is UK practice. Other designers may be suspicious of this bold assumption.

The suggestion is that this assumption may be applied to a floor beam which has a similar arrangement – restraint to the top flange and a bottom flange which changes from tension to compression.

Although many designers might have taken this route, verifying the member between the point of contraflexure and the support, published guidance prohibits this. In the *Designers' Guide to EN 1994-1-1*[1], section 6.4.1, we read "It should not be assumed that a point of contraflexure is equivalent to a lateral restraint".

In some situations, it is common practice to avoid the uncertainty altogether and provide a restraint at the required location. This is the typical solution for bridges, and (for example) trusses.

What are the alternatives?

In short, the answer is to "do it properly". The task is straightforward if the member is a bare steel beam. The proper approach is complicated if the member is a composite beam, so this article proposes that a conservative approach is to pretend the composite beam is in fact steel alone. There is a "simplified verification" method for composite beams in the design standard which does not involve any calculations (it does in the UK National Annex variation!) but as will be seen, the scope means it is of very limited use. The two approaches are examined in the following sections.

Bare steel beam

The solution here is to model the complete span in *LTbeam* or *LTBeamN*, ensure that the bending moment diagram is correct, model the correct restraints and use the software to determine M_{cr}. The calculation of the lateral torsional buckling resistance $M_{b,Rd}$ then follows the normal route. The resistance is checked against the largest moment in the span, which for a fixed ended beam and UDL, will be at the support.

Figure 2 shows the dimensions, loading and resulting bending moment diagram for a continuous beam with fully fixed supports. The hogging moment at the support is $^{wL^2}/_{12}$. The point of contraflexure is 2114 mm from each support.

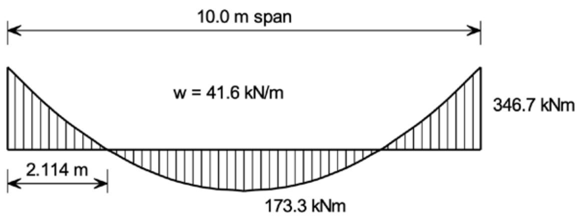


Figure 2: Beam and bending moment diagram

It is assumed that the beam is non-composite, but has a continuous lateral restraint to the top flange – presumably from whatever applies the UDL.

The beam may be modelled with fixed supports, or as simply supported but with a hogging moment applied at each end – it makes no difference to the value of M_{cr}. The selected beam is a 406 × 178 × 60, in S355. With a continuous lateral restraint to the top flange the value of M_{cr} = 1031 kNm. The buckled form is shown in Figure 3(a) (over page).

Completing the process:

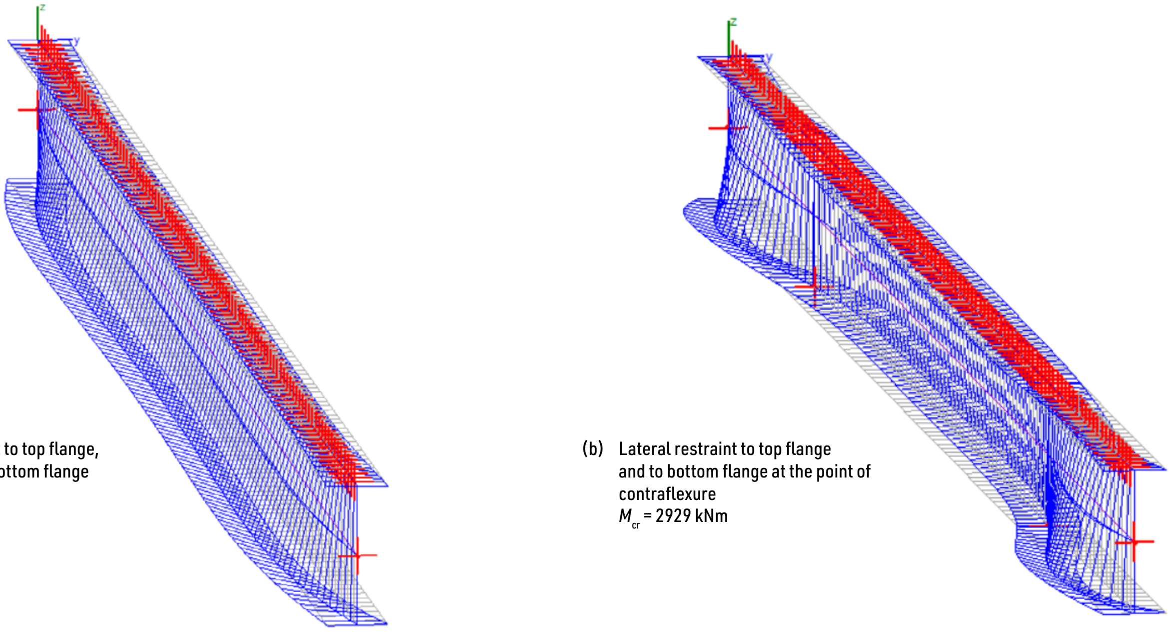
$\bar{\lambda}_{LT}$ = 0.643; ϕ_{LT} = 0.714; χ_{LT} = 0.861; f = 0.819

$\chi_{LT,Mod}$ = 1.0

$M_{b,Rd}$ = 426 kNm, > 347 kNm, OK.

