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NSC

JULY/AUGUST 2022
Vol 30 No 7

Cover Image
Oatly factory, Peterborough
Client: Oatley
Architect: DB3 Architecture & Design
Main contractor: IFP Construction
Structural engineer: SDA Design Consultants
Steelwork contractor: SDM Fabrication
Steel tonnage: 2,160t

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Shortlist shows world-leading steelwork

Nick Barrett - Editor

As BCSA President Mark Denham pointed out in his speech at the National Dinner in June, the past few years have been challenging times for the construction industry. Coping with the implications of Brexit and then the COVID-19 pandemic stretched all industries, but construction pulled through in relatively good shape. The value of a reliable and well proven supply chain such as the steel construction sector's was clearly shown, but hopes for a few years of stability were dashed when Russia invaded Ukraine, sparking off new problems of material shortages and now steep and general price inflation.

Since the President's speech further uncertainty has been created by the imminent change of UK government, preceded by the Prime Minister and the Chancellor of the Exchequer reportedly disagreeing over whether to prioritise tax cuts or increased public spending. Planning for the future with any confidence in the midst of upheavals like these has been a major corporate challenge of our times.

The constructional steelwork sector, as the President said, is in robust good shape and is well prepared to tackle whatever challenges might arise. The sector hopes that recent commitments made to sustainability by the government will survive any change in Prime Minister or any other Cabinet post, because an increased focus on sustainability can only help spread the word that steel is the most sustainable of all construction materials. The BCSA's Roadmap to Net Zero has spelled out the sector's own commitment to achieving those goals, and how it intends to achieve it.

Steel construction already demonstrates high sustainability values as publication of the shortlist for the Structural Steel Design Awards (SSDA) shows (see News). The SSDA is one of the most keenly anticipated events of the structural engineering year - as it has been now for an impressive 54 years. Securing an Award is a valuable recognition of the skill and effort that goes into creating one of these outstanding structures. As well as helping with marketing of steelwork contractors, architects, engineers and contractors, the Awards are valued as recognition from within the steelwork construction peer group.

The shortlist is as good an advertisement for the achievements of an industry as can be found anywhere in the steel construction world; the UK steel construction sector is envied internationally. There isn't a single project on the shortlist this year - or any other year for that matter - that fails to demonstrate steel's ability to deliver a highly sustainable achievement. That is as true whether the project is a large multi-storey office or retail development, a leisure centre, a landmark footbridge, an emergency services headquarters building, a school, industrial facilities serving growth industries, or nationally important sports facilities.

Threats always exist to the continuing ability of any industry to deliver at its best, but at the time of writing at least there is nothing in view that looks likely to knock the UK's steel construction sector seriously off course. Complacency is always a threat, but the BCSA's extensive programme of ongoing technical and market development proves that is not likely to overtake the sector.

There are several steps that could be taken by the wider industry and its clients to further support the steel sector's ability to continue delivering quality projects like those on the shortlist, as alluded to in successive statements from BCSA Presidents and officers. Chief among them of course is to insist on using a BCSA member steelwork contractor. It is no accident that most of those involved in shortlisted projects are members. Can non-BCSA members consistently cut it in this company? Draw your own conclusions.

BCSA joins industry-wide net-zero solutions group

The British Constructional Steelwork Association (BCSA) is now a partner of CO_2nstructZero, joining over 100 other construction organisations.

"CO_2nstructZero is a new, industry-wide initiative led by the Construction Leadership Council. Its role is not to develop new solutions, but to bring people and organisations together to consolidate collective actions and plans for the sector," said BCSA Sustainability Manager Michael Sansom.

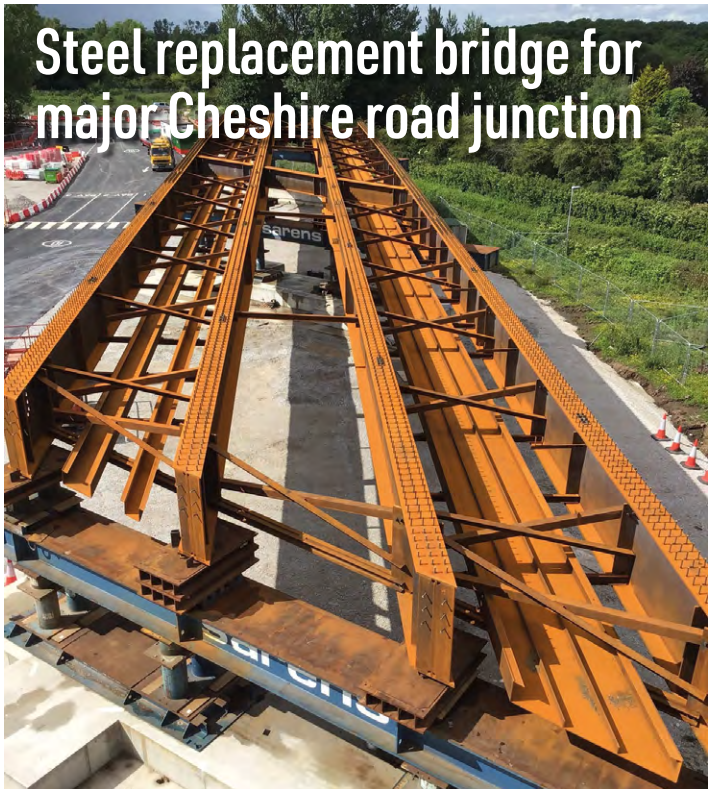
CO_2nstructZero is the construction sector's response to the Government's commitment to be net-zero by 2050 and sets out how the industry can collectively meet this target. Using the Climate Change Committee's 6th Carbon budget, CO_2nstructZero defines nine priorities that form an action plan and sets out how progress will be measured.

The nine priorities are:

1. Accelerating the shift of the construction workforce to zero emission vehicles and onsite plant.
2. Optimise the use of modern methods of construction and improved onsite logistics.
3. Championing developments that enable connectivity with low carbon modes of transport.
4. Retrofit buildings to improve the energy efficiency of the existing housing stock.
5. Scale up industry capability to deliver low carbon heat solutions in buildings.
6. Enhance the energy performance of new and existing buildings.
7. Implement carbon measurement to support our construction projects in making quantifiable decisions to remove carbon.
8. Become world leaders in designing out carbon, developing the capability of designers and construction professionals.
9. Support development of innovative low carbon materials as well as advancing low carbon solutions for manufacturing production processes and distribution.

To measure progress, CO_2nstructZero has published a Performance Framework which sets out the nine headline commitments and the metrics for measurement progress.

Steel replacement bridge for major Cheshire road junction



Approximately 293t of structural steelwork has been used to construct the 68m-long M56/A533 replacement bridge in Cheshire.

Situated between junctions 11 and 12 of the M56, the bridge will replace an older structure to form a new vital link across the motorway for traffic going to Runcorn and Northwich.

The bridge is a two-span weathering steel structure, which will carry a two-lane carriageway and a combined footpath/cycleway.

According to National Highways, the replacement of this bridge will ensure an increased life span of over 120 years for road users, maintaining safety in the long term.

Working on behalf of the Amey/Sir Robert McAlpine JV, Briton Fabricators initially trial erected the entire steel structure at its fabrication yard, prior to delivering it to an assembly point close to its final location.

"By undertaking a trial assembly, we ensured the steelwork could be assembled onsite without any unforeseen challenges," says Briton Fabricators Commercial Director Dean Morcom.

"We then delivered the steel structure and installed it onto the client's trestle system, where the deck slab is now being constructed in readiness for the complete bridge to be moved by SPMTs to its final location."

The bridge is due to be open by summer 2023.

Milestone reached for innovative steel bricks system

A major milestone for the Steel Bricks modular system, fabricated by Caunton Engineering, has been reached as a number of prototype components are now ready for shipment to the USA.

GE Hitachi nuclear power plant experts have visited the Caunton factory to inspect the modules prior to them being sent to Purdue University in Illinois, where they will be tested for their suitability in the construction of nuclear facilities.

Steel Bricks is a modular steel construction system developed by Modular Walling Systems (MWS), with involvement by Caunton Engineering. The system has been included in a multi-million-dollar programme to be delivered within the U.S. Department of Energy's Advanced Construction Technology (ACT) initiative, aimed at making advanced nuclear construction faster and more affordable.

The Steel Bricks modular system is a ground-breaking product developed in 2014 and backed by the UK Government with nearly £1.2M in funding from Innovate UK.

GE Hitachi Nuclear Energy, the world-leading provider of nuclear power plant technology, is leading a team to explore promising technologies from other industries that have not been tested within the context of nuclear energy.

GE Hitachi Vice President Brian Johnston said: "The steel composite prototypes, which have no rebar, could dramatically reduce the amount of labour in the field of nuclear plant construction."

Caunton Engineering welcomed a team from GE Hitachi, Aecon Group, Black and Veatch and MWS to view the Steel Brick modules.

SSDA shortlist announced

The shortlist for the 54th Structural Steel Design Awards (SSDA) jointly sponsored by the British Constructional Steelwork Association (BCSA) and Trimble Solutions (UK), has been announced.

The Awards have again seen a strong number of submissions and the 21 shortlisted projects once again showcase steel's sustainability credentials, flexibility and versatility in a number of varying applications, spread across the UK.

The winners will be announced at an evening reception in London on 29th September.

BCSA Chief Executive Officer David Moore said: "The construction industry remains focused on delivering low carbon structures that meet the ever-changing demands of clients and the climate emergency. Structural steelwork is the original sustainable material that can be re-used and recycled time and time again. and still deliver efficient, practical, and flexible spaces that are both beautiful and cost-effective.

2021/22 has been another challenging year. In the autumn/winter of 2021 and early 2022 it looked like COVID-19 was largely under control and the lifting of restrictions would bring the economy back to pre-pandemic levels. However, the war in Ukraine resulted in significant increases in energy prices, supply issues for certain construction materials and inflation approaching 10%, but even with these trials the constructional steelwork sector remains buoyant and continues to provide low carbon, high quality structures for demanding clients."

Steven Insley, Business Director - UK & Ireland, Trimble added: "In its 54th year, Trimble are once again delighted to continue to be associated with the Structural Steel Design Awards and are further inspired with the level of excellence in the use of this adaptable and sustainable structural material that they display."

The SSDA 2022 shortlist (see page 11) is:

- **1 Triton Square, London**
- **22 Bishopsgate, London**
- **Abbey-Chesterton Bridge, Cambridge**
- **Assembly Bristol, Building A**
- **Bloom Clerkenwell, London**
- **Bombardier Maintenance Hangar, Biggin Hill**
- **Britannia Leisure Centre, Hackney**
- **Central Atrium at Hilltop, RHS Wisley**
- **Esperance Bridge, Kings Cross**
- **Fire Station Auditorium, Sunderland**
- **Houlton School, Rugby**
- **Hydro Ness, Inverness**
- **Joules Head Office, Market Harborough**
- **LCT 7074 Canopy, The D-Day Story, Portsmouth**
- **Lord's Cricket Ground, Compton & Edrich Stands Redevelopment**
- **One Braham, London**
- **One Crown Place, London**
- **Pace Gallery, Hanover Square, London**
- **St James Quarter, Edinburgh**
- **The Glass Works, Barnsley**
- **Tower of Light, Manchester**

High-level steelwork completes on London residential towers

Forming external rooftop plant enclosures, high-level steelwork erection has been completed on two of London's tallest residential towers.

Working on behalf of Multiplex, Bourne Steel has erected approximately 105t of steelwork on the 42-storey River Tower, and most recently on the 56-storey City Tower (pictured), both located in Nine Elms, south London.

As well as the rooftop steelwork, the company has also erected an 18m-long link bridge, that connects the two towers.

In order to limit risk, the amount of working at height and the number of crane lifts, the rooftop steelwork was modularised. This consisted of fully welded assemblies being brought to site that consisted of up to three 6m-high beams and connecting crossbeams. The heaviest assembly weighed 3.5t.

"On the River Tower, the steelwork was brought to site piece-small and bolted into assemblies on the ground before being lifted into place," says Bourne Steel Project Manager Duncan Wyatt.

"For the City Tower, we rationalised our work and decided to pre-weld the assemblies offsite, which was a safer and more economic method."

On completion, the scheme will provide in excess of 67,800m² of residential

apartments, as well as a 173-room luxury hotel that will occupy the lower levels – up to floor 18 – in the River Tower.

Contractor named for Silverstone residential scheme

HG Construction has been appointed as the main contractor for the exclusive Escapade Silverstone trackside residential scheme.

The landmark scheme will transform some of the trackside at the iconic Silverstone racetrack with 60 steel-framed contemporary residences and a clubhouse designed by Twelve Architects.