If a restraint is introduced to the bottom flange at the point of contraflexure, the buckled form is shown in Figure 3(b), and M_{cr} = 2929 kNm – quite different to the real situation.

If the prohibited approach of simply checking from the point of contraflexure to the support had been followed (for interest, not a SCI ▸26



(a) Lateral restraint to top flange, no restraint to bottom flange M_{cr} = 1031 kNm

(b) Lateral restraint to top flange and to bottom flange at the point of contraflexure M_{cr} = 2929 kNm

Figure 3: Buckled form of continuous beam

▸25 recommendation!) M_{cr} = 2426 kNm, demonstrating that the elastic buckling moment is wildly different to that of the correctly modelled beam.

Composite beams

Verification of the hogging zone of a continuous composite beam is covered in clause 6.4.2 of BS EN 1994-1-1. The principles are straightforward and familiar – a pair of beams and the slab form an inverted U-frame, as shown in Figure 4 (taken from Figure 6.11 of the standard).

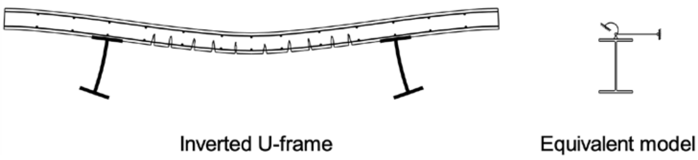


Figure 4: U-frame and model (from BS EN 1994-1-1)

The stiffness of the inverted U-frame depends on the stiffness of the slab, the stiffness of the beam web and (at least conceptually) the stiffness of the connection between beam and slab. Reference 1 notes that the flexibility of the shear connection between beam and slab can be neglected.

Once the stiffnesses have been calculated, M_{cr} for the composite member can be determined, which, as shown in Figure 4, is based on the member with a continuous lateral restraint to the top flange and a rotational spring stiffness at the same level.

Unfortunately, the process is not for the faint-hearted. Reference 1 notes that the calculation of the rotational spring stiffness is straightforward "apart from finding the cracked flexural stiffness of a composite slab". This calculation requires knowledge of the profiled slab dimensions, slab reinforcement and properties of the cracked composite section.

M_{cr} is then calculated, but this is for the composite section. The expression for a uniform steel beam cannot be used. The Eurocode does not give an expression, but this may be found in Reference 1. A value of the reduction factor χ_{LT} is calculated, but this is applied to the design resistance (in hogging) of the composite section. The resistance is compared to the hogging moment including the effects of shrinkage. In all, a complex set of calculations for designers who are not experienced in the detail of composite design – made even more complicated by the continuity which gives rise to hogging moments, the effects of cracking and shrinkage. Designers are commended to review example 6.7 in Reference 1 before undertaking their own verifications.

Simplified verification of composite beams

BS EN 1994-1-1 clause 6.4.3 offers the attractive prospect of a very much simplified approach "without direct calculation". In the core Eurocode, this is a simple test of the steel beam depth – below a tabulated maximum depth, there is no need to complete any calculation – the member is deemed to satisfy. The core Eurocode presents maximum depths for IPE sections. The UK National Annex demands the calculation of a "section parameter" in NA.2.8, which is a purely geometric parameter, but more involved than the section height limit in the core Eurocode.

This approach looks very appealing, but the associated conditions in clause 6.4.3(1) mean that in common practice, designers may be frustrated that they fall outside the scope. In addition to limitations on relative span lengths, the loading must be uniformly distributed – but critically, the design permanent load must exceed 40% of the design total load.

In the calculation which resulted in the design load of 41.6 kN/m used above, the characteristic loading was taken as g_k = 3.0 kN/m² and q_k = 5.0 kN/m², which is considered to be a reasonable pair of loads for a typical composite beam. The design loading is therefore:

Permanent: 1.35 × 3.0 = 4.05 kN/m²

Total: 1.35 × 3.0 + 1.5 × 5 = 11.55 kN/m²

The design permanent load is therefore only 35% of the design total load, so the use of the simplified approach is not permitted.

Conservative solution for composite beams

The approach proposed here may be very conservative, but it has the advantage of speed. If the bare steel beam is modelled with a lateral restraint (only) to the top flange, and found to be satisfactory, the composite member will also be satisfactory. Modelling as a bare steel beam neglects the contribution of the slab and the rotational spring stiffness.

As a comparison, consider example 6.7 in Reference 1. The verification in the hogging region concludes that the composite resistance of 767 kNm exceeds the ultimate moment with shrinkage included of 656 kNm. The steel beam is an IPE450 in S355, 12 m span and one half of a two-span continuous beam.

In *LTBeam* the loading was arranged to produce the correct hogging moment at the internal support. A continuous lateral restraint to the top flange was modelled. M_{cr} = 1098 kNm from this analysis.