The Escapade residences will offer guests light-filled entertaining spaces, high specification acoustics and ensuite bathrooms, in addition to car parking. The two-storey clubhouse will boast an indoor swimming pool and sauna along with treatment rooms on the ground floor, with floor-to-ceiling windows and comfortable dining facilities on the first floor as well as an 8.5m-high roof terrace. Other amenities include a performance-focused gym and a private briefing room designed to enhance the year-round visitor experience at the UK's only Grade 1 circuit.

NEWS IN BRIEF

Severfield has reported a resilient performance for the 12-month period ending 26 March 2022, with an 11% revenue increase and profit before tax also up by the same percentage. The group's revenue was up 11% to £403.6M from £363.3M in 2021, while profit before tax stood at £27.1M, compared to £24.3M the previous year. Its record UK and Europe order book of £486M at June 2022, includes new industrial and distribution hubs, film studios, commercial offices and bridge orders, alongside the new stadium for Everton FC.

Steelwork erection is progressing on a 46,400m² logistics hub on the 21-acre Peterborough South site at Kingston Park. **Glencar Construction** is the main contractor and has been appointed by real estate developer Firethorn Trust. A total of three steel portal-framed warehouses are being built with steelwork designed, fabricated and erected by **Caunton Engineering.**

Willmott Dixon has been chosen by Milton Keynes Council to construct a £8.8M new primary school and nursery that will accommodate pupils as part of a wider plan for the Western Expansion Area. Located on Calverton Lane, Watling Primary School and Nursery will support local education provision for the housing developments of Fairfields and Whitehouse.

Caddick Construction has been appointed by Radius Payment Solutions to deliver its £14.6M state-of-the-art facilities at Arden Square on Crewe Business Park. The three-storey office structure will be constructed to BREEAM 'Excellent' standards and has been designed with a focus on employee wellbeing. Features include a barista coffee bar, pizzeria, Star Wars themed sky bar and outdoor seating, and yoga areas all built around a conical-shaped glazed atrium.

Scottish Championship side **Dundee** has unveiled plans for a new 15,000-capacity stadium to replace its current home at Dens Park. As well as a new football stadium, the project at Camperdown Park will include a conference venue capable of accommodating 850 guests, a 120-bed hotel, and leisure and retail facilities.

PRESIDENT'S COLUMN

Steelwork contractor members of the BCSA fabricate and erect half of the structural steel in the UK and Ireland, but there are literally hundreds of other steelwork contractors that are not members. Why is that, particularly now The Building Safety Act has been enacted in English law with its increased focus on competence and capability in the UK construction industry? What better way to demonstrate your competence and capability as a steelwork contractor than by becoming a BCSA member who has undergone a rigorous annual audit to be listed on the Register of Qualified Steelwork Contractors (RQSC)? The audit checks the competence, capability and financial strength of the steelwork contractor to safely execute various types of buildings and to what guide contract value. Published monthly at the back of this magazine, the RQSC listing is an essential guide for principal contractors and construction professionals to assist them in carrying out their due diligence responsibilities when selecting a competent steelwork contractor for their project.

Joining BCSA also gives a steelwork contractor access to specialist resources and advice on technical, legal, contractual, regulatory and health & safety issues, to name but a few, as well as promotional opportunities. All of the projects featured in this magazine are by BCSA member steelwork contractors and the Structural Steel Design Awards allows BCSA member steelwork contractors to showcase their projects both in this magazine and at the Awards event in September. There is also the opportunity to lobby government on key industry issues. In June, the BCSA hosted its first House of Commons member's lunch where BCSA members from across the UK met 11 local MPs with an interest in the steel construction sector to promote the industry and discuss key issues.

However, a primary purpose of the BCSA is to make steelwork the material of choice for clients, construction professionals and principal contractors, to grow the market for steel construction and create sales opportunities for its members. Working in partnership with UK steel manufacturers and the SCI, the BCSA has an enviable track record in market development over very many years. Demonstrating the cost-effectiveness of steel construction and promoting its carbon, reuse, recycling and circular economy credentials has resulted in steel's market share in the UK being significantly higher than elsewhere in the world. Efficient design is more important today than ever as we tackle the climate emergency and BCSA already has plans in place to update the vast library of steel design guidance and software to support the change to the Generation 2 Eurocodes that are currently nearing completion.

The latest forecast for the amount of constructional steelwork consumed in the UK for 2022 is 913,000 tonnes, which is almost back to the historic average consumption often quoted as 1,000,000 tonnes. But, the market would not be that size save for the activity of BCSA and its members.

So, to the hundreds of other steelwork contractors that are not members, I say join us. Stop riding on the coat tails of others, join BCSA, access the benefits, demonstrate your competence and capability and play your part in developing the UK steel construction industry further. And to the principal contractors and construction professionals reading this column, make life easy for yourself and choose a BCSA steelwork contractor member for your next project, as it will go a long way in satisfying the requirement for competent and capable sub-contractors.

Mark Denham
BCSA President

BCSA President praises steelwork sector's resilience

Speaking at the British Constructional Steelwork Association's (BCSA) National Dinner, sponsored by Barrett Steel, Strumis and Ficep, BCSA President Mark Denham reminded attendees of the steelwork sector's strength, resilience and adaptability.

Mr Denham said the sector had survived an unprecedented period of challenges and uncertainty and remains robust and successful.

"If you can cast your mind back to the night of the 23rd June 2016, it was the date of one of our National Dinners and it was also the date of the EU referendum.

"Did anybody think we were going to wake up to a "leave" result the morning after. Whether you voted for it or you didn't, Brexit caused a period of great uncertainty. As the Brexit dust began to settle, I like many others thought things were getting better.

"Then along came the various waves of COVID with their lockdowns, furlough schemes and business retention loans all to be dealt with on top of your normal workloads. But, deal with them we did. The steel construction industry adapted and continued when many other industries stalled."

As the worst effects of the pandemic receded and demand increased, the industry has had to deal with a number of other serious issues.

"To compound matters, the terrible loss of life and suffering caused by Russia's invasion of the Ukraine has also had consequences for our industry, with further price volatility and material availability problems adversely affecting budgets and programmes on many schemes.

"Going forward, I believe that although we've had to contend with large inflationary pressures in the recent past, a lot of these pressures have now plateaued and if this new stability can be maintained, we may all have a "soft landing" after this latest crisis.

"But, what I do know, is that there have not been too many cases of companies ceasing to trade, which is a real achievement in this kind of trading environment. It's reassuring to know that despite all of these challenges, the UK steel construction industry remains robust and successful."

Ground broken at St Mowden Park Stoke Central

Winvic Construction has begun work to build a 23,500m² warehouse at St. Modwen Park Stoke Central which will be home to Stoke-based National Veterinary Services (NVS).

The project comprises a warehouse with a 15m clear haunch height, three-storey offices totalling 2,248m² and a 306m² two-storey transport office.

Externally, Winvic will deliver the enabling civils and infrastructure works to create the development plateau and install all underground services, drainage and an attenuation pond. Soft landscaping will also be undertaken and parking for 235 cars – with 20 per cent electric charging points – and 51 HGVs will be created.

Scheduled to complete in November 2022, with early access provision in October, the project has been designed with Winvic's input to the St. Modwen Swan Standard which focuses on sustainability. Severfield will be fabricating, supplying and erecting the steelwork.

The sustainability features include an EPC Rating 'A', a BREEAM 'Excellent' rating, utilising a hybrid air source heat pump and a carbon neutral envelope system.

Planning permission granted for latest Paradise Birmingham scheme

The £1.2bn Paradise Birmingham project has received planning approval from the city council for a new 10-storey commercial building – the fourth office block on the estate.

Forming a key part of the second phase of the Paradise masterplan, Three Chamberlain Square is said to be grounded in sustainability according to developer MEPC, and will be a first for Birmingham in terms of environmental standards.

In addition to incorporating a low carbon approach to materials, waste and construction, the design of the scheme builds in a low carbon future for its occupiers.

The building will offer 200 bike spaces and dedicated changing facilities, all electric power and heating, and stairwell connections between floors.

Designed by architects Feilden Clegg Bradley Studios, Three Chamberlain Square is said to be a statement of sustainability for the city and aims to be one of the greenest commercial buildings built in the UK post-COVID-19.

Steelwork creating new school at Walton-on-Thames

Working on behalf of BAM Construction, Elland Steel Structures (ESS) has fabricated, supplied and erected 535t of steelwork for the new Heathside School in Walton-on-Thames.

The 900-pupil steel-framed secondary school will include two main conjoined three-storey teaching blocks and a sports hall. The upper floors of the blocks are formed with steel beams supporting precast planks. This has required ESS to supply and install 5,400m² of precast

planks for the project.

The ground floor will typically accommodate the practical spaces, school administration and the sports, drama and main hall. The first floor will accommodate the teaching and learning spaces and also the library. The second floor will have further general teaching and learning spaces, as well as science laboratories.

Complementing the indoor facilities, the school will also have a playing field for football, cricket and rugby, a multi-use games area, car parking and an amphitheatre.

Heathside School is due to open in autumn 2023.

Plans revealed for innovative West Dunbartonshire energy centre

Plans for an innovative £20M facility in West Dunbartonshire to turn waste plastic into hydrogen and support the UK's energy transition to net-zero have been approved.

West Dunbartonshire Council have given the green light to the plant, the second of its kind in the UK. The plans were lodged by Peel NRE – part of Peel L&P – for the site at Rothesay Dock on the north bank of the River Clyde.

The 13,500-tonne facility will use Powerhouse Energy Plc's pioneering technology to create a local source of sustainable hydrogen from non-recyclable

plastics, destined for landfill, incineration or export overseas.

The hydrogen will be used as a clean fuel for HGVs, buses and cars, with plans for a linked hydrogen refuelling station on the site. It follows the Government doubling its hydrogen production target by 2030 as part of the recently-published Energy Security Strategy, so more clean and affordable energy can be produced in Britain as energy prices continue to rise globally.

Richard Barker, Development Director at Peel NRE, said: "This is a fantastic moment for West Dunbartonshire and the surrounding area. It shows how the UK is innovating when it comes to rolling out new net-zero technologies. The facility will address the dual challenge of both tackling our problem plastic whilst creating hydrogen, a sustainable fuel for future generations."

Medical research centre planned for East Yorkshire

Yorkshire-based property developer Wykeland Group has secured an £80M-plus investment by global medical technology business Smith+Nephew to build a medical research, development and manufacturing facility at the Melton West business park in East Yorkshire.

Located eight miles from Smith+Nephew's current site in Hull, Wykeland said the investment will create a world-class R&D, manufacturing and flexible office environment, which is expected to support more than £8bn of sales in its first 10 years of operation.

Dominic Gibbons, Managing Director at Wykeland, and owner and developer of Melton West, said: "We are delighted the strategic, long-term investments we have made in the infrastructure at Melton West have enabled Smith+Nephew to stay within the region and make such a large investment in a state-of-the-art new facility."

The 200-acre Melton West business park is said to be one of Yorkshire and the Humber's premier locations for investment and job creation. It is located west of Hull, off the A63, with easy access to the M62.

Diary

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

Tue 6, Wed 7, Tue 13, Wed 14 September 2022
Essential Steelwork Design
Online
This online course introduces the concepts and principles of steel building design, before explaining in detail the methods employed by Eurocode 3 for designing members in bending, compression and tension. Load combinations, frame stability, brittle fracture and connection design are also covered. The methods are illustrated through a series of worked examples and workshops.

Tuesday 13 September 2022
SCI Tedds Modules:
Turning SCI Guidance into Designers Tools
Webinar, SCI/BCSA members only
This webinar will introduce and demonstrate the first of the newly released SCI add-in modules for the popular 'Tekla Tedds' software. The features of these modules will be illustrated and related to current SCI guidance. The webinar will conclude with a preview of future modules coming soon to the SCI Shop.

Tue 4, Thu 6, Tue 11 October 2022
Light Gauge Steel Design
Online
This course introduces the uses and applications of light gauge steel in construction, before explaining in detail the methods employed by Eurocode 3 for designing light gauge steel members in bending and compression and calculation of section properties. Specific design issues related to the different uses of light gauge steel are addressed.

Getting the purlin specification right

Available in three section types, Z, C and M, light gauge steel purlins, rails and mezzanine sections are a ubiquitous component in a wide variety of structures where lightweight, high-strength structural support systems are essential.

Metsec's side rails and purlins shown erected on a steel-framed project.

Purlins are most often designed and manufactured to meet the specific needs of each individual project, with section type, depth, length and gauge being selected according to the project's requirements.

Getting it right

Design and specification are crucial to the process, not only in ensuring that the final structure meets the necessary performance standards but also in delivering value for the end client; over-specified and the project could cost more than is necessary.

In the UK market of Great Britain (GB), comprising England, Scotland and Wales, the Construction Products Regulation (CPR) places legal obligations on manufacturers, distributors and importers of construction products used within the GB market to place the UKCA (UK Conformity Assessed) mark on their products where they are covered by a UK-designated standard.

The requirements of the CPR and UKCA marking apply to construction products used on a project irrespective of the design standard adopted for that project; for example, BS 5950 or BS EN 1993.

For fabricated structural steelwork, engineers, contractors and steelwork contractors should ensurthat their specifications require only UKCA marked (or CE marked until 31 December 2022) products are used on their projects in GB.

Similar requirements apply in the EU (CE marking) and the UK market of Northern Ireland (CE and UKNI marking).

Execution

For any project, the required quality of fabrication, or Execution Class, must be specified according to the procedures set out in Annex C of BS EN 1993-1-1 and its associated UK National Annex. The Execution Class should be specified for:

- The works as a whole
- An individual component
- A detail of a component

The engineer is responsible for specifying the Execution Class for the structure (the works as a whole). If the Execution Class for components and details is different to that specified for the structure, the Execution Class for these should not be lower than that specified for the works as a whole and should be clearly identified in the execution specification.

For the majority of buildings constructed in the UK, EXC2 will be the appropriate requirement.

The engineer should always derive the Execution Class based on the design parameters appropriate to each project. The quality requirements to each Execution Class are listed in Table A3 of BS EN 1090-2 and can be reviewed by the engineer if desired.

As mentioned, there is a danger for solutions to be over-specified and incur unnecessary costs. For example, if a project has an Execution Class of EXC2 but the engineer requires full traceability (an EXC3 requirement) instead of the partial (or batch) traceability requirement of EXC2, rather than specifying EXC3 on the basis of achieving this single clause requirement, it is suggested that EXC2 is still specified but with the higher level of traceability added to the specification.

BS EN 1993-1-1 states that the selection of Execution Class should be based on the following three factors:

1. The required reliability
2. The type of structure, component or detail; and
3. The type of loading for which the structure, component or detail is designed.

Guidance on the straightforward procedure for determining the Execution Class for buildings is freely available on *www.steelconstruction.info*.

Getting the numbers right

With mandatory requirements covered, the engineer/designer needs to consider a number of additional factors in determining the specification and number of purlins required for a given application. Depending on what the purlins are being used for (roofs, side rails, mezzanine floors, etc.), these might include snow drifting, tiled roof, steep slope and wind loading.

Most purlin manufacturers will offer assistance in the design process, but Metsec leads the market with its dedicated software package, MetSPEC. Freely available for download, the package incorporates both British Standards and Eurocodes as well as the full range of Metsec purlin sizes to ensure that the specification process is as easy as possible.

The company also offers a comprehensive library of standard connections and macros for use with the Tekla Structures 3D modelling software.

Combined with expert technical support, these software packages ensure that the purlin specification process is as smooth and painless as possible, saving the engineer/designer time and ensuring that the end client receives value for money ■

A side rail with sleeve.

SSDA Shortlist 2022

A total of 21 diverse projects from around the UK that highlight steelwork's numerous attributes have made it onto the shortlist for the 2022 Structural Steel Design Awards, which are jointly sponsored by the British Constructional Steelwork Association and Trimble Solutions (UK) Ltd.

22 Bishopsgate, London

Architect: PLP Architecture
Structural engineer: WSP
Steelwork contractor: Severfield
Main contractor: Multiplex
Client: Lipton Rogers Developments

Britannia Leisure Centre, Hackney

Architect: Faulknerbowns Architects
Structural engineer: Buro Happold
Steelwork contractor: Severfield
Main contractor: Morgan Sindall Construction
Client: Hackney Council

© David Valinsky

Tower of Light, Manchester

Architect: Tonkin Liu
Structural engineer: Arup
Main contractor: Vital Energi
Client: Manchester City Council

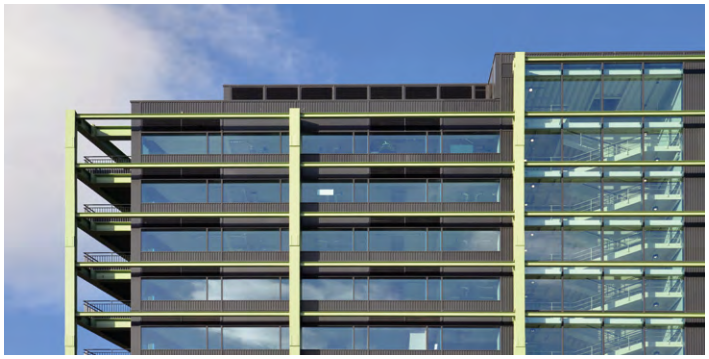
© Simon Kennedy

1 Triton Square, London

Architect: Arup Associates
Structural engineer: Arup
Steelwork contractor: William Hare
Main contractor: Lendlease
Client: British Land

Abbey-Chesterton Bridge, Cambridge

Architect: Knight Architects
Structural engineer: Milestone Infrastructure
Steelwork contractor: S H Structures Ltd
Main contractor: Tarmac
Client: Cambridgeshire County Council



Assembly Bristol, Building A

Architect: Allford Hall Monaghan Morris
Structural engineer: Arup
Steelwork contractor: Severfield
Main contractor: Galliford Try
Client: Bell Hammer

Bloom Clerkenwell, London

Architect: John Robertson Architects Ltd
Structural engineer: Buro Happold
Steelwork contractor: Severfield
Main contractor: HB Reavis UK Ltd
Client: HB Reavis UK Ltd

Bombardier Maintenance Hangar, Biggin Hill

Architect: Civils Contracting Ltd
Structural engineer: REIDsteel
Steelwork contractor: REIDsteel
Main contractor: Civils Contracting Ltd
Client: Biggin Hill Airport Development Ltd

Central Atrium at Hilltop, RHS Wisley

Architect: WilkinsonEyre
Structural engineer: Michael Barclay Partnership LLP
Steelwork contractor: Hillcrest Structural Ltd
Main contractor: Osborne Ltd
Client: Royal Horticultural Society

St James Quarter, Edinburgh

Architect: BDP
Structural engineer: Arup
Steelwork contractor: BHC Ltd
Main contractor: Laing O'Rourke
Client: Nuveen

© Simon Kennedy

Esperance Bridge, Kings Cross

Architect: Moxon Architects
Structural engineer: Arup
Steelwork contractor: S H Structures Ltd
Main contractor: Galldris
Client: Argent

© David Allan

Fire Station Auditorium, Sunderland

Architects: Flanagan Lawrence, Howarth Litchfield
Structural engineer: JC Consulting
Main contractor: Brims Construction Ltd
Client: The Sunderland Music, Arts & Culture Trust

© James Britain

Houlton School, Rugby

Architect: Van Heyningen and Haward Architects
Structural engineer: Price & Myers
Steelwork contractor (new blocks): Mifflin Construction Ltd
Main contractor: Morgan Sindall Construction
Client – Urban&Civic plc


© Keith Hunter

Hydro Ness, Inverness

Architect: Leslie Hutt Architect
Structural engineer: Hasson Engineering Solutions
Steelwork contractor: M.Hasson and Sons Ltd
Main contractors: Bradley and Company, Hydro NI
Client: Highland Council

Joules Head Office, Market Harborough

Architect: Edge
Structural engineer: Cundall
Main contractor: Bailey Construction Ltd
Client: Joules

© Peter Langdown

LCT 7074 Canopy, The D-Day Story, Portsmouth

Architect: Pritchard Architecture
Structural engineer: Mann Williams
Steelwork contractor: Hillcrest Structural Ltd
Main contractor: Ascia Construction Ltd
Clients: The National Museum of the Royal Navy, Portsmouth City Council

Lord's Cricket Ground, Compton & Edrich Stands Redevelopment

Architect: WilkinsonEyre
Structural engineer: Buro Happold
Steelwork contractor: Severfield
Main contractor: ISG Construction
Client: Marylebone Cricket Club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One Braham, London

Architect: WilkinsonEyre
Structural engineer: Arup
Steelwork contractor: Severfield
Main contractor: McLaughlin & Harvey
Client: Aldgate Developments


© Hufton and Crow

One Crown Place, London

Architect: KPF
Structural engineer: AKT II
Steelwork contractor: Severfield
Main contractor: Mace
Client: AlloyMtd


© Matt Clayton

Pace Gallery, Hanover Square, London

Architect: Jamie Fobert Architects
Structural engineer: Price & Myers
Main contractor: QOB Interiors
Client: Pace Gallery

The Glass Works, Barnsley

Architect: IBI Group
Structural engineer: Adept Civil and Structural Consulting Engineers
Steelwork contractor: Billington Structures Ltd
Main contractor: Henry Boot Construction Ltd
Client: Barnsley Metropolitan Borough Council

Steel creates much-needed logistics space

Oxfordshire's increasing demand for small and medium-sized warehouses will be alleviated by the construction of a new business park containing 14 steel-framed units.

The market for warehousing, logistics and industrial space, normally satisfied with large open-plan structures, commonly referred to as sheds, has seen rapid growth over the last few years.

Some of this growth can be attributed to the increase in online shopping, due in part to the COVID-19 pandemic and the general change in people's retail habits, which have had the knock-on effect of companies needing more warehouse and distribution space.

Another contributing factor is the trend towards firms wanting modern, larger out-of-town premises, that are better connected to transport links, such as the motorway network.

Hoping to satisfy some of the demand in Oxfordshire is a new greenfield development near Thame, known as Christmas Hill Business Park.

Phase one of this scheme, being developed by Westhall Estates and constructed by Parkway Construction, will consist of 14 steel-framed small and medium sized warehouse/industrial units, accommodated in seven portal-framed structures. The overall scheme could get even larger, as a second phase is planned on an adjacent plot.

Westhall Estates Director Matt Sutton says: "While Thame continues to be well represented by small, medium and large businesses, their growth plans are invariably constrained by a lack of suitable stock, resulting in companies relocating away from the town and into neighbouring districts.

"Potential inward investors are also prevented from relocating to the town for similar reasons and this site will be an invaluable addition to the town's supply."

The scheme's steel-framed units are equipped with fully fitted open-plan ancillary offices with showers and changing facilities. The entire development has been designed to a high standard with large 50m service yards, 50kN/m² floor loadings, BREEAM 'Excellent' and EPC 'A' ratings, PV renewable energy and electric vehicle charging points.

Inheriting a greenfield site, Parkway's initial task was to begin a large earthmoving exercise, followed by a ground stabilisation programme. The site previously sloped away from the main entry point along the A329, and necessitated a retaining wall being installed along one boundary. Some of the site's footprint has been dug out to create plateaus for the warehouse units, with the overburden then used to infill other areas of the plot.

This has meant that very little material has left the site, meaning there have been fewer truck movements on the local roads.

The groundworks, including the installation of pad foundations, have been immediately followed by the steelwork erection, which began with construction of Unit 15, which is positioned close to the site's entrance.

This unit, which has a single 30m-wide internal span and measures 67m-long and 10m-high to the underside of the haunch, required 89t of structural steelwork.

Structural steelwork was the most appropriate framing solution for this project according to Bailey Johnson Hayes' Partner Bill Bailey.

"Cost and availability as well as the ease with which the material can form the required internal spans, make steel the right choice for this development," he says.

Working in coordination with the ongoing groundworks programme, steelwork contractor H Young Structures has subsequently erected the remaining structures whenever the plateaus have been made ready.

Unit 15 is one of only two structures that consists of a single warehouse space, the other is the slightly smaller unit 11.

However, flexibility is at the heart of the project, and these single warehouse structures could be subdivided into smaller spaces if required, while other buildings on the site that contain two or more units, could also be reconfigured if necessary as their partition walls could be removed.

The largest structure, by far on the Christmas Hill site, accommodates units 9 and 10. This building is 152m-long × 53m-wide and is 15m-high.

Requiring more than 300t of structural

FACT FILE
Christmas Hill Business Park, Thame, Oxfordshire
Main client: **Westhall Estates**
Architect: **Stephen George & Partners**
Main contractor: **Parkway Construction**
Structural engineer: **Bailey Johnson Hayes**
Steelwork contractor: **H Young Structures**
Steel tonnage: **700t**

Steel erection progresses on the site's largest structure, which will acommodate units 9 and 10.

Many of the structures will be divided into smaller units.

Site plan for phase one of the Christmas Hill Business Park

The smaller units contain mezzanine levels for plant and office space.

steelwork, the structure has two 26.5m-wide spans, formed with spliced roof rafters, which were brought to site in halves, assembled on the ground and then lifted into place as complete sections.

The structure will be divided into two units with an internal blockwork wall positioned roughly two-thirds along its length. Unit 10 is larger than its neighbour with 4,755m² of floor area, compared to unit 9's 3,075m². Both units have internal two-storey office areas.

The other structures on the site consist of units 1 and 2, housed in a single structure measuring 32m-long x 16m-wide and units 3, 4, 5 and 6, which are all accommodated in a 67m-long × 19m-wide building. All of these units are single-span structures that have no internal columns and contain office space, located on mezzanine levels.