Completing the process:

$\bar{\lambda}_{LT}$ = 0.741; ϕ_{LT} = 0.789; χ_{LT} = 0.800; f = 0.955

$\chi_{LT,Mod}$ = 0.838

$M_{b,Rd}$ = 505 kNm, which is unsatisfactory and shows the method to be conservative.

This result could be improved if the rotational spring stiffness was included in the model – if the rather involved calculations were undertaken to determine the stiffness. Taking a significant short cut by adopting the value of 96.4 kNm/rad calculated in example 6.7, M_{cr} increases to 2234 kNm, and $M_{b,Rd}$ = 584 kNm – still not satisfactory.

With only a lateral restraint to the top flange, an IPE500 delivers a resistance of 648 kNm, which is close enough to the 656 kNm requirement, recognising that there is benefit from the rotational spring stiffness at the top flange which has been neglected in the calculation.

Conclusions

1. The practice of assuming the point of contraflexure to be a virtual lateral restraint to the bottom flange is enshrined in the design standard for portal frames and confirmed by practice, but correctly prohibited for beams in buildings.
2. A simple buckling analysis shows that if the hogging length is assumed to be restrained at the point of contraflexure, the result is a significantly higher value of M_{cr} (i.e. an artificially high buckling resistance), and quite different to modelling the real condition.
3. If the member is bare steel, modelling the complete beam, with restraints (if any) is the straightforward and correct approach. Tools are available to calculate M_{cr}.
4. With a composite beam, the full process is complex. The codified simplified method is very limited in scope. Assuming the beam to be steel alone will be conservative.

A webinar on continuous composite beams is to be presented on 15 June: See the SCI website for details

References

[1] Johnson, R. P & Anderson, D.
Designers' Guide to EN 1994-1-1- Eurocode 4: Design of composite steel and concrete structures. Part 1.1: General rules and rules for buildings.
Thomas Telford, 2004

AD 428A:
Lateral and torsional vibration of half-through truss footbridges

Revision Note

This AD note was first issued to provide interim guidance on the design of half-through footbridges. It has now been revised following publication of updated standards and is issued as AD428A.

Purpose of this guidance

This note alerts designers to the potential susceptibility of narrow half-through footbridges to excitation by pedestrians in a lateral-torsional mode. Until the recent publication of NA+A1:2020 to BS EN 1991-2:2003 Incorporating Corrigendum No. 1, Eurocodes and UK National Annexes did not fully address this mode of vibration, so there was a danger that it may have been discounted without proper consideration. This previous gap in the standards has led to the need to retrofit dampers and/or provide additional stiffening to some recently constructed footbridges where excitation occurred due to pedestrians walking eccentric to the deck centreline and, more significantly, from deliberate shaking of the deck.

Affected mode of vibration

Half-through footbridges, without plan bracing to the top chord, often have as their lowest natural mode of vibration a lateral-torsional mode. A typical example is shown in Figure 1. The mode occurs because the open bridge cross-section has a low torsional stiffness with a shear centre below the deck level about which axis the rotation occurs.

UK design criteria prior to issue of "NA+A1:2020 to BS EN 1991-2:2003 Incorporating Corrigendum No. 1"

The criteria for assessing the dynamic behaviour of footbridges were outlined in the following Eurocodes (BS EN) and BSI Published Documents (PD):

- BS EN 1990:2002+A1:2005 as modified by UK National Annex
- BS EN 1991-2:2003 as modified by UK National Annex
- PD 6688-2: 2011

They contained the following requirements:

- Eurocode EN 1990 clause A2.4.3.2(2) requires comfort to be verified if the natural frequency is lower than 2.5 Hz for lateral and torsional modes;
- BS EN 1990 clause A2.4.3.2(1) states that comfort criteria should be defined in terms of maximum acceptable acceleration and proposes a horizontal limit for lateral and torsional vibrations of 0.2 ms^{-2} under normal use and 0.4 ms^{-2} for exceptional conditions, but makes these values nationally determined parameters;
- Clause NA.2.3.10 of the UK National Annex to BS EN 1990 states that the pedestrian comfort criteria should be as given in NA.2.44 of the UK National Annex to BS EN 1991-2. However, this clause does not specify a maximum acceptable acceleration for horizontal movement under normal use – it (and PD 6688-2) only address synchronous lateral vibration caused by lateral forces from footfall and does not address lateral and torsional modes excited by vertical loading.

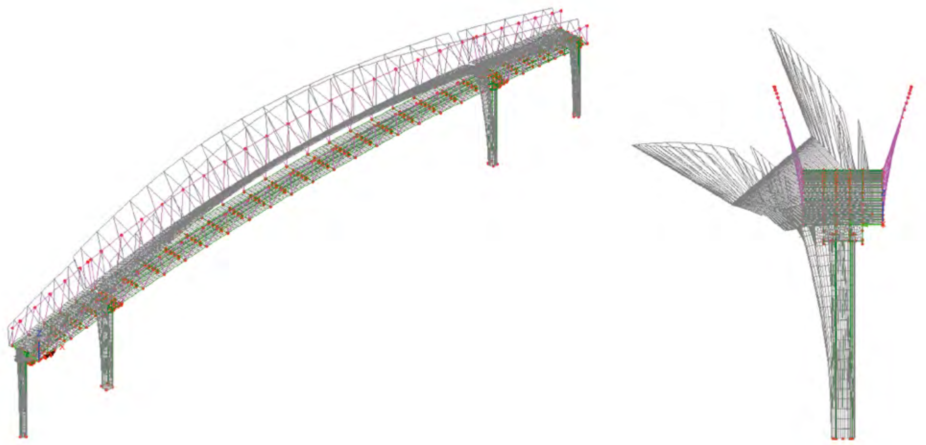


Figure 1: Lateral and torsional mode of vibration

None of the documents provided limiting horizontal accelerations for deliberate lateral shaking of the bridge.