The mezzanines are formed compositely, with steel beams supporting metal decking and a concrete topping. Again, flexibility has been included in the design, as these floors can also be used as internal plant decks.

The remaining two structures are both split into two equal spaces. Units 7 and 8, are housed in an 85m-long structure that is 28m-wide and 12.5m-high, while units 12 and 14 (there is no unit 13) are accommodated in a slightly smaller 51m-long × 18m-wide block.

Phase one of the Christmas Hill Business Park project is due to complete by the end of the year. ■

"Cost and availability as well as the ease with which the material can form the required internal spans, make steel the right choice for this development."

Cladding is complete on Unit 15, the first structure to be erected on the site.

Steel provides the solution for business park expansion

A leading Thames Valley business park is continuing its expansion plans with the construction of its latest steel-framed Grade A office block.

FACT FILE
Foundation Park, Maidenhead
Main client: **JP Morgan**
Architect: **Scott Brownrigg**
Main contractor: **VolkerFitzpatrick**
Structural engineer: **Hurst Peirce + Malcolm**
Steelwork contractor: **Snashall Steel Fabrications**
Steel tonnage: **400t**

"Structurally, the benefits of using a steel frame outweighed those of a fully RC solution, because a steel frame's lighter weight meant less foundation work."

The completed Building 1 will offer approximately 5,000m² of office space

With excellent transportation links, including direct routes into central London and Heathrow Airport, the Thames Valley has become the preferred location for many domestic and international businesses to set up offices.

A favoured environment is a serviced business park, of which there are many. An example is Foundation Park on the outskirts of Maidenhead, which is said to be one of the area's leading business parks, offering newly developed offices, plenty of amenities, such as an onsite deli, wellbeing facilities and a free shuttle bus service.

The park has expansion plans and this has recently included two new office blocks. Both of these steel-framed structures have been built by VolkerFitzpatrick working on behalf of JP Morgan and subcontracting Severfield for the steelwork package on the initial Building 5 project and Snashall Steel Fabrications (SSF) for the latest Building 1 scheme.

The £13.5M Building 1 development will, on completion, offer approximately 5,000m² of Grade A office space within its three storeys. The structure will feature open-plan workspaces, a full height atrium with internal staircase, and a roof terrace.

The building's façade will comprise curtain walling, infilled with alternating feature panels and glazing units.

Inheriting the site following the demolition of two existing office buildings, VolkerFitzpatrick aided by VolkerGround Engineering installed 327 CFA piles, up to a depth of 17m.

Explaining the early success of the scheme, VolkerFitzpatrick Project Manager Scott Reynolds says: "Both teams had a tight schedule to meet, with many logistical challenges, due to the site being situated within a live business park, neighbouring an aerodrome.

"Thorough and consistent communication prior and during the piling programme enabled both parties to make key joint decisions, which lead to the piling being completed ahead of schedule. The successful relationship is also reflected in the quality of workmanship."

The completion of the piling works allowed the installation of the building's precast lift shaft, which in turn allowed SSF to begin its steelwork erection programme.

Working in phases, which consisted of erecting the steelwork to its full height, the steel was initially erected to encircle the lift shaft and then proceeded around the footprint in a clockwise direction.

"Having worked on both buildings 5 and 1, a steel-framed solution was the best practical method for constructing these high specification offices - as it was a more economic option. Structurally, the benefits of using a steel frame outweighed those of a fully RC solution, because a steel frame's lighter weight meant less foundation work," explains Hurst Peirce + Malcolm Project Engineer Jack Harrold.

The steel frame is designed around an irregular column spacing, with perimeter column bays ranging in size up to the largest at 7.5m and with internal spans up to 9m-long. The steelwork includes bespoke cellular beams, with fabricated openings that will accommodate the building's services within their depth. The beams also support metal decking and a concrete topping to create a composite flooring solution for the upper two floors and the roof. The exception is the ground floor, which is a concrete slab.

Stability for the steel frame is provided by cross bracings, which are located predominantly around the lift shaft. However, there are further cross bracings installed in one bay to the full height of the building on three façades, excluding the front elevation.

These are architectural stainless steel bracings that will be on show in the completed building as they have been installed within glazed facades.

The centre of the building contains a full-height atrium, which will allow natural daylight into the heart of the structure via a series of rooflights.

Four 14m-long trusses span the roof of the atrium and support the rooflight arrangement. The trusses, which are up to 1m-deep and weigh up to 5.4t each, were brought to site as complete sections and erected using a single 70t-capacity mobile crane.

Visually, the most outstanding feature of Building 1 is the front elevation that contains the main entrance. This part of the structure's two lowest floors are set-back, whereby the uppermost office level forms an overhang and a covered exterior area at the front of the structure for the entrance.

Supporting the overhang are a pair of Y-shaped 457mm-diameter CHS columns. The circular members are approximately 8m-long and weigh up to 1.4t.

The Y-shaped columns were brought to site in two pieces, with one part slightly larger and heavier as it included the base and a stub for the connection of the second CHS member.

The installation of the Y-shaped columns required SSF to use two mobile cranes, with one machine used for supporting the steelwork until a temporary connection had been made. The two parts of each Y-shaped column have a welded connection that was completed later in the programme.

The CHS columns provide lateral stability to the building as this elevation has been designed as a portal frame.

Two cranes were also necessary in order to support and install a pair of large beams that span over the top of the Y-shaped columns and form the underside of the uppermost front floor level. The beams are the largest on the project and measure 18m-long and 14m-long respectively, with the longest section weighing 4.4t.

The CHS column's connection to the underside of the overhanging upper floor was an important consideration as the architectural vision required no visible bolts.

SSF Project Director Mike Austin explains: "The initial designs for the CHS connections were quite tricky. Primarily because they were required to be shallow so they didn't project below the soffit and ruin the aesthetic look of the 'Y' columns.

"The loads on this build were higher than the last structure (Building 5 has a similar design), and as a result, the first set of designs were proving to be dimensionally too large to be hidden from view. There were some quite in-depth discussions between our connection engineer and the steel frame engineer to come to a practical solution which is now on site."

Summing up, VolkerFitzpatrick Senior Site Manager Les Hills says: "I was involved with the steel package from design through to completion and there were many challenges along the way, but with assistance from SSF and Hurst Peirce + Malcolm, we were able to overcome these swiftly. The designs were turned around quickly leading to an early start on-site, ahead of the programme. Having worked on a similar project within the park, I applied all the lessons learnt, which resulted in a high-quality end product." Building 1 at Foundation Park is due to complete in early 2023. ■

Feature raking Y-shaped columns signpost the building's entrance.

Four trusses span the atrium and support rooflights.

One of the atrium's roof trusses in Snashall's fabrication factory.

Landscraper takes shape

Numerous steel design and installation challenges have been overcome for the construction of a unique and highly flexible office building in King's Cross, London. Martin Cooper reports.

The building gradually steps-down towards its southern end.

FACT FILE
KGX1, London
Concept architect: **Heatherwick Studio/ Bjarke Ingels Group**
Delivery architect: **BDP**
Main contractor: **Lend Lease**
Structural engineer: **AKT II**
Steelwork contractor: **Severfield**
Steel tonnage: **16,000t**

Longer than the Shard is tall, an office building like no other in London is currently taking shape adjacent to King's Cross Station. It has been appropriately dubbed a 'landscraper' as it is 320m-long, while the Shard is 310m-tall.

The building, known as KGX1, will also feature a 25m swimming pool, multi-use games area (MUGA), gym, cafes and a landscaped roof garden containing a 200m-long running track. At ground floor, there will be an events and training space auditorium, while the main frontage along King's Boulevard will be occupied by a parade of retail spaces for shops and other businesses.

The steel-framed structure, that also contains significant quantities of timber and glass, features a combination of active and passive environmental design considerations. The project is targeting a BREEAM 'Excellent' rating and LEED 'Gold' with an aspiration of achieving 'Outstanding' and 'Platinum' respectively.

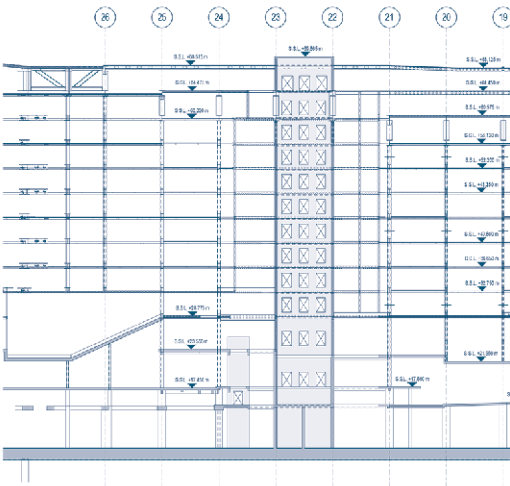
As well as the length of the building, one of the other most noticeable features are the four steps that appear along the building's 320m length. These help the structure gradually increase in height and mimic the sloping topography of the plot. The southern end of the structure is seven-storeys high, while the northern end reaches the full 12-storeys.

Bjarke Ingels, Founding Partner at one of the joint architects of the new building, says: "Our design for the building is rooted in the local character of the area, taking advantage of the contextually defined building envelope while creating continuously cascading work environments that will connect workers across multiple floors. By opening up the ground floor and activating the roofscape, the light and airy workspaces are sandwiched between the terraced gardens on the roof – and market halls, auditoria and shops on the ground."

The steps are said to highlight the cascading nature of the building and will incorporate walkways and staircases, allowing easy access between the floors.

Internally there are five main concrete cores, spaced evenly along the building's length. On both sides of the stability-giving cores there are generally two internal spans, but just one row of columns. This is because there are no perimeter columns at ground floor level in order to create a seamless integration with the King's Boulevard public realm.

The facades are hung from a series of high-level trusses.



The eastern elevation of the 'landscraper' abuts the railway lines at King's Cross station.

Forming another stand-out feature of the building, the façades cantilever by up to approximately 12m and are hung via plated hangers from a series of rooftop trusses that sit within plant room spaces, eliminating the need for perimeter low-level columns and creating a clear open-plan ground floor interface with the Boulevard.

"The architectural vision was to create a seamless space between the boulevard and the building's ground floor, with no intrusive columns," explains AKT II Director Steve Toon.

"A series of high-level trusses was the most appropriate design to meet all other aspirations and challenges. The rear façade also has no perimeter columns as it spans over a Network Rail basement shared access route, pre-constructed on and under the site."

The lack of perimeter columns means there are extremely large loads being transferred into the internal columns. Consequently, the columns, which are spliced at two or three floor intervals, are large fabricated box sections, with the largest measuring 1.2m × 600mm.

Meanwhile, the roof trusses gradually get longer and heavier sequentially along the building's length. This is because the structure splays outwards and gets wider at the northern end as well as incorporating a kink, as the building twists slightly on plan at the widest end.

The most northerly truss is 60m-long × 5.8m-deep and weighs 345t. Each of the trusses were brought to site in transportable pieces, that ranged in weight from 12t elements up to the largest at 25t.

As well as supporting the hanging façades, the trusses are also supporting precast plenum units from their bottom flange. They form the upper parts of the elevation's cladding and rake inwards, following the shape of the trusses.

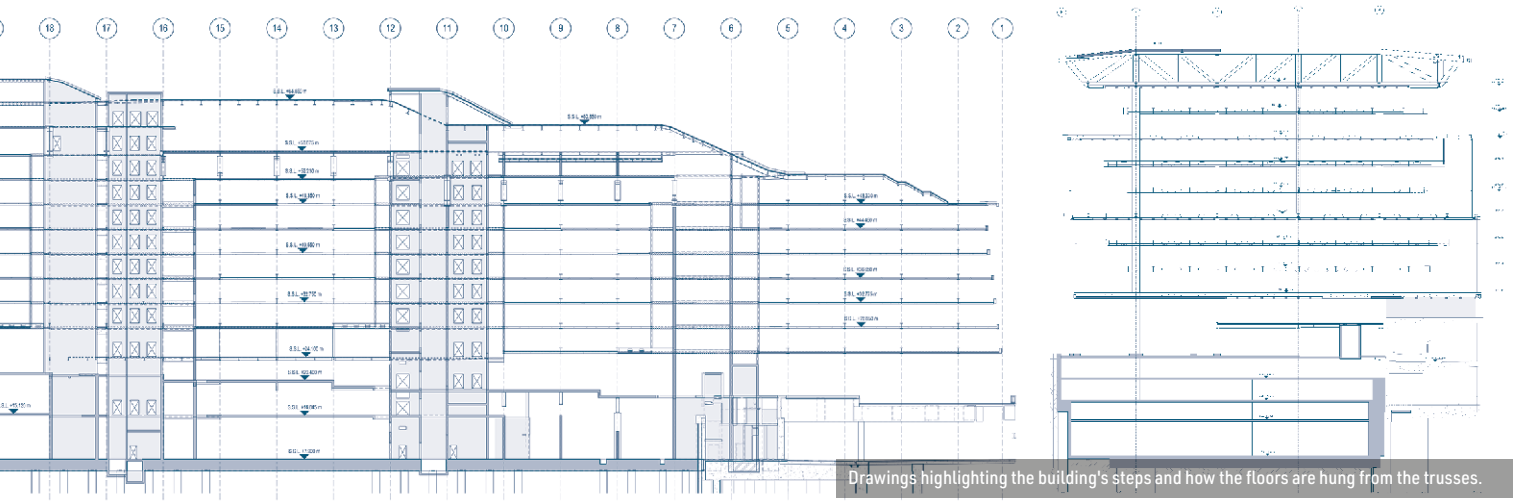
The trusses were installed as part of the overall steelwork erection programme. Steelwork contractor Severfield, split the entire building into a number of phases, and worked sequentially south to north.

However, each phase required a substantial amount of temporary steelwork, to support the hung facades until the floors had been installed to provide sufficient structural stability. Overall, Severfield used 1,700t of temporary steel on the project.

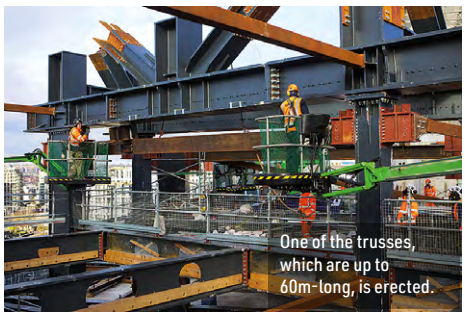
One area in particular that required a substantial amount of temporary steelwork was the ground floor zone within the building's kink.

"This part of the structure, that slightly twists on plan and accommodates the auditorium, could not be constructed with temporary supporting steel members in the way. The solution was a bespoke temporary tower, supporting the trusses above, and placed in the middle of the theatre void," explains Severfield Senior Project Manager Michael Bryars.

▸20



Drawings highlighting the building's steps and how the floors are hung from the trusses.


One of the trusses, which are up to 60m-long, is erected.

▸19

The project's floor construction is a mix of bespoke precast concrete panels and cross laminated timber (CLT), both supported by steel beams, creating the deep floor void for the project's displacement ventilation system.

Below the trusses, the principle floors, which extend to the perimeter façade are formed with precast elements, which will be left exposed on the underside creating a desired warehouse or industrial aesthetic. In between these main floors there are intermediate CLT levels, also hung from above, that are slightly set-back from the perimeter façade, creating double and triple height spaces along the building's perimeters.

Adaptability is at the heart of the building's design, and these CLT floors have predrilled floor beams to allow the easy installation of further steelwork to extend these levels to the perimeter in order to create extra floor space. Conversely, and adding even more flexibility, the CLT floors could be removed, if less floor space or further double or triple height space was required in the future.

Once the floor construction had been completed, a load transfer procedure was undertaken, whereby the temporary steelwork was removed.

"Using a series of jacks, positioned on the tips of the trusses and at ground level at the base of the temporary works, all of the supporting steelwork was removed, while being closely monitored with an automated system. The entire structure's dynamics were changed from a temporary condition to a permanent condition," says Severfield Design Director Ian Dawson.

The load transfer operation has been conducted along most of the building's length, excluding the southern portion of the structure. Here, the initial five bays of the building cantilever through a portalised frame as the cantilever spans are shorter.

Another difference to the design of the southern end of the building is the fact that the trusses are not at roof level, as this only occurs a little further along the structure. Where the trusses are at roof level, up to three levels of metal decked composite floors accommodate the swimming pool and MUGA.

Keeping the inside of a building filled with fresh air has always been an important consideration for offices, but it is even more so since the COVID-19 pandemic.

This building has (as previously mentioned) an air displacement ventilation system, which allows cool air to enter the internal areas at floor level, while the warmer air is extracted at ceiling height. The air conditioning systems are consequently accommodated within a raised floor formed with deep cellular beams, that support the raised floors on their top flange and have service holes within their depth for the air conditioning.

Summing up, Thomas Heatherwick, Founder of Heatherwick Studio, who jointly designed the new building, says: "As my home and the home of my studio for more than 15 years, I have a close relationship with King's Cross. The area is a fascinating collision of diverse building types and spaces and I can't help but love this mix of massive railway stations, roads, canals and other infrastructure all layered up into the most connected point in London."

"Influenced by these surroundings, we have treated this new building like a piece of infrastructure too, made from a family of interchangeable elements which ensure that the building and its workspace will stay flexible for years to come".

The KGX1 building is due to complete by the end of 2023. ■

The use of CLT for intermediate floors

David Brown of the SCI focuses on the use of CLT for the intermediate floors of KGX1

Huge trusses, hangers and massive box section columns – and their splices - are some of the many interesting structural aspects of the KGX1 project; each would be worthy of comment. Also of note are the intermediate floors formed from cross laminated timber (CLT) panels supported on steel beams. The use of CLT demonstrates it is a viable structural alternative to the more usual choice of floor slabs constructed from composite floors on profiled steel sheet or precast concrete. The structural solution at KGX1 involves upstand beams with openings for services and ventilation.

CLT panels consist of several layers of sawn softwood timber boards stacked and glued together with the timber grain of each layer aligned in orthogonally alternating orientation to the adjacent layers. Typically, each layer has a thickness between 20 and 80 mm, and the panels have an odd number of layers. Panels are an engineered product, fabricated and shaped by CNC machinery to tolerances comparable with the steelwork. CLT panels generally have a width between 2.25 and 3.45 m and a length up to 16.5m (limited by transportation restrictions). Although panels may be fabricated up to 500 mm thick, thicknesses between 130 mm and 300 mm are usually found for typical flooring applications, depending on the span. A span to depth ratio of around 25 would be appropriate for initial sizing.

The environmental advantages of CLT are clear, using renewable source material as a dry, offsite manufactured substitute for concrete. Within the

KGX1 project the CLT floors have been designed to be removable, demonstrating a solution which is readily adaptable. Panels can be reshaped, reused and at end of life used as biomass to generate energy.

The obvious concern with CLT is the performance in fire. Unlike concrete, timber is combustible and adds to the potential fire load. The performance of CLT in fire has been extensively studied and recognises that the char offers some protection to the remaining timber layers. Heat resistant adhesives must be used between the layers to prevent delamination. With an appropriate thickness, mass-timber floor panels can achieve 90 min of fire resistance without the need for fire protection. Thicker panels can provide up to two hours of fire resistance. If properly designed and detailed, structural solutions which include timber components offer similar risks in fire compared to other forms of construction. ■

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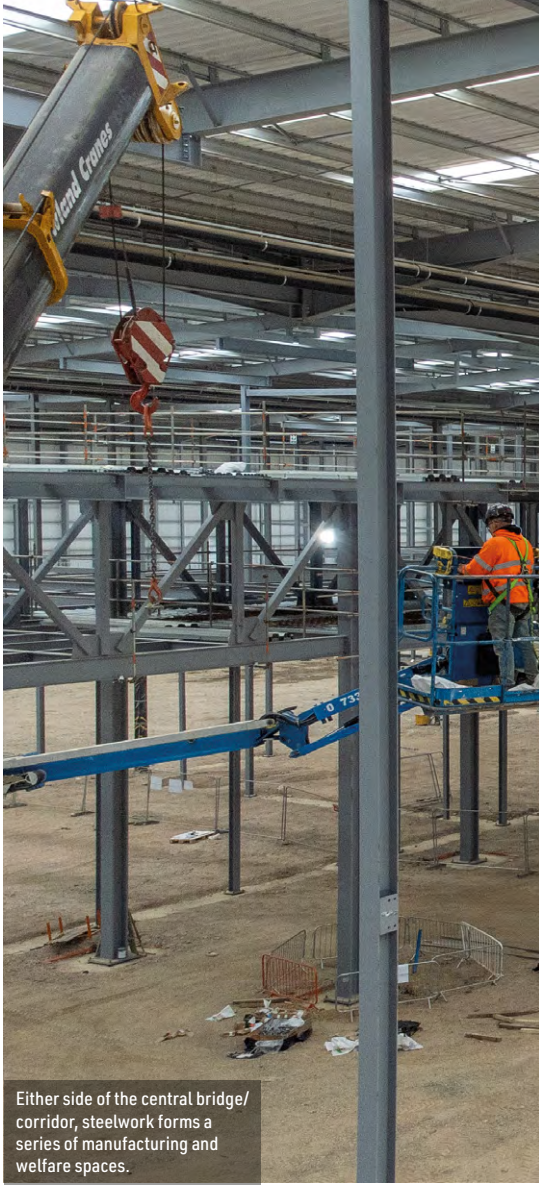
Inside story

More than 2,000t of steelwork has been erected inside of a speculatively-built distribution centre to create one of the world's largest plant-based dairy factories.

The steel erection programme had to use cranes that were small enough to gain access via the warehouse's existing doors.



Either side of the central bridge/corridor, steelwork forms a series of manufacturing and welfare spaces.

Steelwork's flexibility has come to the fore on a project at the Peterborough Gateway, a large distribution and manufacturing park located adjacent to the A1(M), where a speculatively–built warehouse is being repurposed into a new UK factory for Swedish oat drink company Oatly.

Originally built in 2020 and initially called Gateway 385, the steel-framed warehouse is said to be the ideal structure to house a drinks manufacturing facility as the four-span building offers plenty of open-plan floor space.

Externally, some modifications have been made to the warehouse's original design. Many of the dock levellers are unnecessary for the new factory and have been infilled with mixture of high density polystyrene and grout to allow them to support new loads.

"On the plus side, the structure offers a watertight and weather-proof environment for our construction programme, while the main challenge has been erecting steelwork inside the building," says IFP Construction Site Project Director Roger Antrobus.

Exterior view of the completed Oatly factory.

"With limited headroom, we've had to use smaller cranes than we'd ordinarily use, while all materials and equipment have to be able to negotiate the structure's existing doorways."

The steel-framed warehouse structure is 250m-long × 150m-wide, and has four equal 37.5m spans, with only three rows of internal columns, which are spaced at 8m intervals.

The new factory will also make use of the structure's two-storey internal office block and the two-storey external hub.

On completion, the factory will have a temperature and humidity-controlled environment and will be one of the world's largest plant-based dairy factories – with the capacity to produce an anticipated 300 million litres of oat drink per year. According to Oatly, this output will help ensure that plant-based dairy becomes more accessible to more consumers, helping them in turn to reduce their own impact on the environment.

Project steelwork contractor SDM Fabrication has erected 2,160t of structural steelwork over a 20-week programme for the new factory. Working in a phased sequence, the company's erection programme followed on behind IFP's team that had to prepare the existing concrete slab and install holding-down bolts for the new steel columns.

The new factory's production process has dictated the steelwork design and the main feature of the new internal steelwork is a service corridor/bridge structure that runs down one of the middle spans of the warehouse for approximately three quarters of its length.

It is formed by two parallel lines of 12m-long x 4.5m-deep trusses (36 in total) that are connected by 8m-long beams to form a bridge to carry the factory's services. The bridge contains two cantilevering platforms, one within the depth of the trusses and the other supported on top.

"It carries supplies of water, paper for cartons, ingredients as well as power lines, which are distributed to various parts of the factory, on either side of the corridor/bridge," explains SDA Design Consultants' Associate Iain Johnston.

"Below the trusses, which are supported on 6m-high columns, there is a covered corridor that provides access to production areas and allows large pieces of equipment to be replaced."

One end of bridge/corridor structure connects to a two-storey utility building, that acts as a plant area and is positioned in one of the building's corners.

Either side of the bridge/corridor, further steelwork has been erected to form single storey accommodation and welfare blocks as well as

FACT FILE
Oatly factory, Peterborough
Client: **Oatly**
Architect: **DB3 Architecture & Design**
Main contractor: **IFP Construction**
Structural engineer: **SDA Design Consultants**
Steelwork contractor: **SDM Fabrication**
Steel tonnage: **2,160t**

"With limited headroom, we've had to use smaller cranes than we'd ordinarily use, while all materials and equipment have to be able to negotiate the structure's existing doorways."

production areas. These have been created with steel-framed partition walls, that connect to the existing warehouse frame along the building's perimeter.

Although the new internal steelwork connects to the warehouse frame in places via bolted connections, it does not gain any stability from it.

"Deflection issues had to be taken into account and so there are minimal tie-ins to the existing warehouse frame," adds Mr Johnston.

"Stability for the new steelwork is provided by the bridge /corridor acting as a central spine and core, together with a combination of bracing and the diaphragm action of the composite walls."

Summing up, IFP Construction Operations Manager Matt Sparrow says: "We are delighted to be working with Oatly to deliver this exciting new factory.

"The future of the food and drink manufacturing sector will have sustainability at its heart – reducing road miles, carbon emissions and ultimately the sector's impact on the environment.