A literal reading of all the applicable clauses therefore led to the conclusion that a lateral-torsional mode with frequency less than 2.5 Hz should be verified for horizontal acceleration as EN 1990 clause A2.4.3.2 (2) still applies. However, no acceleration limit was provided as EN 1990 clause A2.4.3.2(1) was modified by the UK NA to BS EN 1991-2 which, itself, did not provide a limit.

Updated provisions in NA+A1:2020 to BS EN 1991-2:2003 Incorporating Corrigendum No. 1

The following requirements have been made in NA+A1:2020 to BS EN 1991-2:2003 Incorporating Corrigendum No. 1 to address the original problems noted above:

i. The design should conform to the requirements of BS EN 1990 clause A2.4.3.2(2) i.e. a verification of the comfort criteria should be performed if the fundamental frequency of the deck is less than 5 Hz for vertical vibrations, and 2.5 Hz for horizontal (lateral) and torsional vibrations.

ii. The maximum acceptable acceleration for horizontal movement under normal use should be taken as the recommended value given in BS EN 1990 clause A2.4.3.2(1) [i.e. 0.2 ms^{-2}], measured at the level of the deck. The acceleration should be calculated under the vertical load models of NA.2.44 considering walking paths offset from the bridge centreline as necessary.

iii. Where the fundamental frequency of the bridge is less than 3 Hz for horizontal (lateral) and torsional vibrations, consideration should be given to making provision in the design, in discussion with the client, for possible installation of dampers to the bridge after its completion. [This recommendation makes some allowance for uncertainty in the value of damping and other parameters used in the calculations and also provides some potential remedy for unacceptable horizontal accelerations from deliberate shaking should they occur].

iv. Any further limiting criteria for pedestrian comfort, such as under deliberate shaking, should be determined on a project-by-project basis and agreed with the client.

v. The potential for unstable lateral responses (synchronous lateral vibration) should still also be checked using NA.2.44.7 of the UK National Annex to BS EN 1991-2.

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New and revised codes and standards

From BSI Updates February 2021

BS EN PUBLICATIONS

BS EN ISO 8501-4:2020
Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Initial surface conditions, preparation grades and flash rust grades in connection with water jetting
supersedes BS EN ISO 8501-4:2006

BS EN 15011:2020
Cranes. Bridge and gantry cranes
supersedes BS EN 15011:2011+A1:2014

BRITISH STANDARDS REVIEWED AND CONFIRMED

BS EN ISO 8501-3:2007
(BS 7079-A3:2006)
Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Preparation grades of welds, edges and other areas with surface imperfections

BRITISH STANDARDS UNDER REVIEW

BS 7668:2016
Weldable structural steels. Hot finished structural hollow sections in weather resistant steels. Specification

NA to BS EN 1990:2002+A1:2005
UK National Annex for Eurocode. Basis of structural design

NA to BS EN 1991-1-1:2002
UK National Annex to Eurocode 1. Actions on structures. General actions. Densities, self-weight, imposed loads for buildings

NA to BS EN 1991-1-2:2002
UK National Annex to Eurocode 1. Actions on structures. General actions. Actions on structures exposed to fire

NA to BS EN 1991-1-4:2005+A1:2010
UK National Annex to Eurocode 1. Actions on structures. General actions. Wind actions

NA to BS EN 1991-1-5:2003
UK National Annex to Eurocode 1. Actions on structures. General actions. Thermal actions

NA to BS EN 1991-1-6:2005
UK National Annex to Eurocode 1. Actions on structures. General actions. Actions during execution

NA+A1:2014 to BS EN 1991-1-7:2006+A1:2014
National Annex to Eurocode 1. Actions on structures. Accidental actions

NA to BS EN 1991-3:2006
UK National Annex to Eurocode 1. Actions on structures. Actions induced by cranes and machinery

NA to BS EN 1991-4:2006
UK National Annex to Eurocode 1. Actions on structures. Silos and tanks

NA+A1:2014 to BS EN 1993-1-1:2005+A1:14
UK National Annex to Eurocode 3. Design of steel structures. General rules and rules for buildings

NA to BS EN 1993-1-2:2005
UK National Annex to Eurocode 3. Design of steel structures. General rules. Structural fire design

NA to BS EN 1993-1-3:2006
UK National Annex to Eurocode 3. Design of steel structures. General rules. Supplementary rules for cold-formed members and sheeting

NA+A1:15 to BS EN 1993-1-4:2006+A1:2015
UK National Annex to Eurocode 3: Design of steel structures. General rules. Supplementary rules for stainless steels

NA+A1:2016 to BS EN 1993-1-5:2006
UK National Annex to Eurocode 3. Design of steel structures. Plated structural elements

NA to BS EN 1993-1-8:2005
UK National Annex to Eurocode 3. Design of steel structures. Design of joints

NA to BS EN 1993-1-9:2005
UK National Annex to Eurocode 3. Design of steel structures. Fatigue

NA to BS EN 1993-1-10:2005
National Annex (informative) to Eurocode 3. Design of steel structures. Material toughness and through thickness properties

NA to BS EN 1993-1-11:2006
UK National Annex to Eurocode 3. Design of steel structures. Design of structures with tension components

NA to BS EN 1993-1-12:2007
UK National Annex to Eurocode 3. Design of steel structures. Additional rules for the extension of EN 1993 up to steel grades S 700

NA+A1:2012 to BS EN 1993-2:2006
UK National Annex to Eurocode 3. Design of structures. Steel bridges

NA to BS EN 1993-3-1:2006
UK National Annex to Eurocode 3. Design of steel structures. Towers, masts and chimneys. Towers and masts

NA to BS EN 1993-6:2007
UK National Annex to Eurocode 3. Design of steel structures. Crane supporting structures

NA to BS EN 1994-1-1:2004
UK National Annex to Eurocode 4. Design of composite steel and concrete structures. General rules and rules for buildings

NA to BS EN 1994-1-2:2005
UK National Annex to Eurocode 4. Design of composite steel and concrete structures. General rules. Structural fire design

NA to BS EN 1994-2:2005
UK National Annex to Eurocode 4. Design of composite steel and concrete structures. General rules and rules for bridges

PD 6688-1-1:2011
Recommendations for the design of structures to BS EN 1991-1-1

PD 6688-1-7:2009+A1:2014
Recommendations for the design of structures to BS EN 1991-1-7

PD 6688-2:2011
Background to the National Annex to BS EN 1991-2. Traffic loads on bridges

PD 6695-1-9:2008
Recommendations for the design of structures to BS EN 1993-1-9

PD 6695-1-10:2009
Recommendations for the design of structures to BS EN 1993-1-10

NEW WORK STARTED

ISO 8504-4
Preparation of steel substrates before application of paints and related products. Surface preparation methods. Acid pickling
will supersede None

FROM
Building with Steel
February 1971

An attractive interior finish to a steel-framed building with 175ft clear spans. These large spans pose no problems for steel fabrication based on catalogued details and create large clear floor areas which allow a high degree of adaptability inside the building. The monitor roof design provides a high level of even, balanced natural daylighting without glare or excessive heat gain, important requirements for some industries. This fine example of the monitor is on a building for United Biscuits Limited at Harlesden.

Industrial buildings

The Conder Group is well known for its standard industrial buildings - catalogued buildings in fact. But this does not mean that choice is denied the customer. Complete flexibility is permitted by standardizing techniques - not components. The advantages of this approach are described here by David Brett, Marketing Director Conder Group Services Ltd

Putting an industrial building together is a complex job. Many inter-related requirements - physical, technical and economic - have to be considered and there is very rarely one simple absolute solution to the problem. More often there are various alternatives to be considered and the best solution for a particular set of circumstances involves some important decision-making. That, in a nutshell, is why the technical expertise and proven details of catalogued buildings are so valuable and important.

In recent years there has been a change in attitude towards the role of the industrial building. An oversimplified conception of the factory as a single storey 'shed' with overhead daylighting, the necessary level of supplementary electric lighting and the minimum of heating and insulation necessary to comply with the Factories Acts has been superseded by a growing awareness that while a factory is indeed a shell housing a process it can, and should, be something more; a working environment that makes a positive contribution to production and productivity.

This change of attitude has had a considerable effect on two inter-related aspects of industrial buildings - economics and design. Traditionally, and understandably, industrialists investing in a new factory have always wanted them to be as cheap a possible and because a new factory involves high capital cost it has been common to concentrate on this initial capital expenditure. But with the growing awareness of an industrial building's contribution to production and productivity there has grown the realization that the building is an important practical investment. The factory that is cheapest in terms of initial cost may not be the most suitable for production needs, nor the cheapest to use, nor the most economic investment in terms of future changes and expansion.

The best economic solution therefore needs careful consideration. So does the design. To get your better factory it will have to be designed to create the optimum environment for efficient, high quality production. That means a design related to machines, processes, materials and movement requirements. At the same time it must be designed in relation to initial capital cost, cost in use (including maintenance) and with adaptability to meet changing processes and needs.

Why Catalogued Buildings?

This is the context in which the sponsor of catalogued buildings operates. Clearly he cannot afford to limit the range of design possibilities within his standard details. If he does he severely limits his 'marketability'. But given that the range of details provide a high degree of adaptability he will provide technical and economic benefits over the one-off design for almost every type of industrial building.