"We know that working alongside Oatly, with such a forward-thinking and purpose-led vision for its own operations and factories, means that the environmental credentials and standards that must be met in the construction process are of the upmost importance. We are excited to get started and look forward to delivering Oatly's first UK-based factory, which will form an integral element of their sustainable supply chain." ■

Gateway construction

Working on behalf of main contractor Winvic Construction, Caunton Engineering fabricated, supplied and erected approximately 1,000t of steelwork for Gateway 385 in 2020.

The speculatively-built distribution centre achieved a BREEAM 'Very Good' rating and an EPC rating of A.

With a floor loading of 50K/Nm², the building originally had 58 dock loaders - many of which have now been infilled - and eight level access loading doors. It also includes an adjacent 345-space car park and gatehouse. ■

The bridge/corridor trusses will support services and plant within their depth.

Steel frame completes bridging solution

The steel-framed One Keskidee Square, a 26,000m² commercial building at King's Cross, is targeting a BREEAM 'Outstanding' rating and has recently celebrated its topping out.

Long span cellular beams have been used throughout the project as an efficient method for service distribution.

The completed One Keskidee Square will be one of the final buildings in the wider King's Cross development.

One Keskidee Square is an 11-storey structure located on the north-western edge of what has been described as one of the largest regeneration schemes in Europe.

One of the final buildings within the King's Cross development, which over the last 20 years has radically changed this former industrial site in central London into a vibrant business, dining, shopping and residential neighbourhood, One Keskidee Square has recently topped out.

The structure straddles two Thameslink rail tunnels and so piles had to be installed between the tunnels and either side.

Once complete, the 67-acre King's Cross neighbourhood will include 50 new buildings, 1,750 new homes, 20 new streets, 26 acres of public realm and even has its own new postcode – London N1C.

The building will offer approximately 26,000m² of Grade A flexible office space, predominantly located on the nine upper levels. Below this, the building has an entrance lobby with retail at ground floor and a mezzanine level (between ground and first floor) that will accommodate back-of-house facilities and plant equipment.

Typical of many city centre developments, the BAM project team have had to overcome a number of logistical challenges associated with the site, which is bounded by a road along its main elevation and has another construction site along two sides of its footprint.

The confined nature of the site has impacted on the crane and lifting operations, as BAM's Construction Manager Peter Spear explains: "The two tower cranes on our site and the ones on the plot next door are from the same supplier and have been coordinated to work safely, without any over-sailing of the adjacent projects.

"Our steelwork contractor Elland Steel Structures used both tower cranes for its erection programme, but as there is little storage space onsite, they had to deliver the steel on a just-in-time basis and sequence the erection programme around the metal decking and concreting teams."

Another challenge concerns what is underneath the project's footprint, namely a pair of bored Thameslink rail tunnels. The structure's piled foundations have had to be designed and installed around these subterranean obstructions. A series of 40m-deep piles were installed in between the tunnels and either side of them.

The structure's steelwork is founded directly onto these piles, creating large open floorplates with internal spans of up to 15m-long, while diverting superstructure loads away from the tunnels. The longest 15m span bridges over one tunnel, while the building's offset concrete core spans over the other tunnel.

Coordination with Network Rail and the installation of sensors within the tunnels has been key in allowing the project to progress without any disruption to rail services.

Within the structure, the internal steelwork and soffits will be left exposed, with the office spaces designed as warehouse-like floorplates offering maximum volume and plenty of natural light.

The steel frame consists of UB sections that have had bespoke cells cut into them during the fabrication process to accommodate the building's services within their depth.

However, these steel sections were not the original choice for the design of One Keskidee Square, as BAM Design Senior Engineer Robert Gray explains: "Initially, the steel frame was designed with a series of plate girders to support each floor, but due to the industry's supply issues, we had to redesign much of the steelwork and reconsider many of the connections."

The change in design was challenging, as the

FACT FILE
One Keskidee Square, King's Cross, London
Developer: **Argent**
Architects: **Allford Hall Monaghan Morris/ Bennetts Associates**
Main contractor: **BAM Construction**
Structural engineer: **Ramboll/BAM Design**
Steelwork contractor: **Elland Steel Structures**
Steel tonnage: **2,100t**

The steel frame recently celebrated a topping out ceremony.

exposed plate girders created a uniform internal 'look' required by the architectural vision. Using UB sections meant the loadings were different and various section sizes had to be used to create a design that looked similar.

Internal columns are typically spaced at 9m centres, with the perimeter members set at 6m spacings and secondary beams at 3m intervals. The main elevation, which has a curvature to match the road alignment, is created with a row of architectural CHS columns, which were chosen as they avoided any alignment issues with the internal frame. Because of the geometry of the curved radius, many beams do not perfectly align with perimeter columns, and some complicated connections have been made that were easier to design with CHS sections.

As well as the main 15m-wide internal span, there is further span along the western elevation. It is 13.5m-wide at the southern end and decreases in width along its length due to the structure's curve.

The lower floorplates encompass the entire structural footprint, but at level six, the building steps back to form an external terrace along the main western elevation. To create the terrace, there is a series of transfer structures, positioned at the underside of level six that support the realigned columns above.

Corresponding to the curving radius of the elevation, the transfer structures decrease in length from south to north, with the largest structure weighing 15t.

This transfer structure has a spliced connection, which allowed it to be erected in two pieces later in the steel erection programme as it is positioned in an area used as a tower crane position.

One of the tower cranes was relocated on top of the jump-formed core to assist with logistics. "Ideally, we would have preferred to sit this tower crane outside of the building's footprint, but to due to the confined site it had to be located within the frame and so the steelwork was erected around it," says Mr Spear.

"Towards the end of the steel erection programme, this crane was not needed anymore and removed. The void where it had previously sat was infilled with steelwork, including the transfer structure, which replaced a quantity of temporary steelwork."

There are further transfer beams on the eastern elevation, as this elevation incorporates a stepped design of terraces that ascend from level six up to the roof.

Meanwhile, at first floor level, there are even more transfer beams required to form a 6m cantilever along the south elevation to create an overhang above the main entrance.

Some of these beams represent the largest steel elements of the project. Supporting nine levels of steelwork, they are up to 1m deep and weigh up to 25t.

The ground floor is a double-height space and to ensure there are no internal columns in the entrance foyer, the mezzanine level is hung from the underside of the first floor in this area. Approximately 30% of the mezzanine has been designed in this way as another column-free ground floor area is required for a vehicle lane that passes through the structure to provide access to a service yard.

One Keskidee Square is due to complete in Summer 2023. ■

Design of Angles

David Brown of the SCI offers advice on the use of angles in bending, in response to questions received by the advisory service. Angles subject to bending are often found carrying loads over openings, but also may be found as continuous chords in trusses. Eurocode guidance follows that presented in the previous standard, BS 5950.

Using an angle in bending? Select another profile!

Questions relating to angle sections are surprisingly common at the SCI. Usually, they are not related to the use of angles in compression (typically in a truss) where the design guidance is clear, but rather concern the bending resistance of angles. Often, it becomes clear that the angle is unrestrained, so the real issue is the buckling resistance of the member. In those situations, the SCI's advice is to select a different profile. Angles in bending are often used to support brickwork over openings. Although this is a common detail in domestic applications, the member selection is fraught with potential risk. As illustrated in Figure 1, the compressed leg will wish to move out of plane, which combined with the usual eccentric application of load will lead to a twist of the member – and a dissatisfied client if the supported façade cracks.

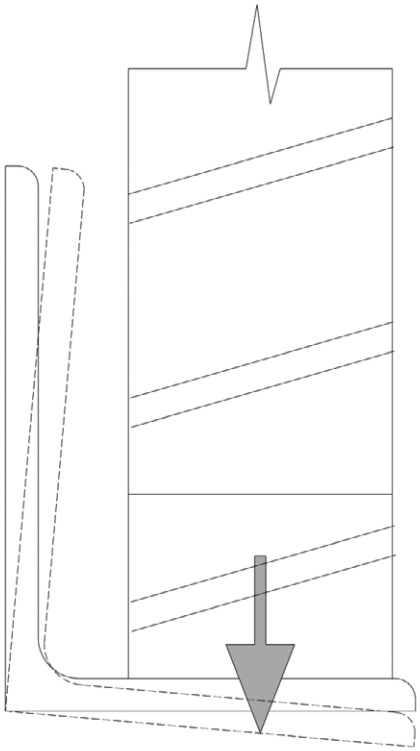


Figure 1: Behaviour of a single angle under load

As an aside to the main theme of this article, any member supporting an eccentric load will twist. When carrying eccentric loads commonly found in domestic construction (but equally applicable in all situations) thought should be given to using a hollow section which is torsionally very stiff. Although the hollow section member itself may be more expensive and the connections more involved, the risk of twist has been minimised. Figure 2 shows a member to be used in a house extension – a selection commended by the author.

Angles in compression

Here, the design guidance is straightforward. Angles do not buckle about their rectangular axes which are aligned with the angle legs, but buckle about their principal axes, u-u or v-v, as shown in Figure 3.

Figure 2: Torsionally stiff member for eccentric loading condition

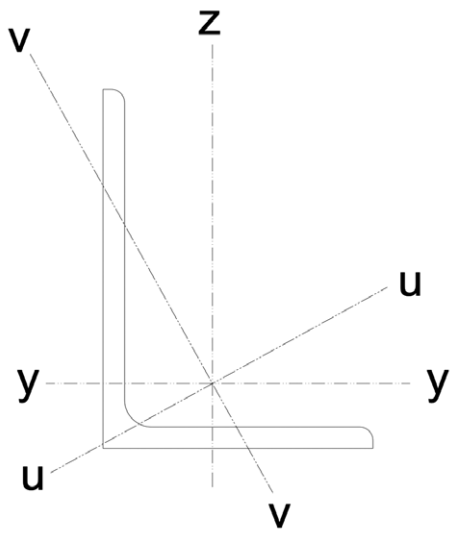


Figure 3: Axis identification for angles

Following the same principle as illustrated in Figure 1, each leg wishes to buckle in its own out-of-plane direction, which causes a twist. This torsional behaviour is allowed for in the calculation of the slenderness, which considers the different axes, adjusts the slenderness for the torsional behaviour and finally allows for the restraint (or otherwise) offered by the end connections. The determination of slenderness is covered in clause 4.7.10 in BS 5950. Section BB.1.2 of BS EN 1993-1-1 provides equivalent (but not as comprehensive) guidance.

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Angles in bending – lateral torsional buckling

BS 5950 looks hopeful, since clause 4.3.8 covers the buckling resistance moment for single angles and provides both a basic method and a simplified method. Optimism may be misguided, especially if unequal angles have been selected. As will be seen later, the designer must overcome a number of challenges.

Equal angle buckling resistance moment – BS 5950 simplified method

Assuming that the angle is being used to carry load across an opening, the heel of the angle is in tension. The simplified method of BS 5950 clause 4.3.8.3 gives the buckling resistance moment, M_b for members subject to bending about the x-x axis as:

$$M_b = p_y Z_x \left(\frac{1350\varepsilon - L_E/r_v}{1625\varepsilon}\right) \text{ but } M_b \le 0.8\, p_y Z_x$$

Where $\varepsilon = (275/p_y)^{0.5}$

BS 5950 specifies the elastic modulus is to be used in the calculations.

Assuming the angle is 150 × 150 × 12, 4 m long and S275, then ε = 1.0 and (from section tables) r_v = 29.5 mm.

$$\text{Then } M_b = 275 \times 67.7 \times 10^3 \left(\frac{1350\times1\times4000/29.5}{1625\times1}\right) \times 10^{-6} = 13.9\text{kNm}$$

Equal angle buckling resistance moment – BS EN 1993-1-1

The Eurocode is less helpful, as no design advice is given. Designers are encouraged to consult The Institution of Structural Engineers' "Grey Book"[1] which recommends that the applied moment be resolved about the u-u and v-v axes, and an interaction expression used to verify the member. The relative slenderness $\bar{\lambda}_{LT}$ is given by:

$$\bar{\lambda}_{LT} = 0.72 v_a \sqrt{\frac{f_y}{E}\, \phi_a \lambda_v}$$

This is a rearrangement of the expression given for λ_{LT} in B.2.9.2 of BS 5950, determined by dividing the BS 5950 slenderness by $\lambda_1 = \pi\sqrt{\frac{E}{f_y}}$.

ϕ_a is the equivalent slenderness coefficient and is given in the "Blue Book" as 3.77 for this particular angle.

The value of v_a is more complicated, and is given by:

$$v_a = \frac{1}{\sqrt{\left(1+\left(\frac{4.5\psi_a}{\lambda_v}\right)^2\right)} + \frac{4.5\psi_a}{\lambda_v}}$$

This is the same presentation as found in B.2.9.3 of BS 5950.

ψ_a is the monosymmetry index, found in the Blue Book for unequal angles. For equal angles, ψ_a = 1.