The reasons why become obvious when you consider that the successful sponsor of catalogued buildings is a specialist. The very fact that the details are catalogued means that a great deal of technical expertise has gone into their development. That, in turn, means the quality and guarantee of proven details. If it didn't the sponsor wouldn't still be in business.

As well as the benefits of technical development, catalogued details provide several other advantages:

- Because the building is to a certain extent pre-designed, the pre-contract period is drastically reduced.
- The quality and accuracy of fabrication is guaranteed because everyone is working with familiar details.
- Proven construction methods mean the erection period can be accurately scheduled.
- Proven details allow accurate cost control.

Add to these a range of details that allow a high degree of adaptability in design and the sponsor can provide, technically, economically and in the shortest time, the best building for the client's needs.

That Vital Steel Frame

Nowhere are these benefits more important than with the structural steel of the building. A building's framework is like the body's skeleton and must be designed in relation to all the other elements of the finished building - clear areas, provision for services and production loads and so on. Clearly, in the context of the different needs of different industries, adaptability is important.

Steel is the most common material to be used for structural frameworks and it has physical and technical qualities that make it particularly suitable for a wide variety of catalogued details. First and foremost its tolerances are much finer than any other structural material; you can produce a very accurate jig based on almost any dimensions you want. Also -

- its load-bearing capacity is the best of all practical materials.
- it is the most suitable pre-engineering material -
- it can be cut accurately to ¼ in.
- bolted connections make it ideal for construction in almost any conditions.
- it's the most suitable material for extensions, etc.

Maximize these various benefits and you can provide a great variety of catalogued details and the kind of service that wins respect.

At Conder, for example, we have been able to offer this adaptability by concentrating our standardization into the joints and connections and allowing almost any dimensions the customer wants. So, a steel-framed catalogued building can provide, if need be, a building tailor-made to the last inch.

Structural Types

The most common basic construction type is the portal frame, which Conder pioneered as a commercially viable alternative to the conventional lattice truss structure. Its simple clear lines are not only more aesthetically pleasing but also offer economies in material, erection times and space, allowing, for example, headroom above eaves level.

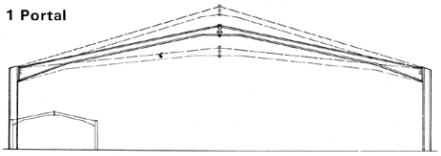
This 150ft clear span portal frame building creates the optimum building for the manufacturer's needs - a large clear area essential for easy mobility of the bulky equipment being made, capacity for 15-ton E.O.T. cranes and direct daylight with glare and heat controlled by anti-glare glass and double-glazing.

Steel-framed construction provides great scope for attractive external appearances. The clean lines of the mansard profile used for this Passenger Transit Shed at Southampton Docks contribute much to the pleasing look of the building. The canopy on the near side of the shed is an easy extension to make using the bolted connections of steel construction. Alongside the building is the SS France, the longest liner in the world.

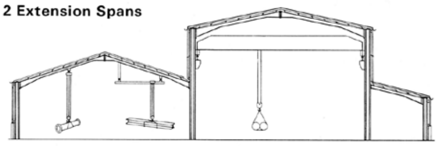
And they really can go up quickly. Conder covered a 24-acre site for the British Shoe Corporation with multiple 90ft spans at the rate of an acre a week. You can have very wide clear spans up to 200ft thus creating large clear floor areas and offering maximum adaptability of the space inside the building.

This basic portal frame structure can be modified, as Figs. 2-7 show. Each of the variations offers appropriate technical and economic advantages in certain situations. The 'A' frame, for instance, is ideal for bulk storage warehouses where the profile of the building can be accurately related to the stored material's angle of repose.

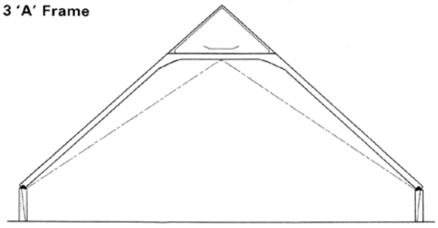
1 Portal



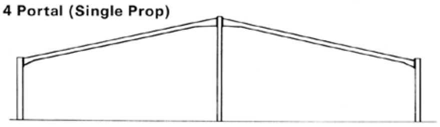
2 Extension Spans



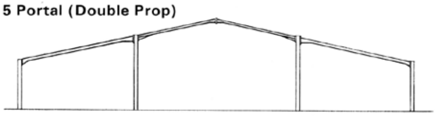
3 'A' Frame



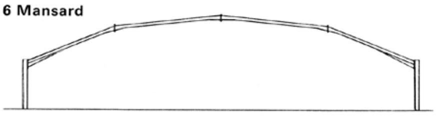
4 Portal (Single Prop)



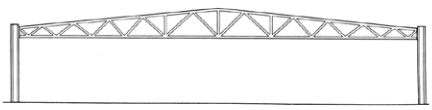
5 Portal (Double Prop)



6 Mansard



7 Braced Beam



The braced beam structure is most suitable when there are a great many overhead services to be installed. But often the selection of the structural type is not so self-determining. When, for example, does a mansard profile become a better technical and economic proposition than the orthodox portal frame? When is a tied or propped portal most suitable? These kinds of considerations need the technical know-how and proven details of the specialist to provide the most effective answers.