For the selected angle, $\lambda_v = 4000/29.5 = 135.6$

$$v_a = \frac{1}{\sqrt{\left(1+\left(\frac{4.5\times1}{135.6}\right)^2\right)} + \frac{4.5\times1}{135.6}} = 0.984$$

Therefore:

$$\bar{\lambda}_{LT} = 0.72 \times 0.984 \times \sqrt{\frac{275}{21000}} \times 3.77 \times 135.6 = 0.580$$

From Table 6.4 of BS EN 1993-1-1, curve *d* must be selected, and α_{LT} = 0.76 from Table 6.3.

According to expression (6.56), χ_{LT} = 0.724

In the "Grey Book", the applied moment is resolved into moments about the u-u and v-v axes and the buckling resistance moment calculated about the u-u axis. The moment resistance about the v-v axis is the resistance of the cross section. Using the elastic modulus about the u-u axis poses an immediate problem as this property is not given in published tables. The second moment of area about the u-u axis is given as 1170 cm⁴ and the dimension c to the centroid given as 41.2 mm. The distance to the extreme fibre at the angle toe is 106 mm. The minimum modulus, W_u is given by:

$$W_u = \frac{1170 \times 10^4}{106} = 110 \times 10^3 \text{mm}^3$$

The modulus about the v-v axis can be calculated as

$$\frac{303 \times 10^4}{58.3} = 52 \times 10^3 \text{mm}^3$$

The lateral torsional buckling resistance is then given by:

$$M_b = \frac{0.724 \times 275 \times 110 \times 10^3}{1.0} \times 10^{-6} = 21.9 \text{ kNm}$$

This is the LTB resistance about the u-u axis, so cannot be compared

directly with the buckling moment calculated according to BS 5950.

If the applied moment was 14 kNm in the major axis, the resolved moments in the u-u and v-v axes are both 9.9 kNm

According to the "Grey Book", the interaction to be satisfied is:

$$\frac{M_{v,Ed}\gamma_{M0}}{W_v f_y} + \frac{M_{u,Ed}\gamma_{M1}}{\chi_{LT} W_{el,u,min} f_y} \leq 1.0$$

Substituting:

$$\frac{9.9 \times 10^6 \times 1.0}{52 \times 10^3 \times 275} = \frac{9.9 \times 10^6 \times 1}{21.9 \times 10^6} \leq 1.14$$ which is unsatisfactory.

The approach set out in the "Grey Book" is following the advice given in clause I.4.2 of BS 5950, described as the "Basic Method", which requires the applied moments to be resolved about the principal axes u-u and v-v, and an interaction check for biaxial moments to be completed. BS 5950 refers the designer to clause 4.8.3.3.1 for the biaxial check, but using the moments and resistances about the principal axes in the same way as the "Grey Book". The only notable difference is that the LTB resistance according to BS 5950 is 26 kNm, compared to the value of 21.9 kNm computed above. According to BS 5950, the interaction result is 1.07, lower than the Eurocode result, due solely to the increased LTB resistance.

The "Simplified method" of I.4.3 uses the "Simplified method" of clause 4.3.8.3 to calculate the buckling resistance moment, M_b about the x-x axis. This value is then used in the interaction expression of I.4.3, but using the moments and resistances about the rectangular axes. With an applied moment of 14 kNm about the major axis only and a resistance $M_{bx} = M_b = 13.9$ kNm as calculated above, the interaction result is 1.01.

Buckling of unequal angles – more complexity

BS 5950 does not permit the "Simplified method" to be used for unequal angles – the "Basic method" of clause 4.3.8.2 must be used. This is going to be painful for designers, as an unequal angle is probably preferable – at least by intuition, to have the longer leg vertical if spanning over an opening. In Both BS 5950 and the "Grey Book", applied moments are to be resolved into the u-u and v-v axes. The position of the centroid and the angle between the principal axes and the rectangular axis is given in the Blue Book, so this is not overly difficult. The Blue Book also gives the second moment of area about the u-u and v-v axes, so with some trigonometry, the distances to the extreme fibres and the modulus about each principal axis can be determined. The monosymmetry index is given, so the calculation of v_a given above can be completed.

The complexity is not over, especially if the angle is not at least Class 3 (semi-compact in BS 5950). According to Table 11 of BS 5950, the Class 3 limit for a single angle when the compression is due to bending is 15ε, so a 150 × 10 leg in S275 would be satisfactory, but nothing more slender. According to BS EN 1993-1-1 and Table 5.2, the limiting value is 14ε, but based on the dimension c. For a 150 × 10 leg, the dimension c is around 128 mm, so c/t = 12.8 and the limiting value is 12.9, meaning the same conclusion is reached.

If the angle is Class 4 (and many are), the Eurocode method of calculating effective properties, or the BS 5950 alternative of using a reduced design strength adds more complexity. If the member is used under combined bending and axial (for example, as a continuous chord in a truss), the design effort involved with a Class 4 angle is likely to be too much to be worthwhile.

Conclusions

This article has identified two messages. Firstly and most importantly, an angle may be cost-effective but is not suitable for carrying significant moments. Under bending, and under axial loads, there is torsional behaviour causing a significant twist, which may be very detrimental if an angle is supporting brittle materials. The second message is that the verification of an unequal angle in bending is complicated – more so if the member is Class 4 and even more so if the member is subject to combined axial load and bending. If faced with this design situation, an equal angle of at least Class 3 cross section is recommended. In general, the author's advice remains that if faced with an angle subject to unrestrained bending, substituting an alternative profile is a much better solution. ■

1. Manual for the design of steelwork building structures to Eurocode 3: October 2010 ISE, 2010

AD 489: Height of shear studs

AD 380 entitled "What height of shear stud should be used in Eurocode 4?" provided interim advice on the height/length of shear studs to be used in design calculations and referred to a programme of tests/analysis that was in progress. On completion, the programme of tests provided the input to SCI publication P405[1] but AD380 was not subsequently updated. This AD note now supersedes AD380 and reconfirms and supplements the guidance it contained.

BS EN 1994-1-1[2] defines h_{sc} as the 'overall nominal height' of a stud connector in the list of notation, but elsewhere the same variable is defined as simply 'the overall height'. Moreover, a stud that is for example 105 mm long when manufactured would typically have "length after welding" (LAW) of 100 mm when welded directly to a beam flange, or 95 mm when welded through decking. It would generally be described as a nominal 100 mm stud.

Resistances

Stud resistance values are a function of h_{sc}, because the solid slab resistance P_{Rd} (clause 6.6.3.1(1)) may be reduced using the factors k_l (clause 6.6.4.1(2)) and k_t (clause 6.6.4.2(1)) used to allow for the presence of decking. SCI's advice in P380 was that LAW should be used when determining reduction factors, not least because although the code itself is not clear, the ICE Designers' Guide to Eurocode 4 by Prof. Roger Johnson used the LAW in the examples.

In addition, BS EN 1994-1-1, clause 6.6.5.8(1) suggests that the minimum embedment length, i.e. length of stud extending above the top of the deckling, should be $2d$ (where d is the stud diameter). Although considering the LAW when verifying this would be consistent, it would also suggest that a nominal 100 mm stud of 19 mm diameter could not be used with 60 mm decking. Experience and tests have shown that such a conclusion would be incorrect. It is therefore reconfirmed that, although apparently inconsistent, the nominal stud length may be used when establishing this lower bound length.

Results of test programme and analysis

As well as considering what values to use for the variables in code rules, the test programme referred to was undertaken to confirm what resistances and slip capacities, can be achieved when studs are used with modern forms of profiled decking. The tests also investigated the justification for the detailing requirement given in BS EN 1994-1-1 that any mesh local to the studs should be placed at least 30 mm below the head of the studs. Note that this criterion is not satisfied with the very common situation in the UK of a 60 mm trapezoidal deck used with nominal 100 mm studs.

The conclusions from this test programme are provided in reference 1, and guidance given therein confirms the recommendation that the as-welded height (LAW) is used in the BS EN 1994-1-1 reduction formulae.

More significantly, the results also show that when the decking is transverse to the beam the rules given in BS EN 1994-1-1 may be unconservative. To allow for this, additional reduction factors to those given in BS EN 1994-1-1 associated with the decking geometry are required as described:

- when double studs are present additional reduction factors are introduced as follows:
  - When mesh is placed below the heads of the studs an additional multiplication factor k_{mod} of 0.9 should be applied. The mesh does not need to be 30 mm below the head, merely underneath it.
  - When mesh is placed at nominal cover (assumed to mean above the head given typical slab geometries) the values derived from EN 1994 should be reduced using an additional multiplication factor k_{mod} of 0.7. For studs with transverse decking:

$$P_{Rd} = k_{mod} k_t MIN[P_{Rd} \text{solid slab}]$$

- no further reduction is necessary when single studs are used, even if mesh is placed at nominal cover.

In addition, much research has been carried out in continental Europe as part of the background to new rules that will be presented in the so-called Generation 2 EN 1994-1-1. These suggest that some current UK practice may be unconservative, although this may simply be because of conservatism of the mechanical models that have been developed to predict resistance. The Generation 2 document will also allow the use of test derived values.

One final point for designers to be aware of is that studs come in standard lengths (of which 100 and 125 mm are the most common). A designer may consider increasing the length of a stud to (potentially) increase resistance, but only standard lengths should be specified.

Contact: **Advisory Desk**
Tel: **01344 636555**
Email: **advisory@steel-sci.com**

References

1 Couchman G C, *Minimum degree of shear connection rules for UK construction to Eurocode 4*, SCI P405, 2015
2 BS EN 1994-1-1:2004 *Eurocode 4 Design of composite steel and concrete structures. General rules and rules for buildings* (incorporating corrigendum April 2009)

All-steel operating theatre

FROM
Building with Steel
November 1971

The theatre installed at the Mile End hospital

This theatre was constructed by the medical equipment division of Calmic Ltd in association with T. P. Bennett & Son at a cost of £68,000. It is designed in metric dimensions and built to the Wellcome industrialised modular theatre system.

Sterility, temperature, humidity and light are all controlled in this theatre. The structure is self-supporting and comes as a complete package only requiring erection by Calmic engineers and connection to water, steam and electric supplies. The all-steel construction makes it ideal for the tropics. The standard units provide six sizes of theatre and all steel is galvanized while the wall panels are additionally protected with a 1mm PVC coating.

It is claimed that the total departmental cost can be 30 per cent lower than with traditional methods since the building required to house the theatre is much less complex.

New and revised codes and standards

From BSI Updates June 2022

PUBLISHED DOCUMENTS

PD CEN ISO/TR 52120-2:2022
Energy performance of buildings. Contribution of building automation, controls and building management. Explanation and justification of ISO 52120-1
supersedes PD CEN/TR 15232-2:2016

CORRIGENDA TO BRITISH STANDARDS

BS EN ISO 23864:2021
Non-destructive testing of welds. Ultrasonic testing. Use of automated total focusing technique (TFM) and related technologies
Corrigendum, April 2022

BRITISH STANDARDS REVIEWED AND CONFIRMED

BS ISO 11863:2011
Buildings and building-related facilities. Functional and user requirements and performance. Tools for assessment and comparison

BS ISO 18203:2016
Steel. Determination of the thickness of surface-hardened Layers

BS ISO 15686-10:2010
Buildings and constructed assets. Service life planning. When to assess functional performance

BRITISH STANDARDS UNDER REVIEW

BS ISO 1099:2017
Metallic materials. Fatigue testing. Axial force-controlled method

BS ISO 16745-1:2017
Sustainability in buildings and civil engineering works. Carbon metric of an existing building during use stage. Calculation, reporting and communication

BS ISO 16745-2:2017
Sustainability in buildings and civil engineering works. Carbon metric of an existing building during use stage. Verification

BS ISO 20400:2017
Sustainable procurement. Guidance

ISO 14555:2017
Welding. Arc stud welding of metallic materials

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – ADOPTIONS

22/30391768 DC
BS ISO 17607-2 Steel structures. Execution of structural steelwork. Steels
Comments for the above document were required by 22 June 2022

22/30391771 DC
BS ISO 17607-1 Steel structures. Execution of structural steelwork. General requirements and vocabulary
Comments for the above document were required by 21 June 2022

22/30391774 DC
BS ISO 17607-3 Steel structures. Execution of structural steelwork. Fabrication
Comments for the above document were required by 21 June 2022

22/30391777 DC
BS ISO 17607-4 Steel structures. Execution of structural steelwork. Erection
Comments for the above document were required by 22 June 2022

22/30391783 DC

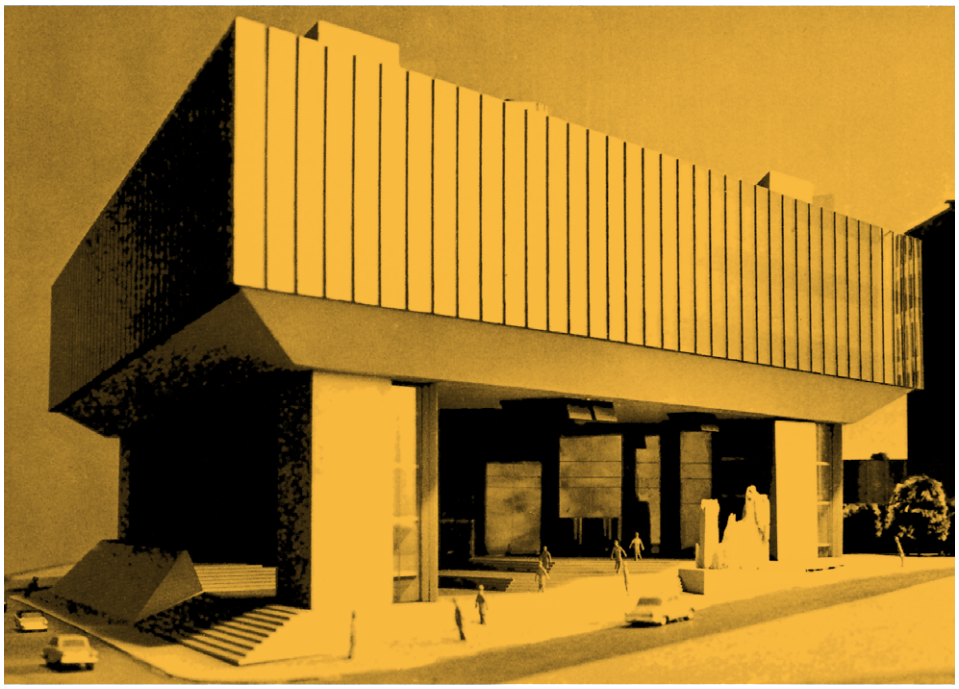
BS ISO 17607-5 Steel structures. Execution of structural steelwork. Welding
Comments for the above document were required by 22 June 2022

22/30391786 DC
BS ISO 17607-6 Steel structures. Execution of structural steelwork. Bolting
Comments for the above document were required by 22 June 2022

CEN EUROPEAN STANDARDS

EN ISO 22057:2022
Sustainability in buildings and civil engineering works. Data templates for the use of environmental product declarations (EPDs) for construction products in building information modelling (BIM)

Halifax Building Society Headquarters



The largest building society in the world is now building its new headquarters in Halifax and steel is playing an interesting part in its construction.

The building is on a sloping site and the main floors are raised on a podium. Although the office accommodation for 700 people is built in reinforced concrete the entire section sits on a steel sub-frame. The girders are approximately 14ft deep and 300ft long. The third floor (lower of the two raised floors) is an open plan office for 550 while the fourth floor contains board and directors suites. The photograph is of a model showing the structure elevated on the steel podium.

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, Membership Manager
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, ● = Bronze, ● = Certificate

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

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

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		●	Up to £3,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●							●		✔	2	✔	●	Up to £3,000,000
AJ Engineering & Construction Services Ltd	01309 671919			●	●		●		●	●	●			●	●	✔	4		●	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 £1,400,000
Arromax Structures Ltd	01623 747466			●	●	●	●	●	●	●	●				●		2			Up to £800,000
ASME Engineering Ltd	020 8966 7150			●	●	●		●		●	●			●	●	✔	4		●	Up to £4,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●			●	●			●	●	✔	2			Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2	✔	●	Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●			●	✔	4	✔	●	Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £1,400,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		4			Up to £3,000,000
Bourne Group Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●		●	●	●	✔	4		●	Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●						●	✔	4		●	Up to £6,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●		●	●	●	●	●		●	●	●	✔	3		●	Up to £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
DAM Structures Ltd	01377 271843	●		●	●	●		●	●	●	●			●		✔	4			Up to £6,000,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £200,000
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		●	Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	●	Above £6,000,000
EvadX Ltd	01745 336413		●	●	●	●	●	●		●	●	●			●	✔	3		●	Up to £4,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●		●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●			●		●	●	●	●	●		●	●	●	✔	3		●	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	✔	●	Up to £3,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Harry Peers Steelwork Ltd	01204 528393	●		●	●	●	●	●	●		●					✔	4			Above £6,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Hillcrest Structural Steel Ltd	023 8064 1373			●	●	●	●	●		●	●			●	●	✔	3		●	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	✔	●	Above £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4		●	Up to £6,000,000
Leach Structural Steelwork Ltd	01995 642000			●	●	●	●	●			●					✔	2		●	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		●	Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £2,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £1,400,000
Maldon Marine Ltd	01621 859000				●	●			●	●	●				●	✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						3			Up to £3,000,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £2,000,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●			●	●				✔	4		●	Up to £2,000,000
North Lincs Structures	01724 855512			●	●					●	●				●		2			Up to £400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		●	Up to £6,000,000
Painter Brothers Ltd	01432 374400	●			●				●	●	●				●	✔	3			Up to £6,000,000*
Peter Marshall (Steel Stairs) Ltd	0113 307 6730				●	●				●	●				●	✔	3			Up to £1,400,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
REIDsteel	01202 483333			●	●	●	●	●	●	●	●	●	●		●	✔	4		●	Up to £6,000,000
SAH Luton Ltd	01582 805741			●	●	●				●	●			●	●		2			Up to £400,000
S H Structures Ltd	01977 681931	●		●	●	●	●	●	●	●	●	●	●		●	✔	4	✔	●	Up to £3,000,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●			●	●			●	●	✔	4			Up to £2,000,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
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
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
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	✔	●	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		●	Up to £800,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	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)

Steelwork contractors for bridgeworks

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 ● = Bronze ● = Certificate

Notes

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

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

BCSA steelwork contractor member	Tel	FB	CF	SG	PG	TW	BA	CM	MB	SRF	FRF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
Adey Steel Ltd	01509 556677	●		●	●	●	●				●	●	✓	3			✓	●	Up to £3,000,000
AJ Engineering & Construction Services Ltd	01309 671919	●			●	●	●	●	●	●	●	●	✓	4				●	Up to £3,000,000
Billington Structures Ltd	01226 340666	●		●	●	●	●					●	✓	4	✓	✓	✓	●	Above £6,000,000
Bourne Group Ltd	01202 746666	●			●	●				●		●	✓	4	✓		✓	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓	●	Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●	●	●	●		●	●	●	✓	4			✓	●	Up to £6,000,000
Cementation Fabrications	0300 105 0135	●		●	●	●	●					●	✓	3			✓	●	Up to £6,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	●	✓	4			✓		Up to £400,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	●	✓	3		✓	✓	●	Up to £1,400,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●		●			●	✓	4				●	Up to £3,000,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●	●	●		●	●	●	●	✓	3			✓	●	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●			●	●				●	●	●	✓	4	✓		✓	●	Above £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓	●	Up to £1,400,000
Millar Callaghan Engineering Services Ltd	01294 217711	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●	●	●	●	●	●					●	✓	4			✓		Up to £2,000,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £6,000,000
REIDsteel	01202 483333	●				●	●	●				●	✓	4				●	Up to £6,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	●	Up to £3,000,000
Severfield plc	01204 699999	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499											●	✓	3					Up to £800,000
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	✓	✓	✓	●	Above £6,000,000
Non-BCSA member																			
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●			●	●	✓	4	✓		✓	●	Up to £3,000,000
Carver Engineering Services Ltd	01302 751900	●		●	●	●	●		●	●	●	●	✓	4			✓		Up to £3,000,000
Centregreat Engineering Ltd	029 2046 5683	●		●	●	●	●	●	●	●	●	●	✓	4					Up to £3,000,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●	●	●		●	●	✓	4			✓	●	Up to £1,400,000
Eiffage Metal	00 33 388 946 856	●	●	●	●	●	●	●	●			●	✓	4					Above £6,000,000
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 £800,000
In-Spec Manufacturing Ltd	01642 210716									●	●	●	✓	4			✓		Up to £800,000
J&D Pierce Contracts Ltd	01505 683724	●		●	●	●	●	●	●		●	●	✓	4			✓		Above £6,000,000
Kelly's Welders & Blacksmiths Ltd	01383 512 517											●	✓	2			✓		Up to £200,000
Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £3,000,000
Malin Group	0141 370 5467	●			●	●	●			●	●	●	✓	4			✓		Up to £4,000,000
North View Engineering Solutions Ltd	01325 464558											●	✓	3					Up to £800,000
Smulders Projects UK Ltd	0191 295 8700	●	●	●	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000
Tecade S.A.U.	00 34 955 833 811		●	●	●	●	●	●	●			●	✓	4		✓	✓		Up to £6,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●				●	●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000

Corporate Members

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

Company name	Tel
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	0300 123 5000
Keiths Welding Limited	07791 432 078

Company name	Tel
MMCEngineer Ltd	01423 855939
Paul Hulme Engineering Ltd	07801 216858
QHSE-Interspect Ltd	07438 413849
Sandberg LLP	020 7565 7000

Company name	Tel
Structural & Weld Testing Services Ltd	01795 420264
SUM ADR Ltd	07960 775772

Industry Members

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

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

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

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

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			
Farrat Isolevel	0161 924 1600	✓	N/A				
FLI Structures	01452 722200	✓	M	4	20	●	
Hadley Industries Plc	0121 555 1342	✓	M	4		●	
Hi-Span Ltd	01953 603081	✓	M	4		●	
Jamestown Manufacturing Ltd	**00 353 45 434288**	✓	**M**	4	20		**Gold**
Kingspan Structural Products	01944 712000	✓	M	4		●	
MSW UK Ltd	0115 946 2316		D/I				
Prodeck-Fixing Ltd	01278 780586	✓	D/I				
Structural Metal Decks Ltd	01202 718898	✓	M	4			
Stud-Deck Services Ltd	01335 390069		D/I				
Tata Steel – ComFlor	01244 892199	✓	M	4			
voestalpine Metsec plc	**0121 601 6000**	✓	**M**	4		●	**Gold**

Computer software

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Autodesk Ltd	01252456600		N/A				
Fabsec Ltd	01937 840641		N/A				
Idea Statica UK Ltd	02035 799397		N/A				
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		3B		
Tata Steel – Tubes	01536 402121	✓	M		3B		

Manufacturing equipment

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

Membership services

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
Deconstruct UK Ltd	02035 799397	✓	N/A				

Protective systems

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

Safety systems

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

Steel stockholders

Company name	Tel	QM	CA	FPC	NHSS	SCM	SfL
AJN Steelstock Ltd	01638 555500	✓	M	4			
Arcelor Mittal Distribution - Scunthorpe	**01724 810810**	✓	**D/I**	**4**	**3B**		**Headline**
Barrett Steel Services Limited	**01274 682281**	✓	**M**	**4**	**3B**		**Headline**
British Steel Distribution	01642 405040	✓	D/I	4	3B		
Cleveland Steel & Tubes Ltd	**01845 577789**	✓	**M**	**3**	**3B**		**Gold**
Dent Steel Services (Yorkshire) Ltd	01274 607070	✓	M	4	3B		
Dillinger Hutte U.K. Limited	01724 231176	✓	D/I	4		●	
Duggan Profiles & Steel Service Centre Ltd	00 353 567722485	✓	M	4			
Kloeckner Metals UK	0113 254 0711	✓	D/I	4	3B	●	
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		
Lindapter International	01274 521444	✓	M				
Tension Control Bolts Ltd	**01978 661122**	✓	**M**		**3**		**Silver**

Welding equipment and consumables

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

ArcelorMittal
Distribution Solutions UK

Plates & Profiles

Our heavy plate and profile site benefits from a dockside location enabling us to receive vessels from our own and independent European mills directly into our large area stockyard. ArcelorMittal Distribution Solutions UK is fully accredited to ISO 9001, ISO 1001, OHSAS 18001 and EN 1090 and compliant with the requirements of the cyber essentials scheme.

CYBER ESSENTIALS CERTIFIED

Our range of grades

- Structural steels to EN 10025 part 2,3 & 4
- Weathering steel to EN 10025 part 5
- Offshore grades to EN 10225
- Shipbuilding grades - Lloyds Register Grade A DH36, AH36, etc.
- Boiler and pressure vessel grades to EN 10028 2 & 3 and ASTM/ASME

and many others.

With strong and trusted partner supply relationships across a wide range of industries including oil & gas, petrochemical, shipbuilding, offshore, renewable energy, structural, yellow goods, mining, quarrying and boiler manufacture, within the UK and Europe, we offer multiple services and options such as:

- Profiling and processing
- Plasma and oxy-propane options
- Direct C.A.D. input both from your own files or by use of our in-house C.A.D. option
- Shot blasting and painting, weld preparation, rolling, forming, pressing, drilling, machining
- Testing: recertification, in-house UT, through thickness, charpy, hardness, band (All can be 3rd party witnessed)
- Gas bevelling, machine bevelling, CNC paint marking, etching

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