Structural Strictures

Let's take the first question as an example. This sort of alternative arises when a large clear floor area is necessary. A wide span portal frame requires a heavy and therefore more expensive frame and more complex eaves connections because of the greater bending moment. The mansard, with its steeper pitch at the eaves, reduces the bending moment on the stanchions but introduces further joints in the roof frame.

In reaching the best solution you need to compare the relative merits of the alternative structures not only one with another but also in relation to other features of the building's requirements. The mansard, for example, has a steeper profile and therefore creates a greater area to heat. On the other hand it provides greater height for storage or overhead travelling cranes should they be necessary. Physical, technical and economic considerations overlap.

Even with a simple, single storey portal frame building many alternatives arise. If you have wide bay spacings you obviously require fewer frames and foundations but need heavier and more expensive purlins. On the other hand narrower bay spacings mean more frames, more foundations, but lighter, cheaper purlins. Which is the best compromise? This will depend largely on the requirements and proportions of the building and the relationship of the alternatives in terms of cost.

Ground conditions and their effect on foundations can also play an important role in the technical and economic choice of structural frame. A pin base (allowing rotation of the frame) means that all the lateral forces due to wind bearing, etc, have to be resisted by the frame itself, producing a heavier and more expensive structure but simpler cheaper foundations, whereas a fixed base which provides fixity for the frame assists considerably in resisting lateral forces and reducing the cost of the frames but increasing foundation costs. Sub-soil conditions can, therefore, play a big role in economic and design considerations.

Light Requirements

Turn your attention from the bottom of the building to the top and there, too, important decisions have to be made because a vital feature of factory design, and one that is integrally related to the building's framework, is the problem of lighting and its effect on roof design. Lighting requirements have to be related to thermal requirements and the effects of solar penetration. For example, direct sunlight may have to be avoided for colour preservation and possible damage to certain types of goods and materials. At the least the glare from direct sunlight can create an uncomfortable working environment. So here, too, catalogued details need to include effective alternatives. For instance, the problems outlined above are most satisfactorily avoided by the monitor roof design. The monitor provides the greatest amount of light from the north balanced with a smaller amount from the south. This two-directional natural lighting system provides balanced, even daylight at a high level, is glare-free, and avoids excessive heat gain. In addition it eliminates valley gutters, so avoiding a major maintenance problem.

These general examples of technical considerations indicate the range of problems that need to be overcome. Putting up an industrial building really isn't easy, so it's logical to turn to the expertise of those experienced at providing the most effective answer quickly.

Time and time again (we at Conder, for example, complete the steelwork for an industrial building at the average rate of approximately one a day) it is proved that, both technically and economically, the catalogued building really makes sense.

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 C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
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*
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
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2	✔	Silver	Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●			●	✔	4		Silver	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		Gold	Up to £6,000,000
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 £400,000
Duggan Steel	00 353 29 70072	●	●	●	●	●	●	●	●		●				●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	4		Gold	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 £4,000,000
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
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	2			Up to £1,400,000
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)
G.R. Carr (Essex) Ltd	01286 535501	●		●	●			●			●			●	●	✔	4			Up to £800,000
H Young Structures Ltd	01953 601881			●	●	●	●	●						●	●	✔	4	✔	● (green)	Up to £3,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●	●	●			●	●	●	✔	3			Up to £3,000,000
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	✔	● (yellow)	Above £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4		● (yellow)	Up to £6,000,000
LA Metalworks Ltd	01707 256290				●	●				●	●			●	●	✔	2			Up to £2,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		● (grey)	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
Littleton Steel Ltd	01275 333431				●					●	●			●	●	✔	3			Up to £1,400,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	4		● (green)	Up to £3,000,000
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 £800,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		● (yellow)	Up to £6,000,000
Painter Brothers Ltd	01432 374400	●			●				●	●	●				●	✔	3			Up to £6,000,000*
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £1,400,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●				●	✔	3			Up to £2,000,000
S H Structures Ltd	01977 681931	●		●	●	●	●	●	●	●	●	●			●	✔	4	✔	● (yellow)	Up to £3,000,000
SAH Luton Ltd	01582 805741			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (yellow)	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 £2,000,000
South Durham Structures Ltd	01388 777350			●	●	●				●					●		2			Up to £800,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £1,400,000
Steel & Roofing Systems	00 353 56 444 1855	●		●	●	●	●				●	●		●	●	✔	4			Up to £4,000,000
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		● (yellow)	Up to £6,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (yellow)	Above £6,000,000

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)

RQSC
The Register of Qualified Steelwork Contractors Scheme

Steelwork contractors for bridgeworks

BCSA

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

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

FB Footbridges
CF Complex footbridges
SG Sign gantries
PG Bridges made principally from plate girders
TW Bridges made principally from trusswork
BA Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
CM Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
MB Moving bridges
SRF Site-based bridge refurbishment
FRF Factory-based bridge refurbishment
AS Ancilliary structures in steel associated with bridges, footbridges or sign gantries (eg grillages, purpose-made temporary works)
QM Quality management certification to ISO 9001
FPC Factory Production Control certification to BS EN 1090-1
1 – Execution Class 1 2 – Execution Class 2
3 – Execution Class 3 4 – Execution Class 4
BIM BIM Level 2 compliant
SCM Steel Construction Sustainability Charter
(● = Gold, ● = Silver, ● = 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
Billington Structures Ltd	01226 340666	●		●	●	●	●					●	✓	4	✓	✓	✓	Gold	Above £6,000,000
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			✓	● (yellow)	Up to £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
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	●	✓	4			✓		Up to £400,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	●	✓	3			✓	Silver	Up to £1,400,000
ECS Engineering Services Ltd	01773 860001	●			●	●	●		●			●	✓	3				Gold	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	Above £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●	●	●		●	✓	4			✓	Member	Up to £3,000,000
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 £6,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	Gold	Up to £3,000,000
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	✓				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
Eiffage Metal	00 33 388 946 856	●	●		●		●	●	●			●	✓	4					Above £6,000,000
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 £200,000
In-Spec Manufacturing Ltd	01642 210716									●	●	●	✓	4			✓		Up to £800,000
Kelly's Welders & Blacksmiths Ltd	01383 512 517											●	✓	2			✓		Up to £200,000
Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Up to £3,000,000
Lundy Projects Ltd	0161 476 2996	●		●	●	●	●			●	●	●		4					Up to £4,000,000
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

BCSA

Corporate Members

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

Company name	Tel	Company name	Tel	Company name	Tel
Gene Mathers	0115 974 7831	Keiths Welding Limited	07791 432 078	Structural & Weld Testing Services Ltd	01795 420264
Griffiths & Armour	0151 236 5656	Paul Hulme Engineering Ltd	07801 216858	SUM Ltd	0113 242 7390
Highways England Company Ltd	08457 504030	QHSE-Interspect Ltd	07438 413849		
Inspire Insurance Services	02476 998924	Sandberg LLP	020 7565 7000		

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.

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

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

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

SfL Steel for Life Sponsor

Structural components

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Albion Sections Ltd	0121 553 1877	✓	M	4			
BW Industries Ltd	01262 400088	✓	M	3			
Cellbeam Ltd	01937 840600	✓	M	4	20		
Composite Profiles UK Ltd	01202 659237		D/I				
Construction Metal Forming Ltd	01495 761080	✓	M	3			
Daver Steels Ltd	0114 261 1999	✓	M	3			
Fabsec Ltd	01937 840641		N/A				
Farrat Isolevel	0161 924 1600	✓	N/A				
FLI Structures	01452 722200	✓	M	4	20	● (Gold)	
Hadley Industries Plc	0121 555 1342	✓	M	4		● (Silver)	
Hi-Span Ltd	01953 603081	✓	M	4		● (Member)	
Jamestown Manufacturing Ltd	**00 353 45 434288**	✓	**M**	4	20		**Headline**
Kingspan Structural Products	01944 712000	✓	M	4		● (Gold)	
MSW UK Ltd	0115 946 2316		D/I				
Prodeck-Fixing Ltd	01278 780586	✓	D/I				
Structural Metal Decks Ltd	01202 718898	✓	M	2			
Stud-Deck Services Ltd	01335 390069		D/I				
Tata Steel – ComFlor	01244 892199		M				
voestalpine Metsec plc	**0121 601 6000**	✓	**M**	4		● (Gold)	**Gold**

Computer software

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Idea Statica UK Ltd	02035 799397		N/A				
StruMIS Ltd	01332 545800		N/A				
Trimble Solutions (UK) Ltd	0113 887 9790		N/A				

Steel producers

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

Manufacturing equipment

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

Protective systems

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Forward Protective Coatings Ltd	01623 748323	✓	N/A				
Hempel UK Ltd	**01633 874024**	✓	**N/A**				**Bronze**
Highland Metals Ltd	01343 548855	✓	N/A				
International Paint Ltd	0191 469 6111	✓	N/A				
Jack Tighe Ltd	**01302 880360**	✓	**N/A**		**19A**		**Silver**
Joseph Ash Galvanizing	01246 854650	✓	N/A				
PPG Architectural Coatings UK & Ireland	01924 354233	✓	N/A				
Sherwin-Williams Protective & Marine Coatings	**01204 521771**	✓	**N/A**			● (Silver)	**Bronze**
Vale Protective Coatings Ltd	01949 869784		N/A				
Wedge Group Galvanizing Ltd	**01909 486384**	✓	**N/A**				**Gold**

Safety systems

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
easi-edge Ltd	01777 870901	✓	N/A			● (Gold)	

Steel stockholders

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

Structural fasteners

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
BAPP Group Ltd	01226 383824	✓	M		3		
Cooper & Turner Ltd	0114 256 0057	✓	M		3		
Henry Venables Products Ltd T/A Blind Bolt	01299 272955		M				
Lindapter International	01274 521444	✓	M				
Tension Control Bolts Ltd	**01978 661122**	✓	**M**		**3**		**Bronze**

Welding equipment and consumables

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