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NSC

Capital scheme for capital

Nov/Dec 2019
Vol 27 No 10

Steel forms Salford masterplan

Water works sit well in landscape

Offsite benefits Greenock health centre

Steel spans Roman wall

Cover Image
Two New Bailey, Salford
Main client: The English Cities Fund
Architect: Allford Hall, Monaghan Morris [AHMM]
Main contractor: Bowmer + Kirkland
Structural engineer: Integra Consulting Engineers
Steelwork contractor: Severfield
Steel tonnage: 2,500t

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BCSA prepared for Brexit - and beyond

Nick Barrett - Editor

Brexit-related caution is reportedly holding up developments across UK industry, to the detriment of construction order books. Recent figures from ABI Barbour suggest a fall of 15% in September compared to a year previously.

But as readers can see, there is still a lot of activity on sites throughout the UK - we report from Edinburgh, Greenock, Cumbria, Salford and London this month - and despite the marked slowdown in London commercial activity, there is a fair degree of optimism in the regions.

Brexit might even be proving to be a good thing for some parts of the market, it has been reported, as the possibility of more complicated supply chains post Brexit is helping drive demand for more regional distribution hubs. Population flows in recent years have generally been from the regions and towards London, but there are signs that this is reversing with the population of Birmingham for example increasing thanks to this regional drift. Demand for schools, offices, shops and housing of course always rises with population growth. The economy might have slowed down, but life goes on and drives changes in demand for construction services.

The political outlook remains uncertain and cloudy and unlikely to clear at least until the 12 December General Election, but a lot of business life has also had to go on regardless. The steel sector has remained busy preparing for the post-Brexit world. For example, a guide to UK Conformity Assessed Marking (UKCA Marking) which would replace CE Marking has been produced, spelling out what would happen in the event of a no-deal Brexit. It has been widely distributed and is available for download free from *SteelConstruction.info*. The change it prepared for might not happen, but the steelwork sector is ready if it does.

BCSA's technical staff have been instrumental in ensuring that architects and engineers will not face the same sort of uncertainty that bedevils developers, whatever the outcome of the Brexit process. BCSA's members support the unstinting effort put into the constant process of ensuring that codes and standards are produced that will ensure the best quality steel-framed buildings.

BCSA members and staff are steeped in the process of codes and standards development and also contribute significantly to devising new design guides - for example, preparations are already underway for updating no fewer than 34 design guides that will be needed by 2023. This means that BCSA members are well placed to know how to proceed whatever the type or size of building or other structure, and to confidently advise designers, contractors and clients. A wealth of advice and other steelwork sector back-up is available from the BCSA itself, and partner organisations like the Steel Construction Institute, university research departments and major steel manufacturers.

Making sure that your steelwork contractor is a BCSA member is the best assurance that you can have that your project is in the safe hands of a technically audited specialist that will be a fully up-to-date, key member of your construction team. That won't change whatever the Brexit outcome.

BCSA publishes no-deal Brexit conformity guide

The British Constructional Steelwork Association (BCSA) has published a guide outlining how the steel construction sector can meet the requirements of UKCA Marking in the event of the UK exiting the European Union (EU) with no deal.

Should a no-deal exit occur, the government will immediately introduce UK Conformity Assessed Marking (UKCA Marking) on exit day, although the CE Marking of construction products will still be permitted for a limited time period (currently unspecified).

The legislation that will make this change has already been drafted and will become UK law if the UK leaves the EU without a deal.

After a no-deal Brexit, UKCA or CE Marking remains mandatory for all construction products covered by a UK Designated Standard.

This includes fabricated structural steelwork, and engineers, contractors and steelwork specialists will need to understand their obligations and how the new UKCA Mark works.

The BCSA supplement, available at *www.steelconstruction.info/UKCA_Marking* highlights the straightforward process that companies involved in steel construction need to follow in order to continue to comply with the Construction Products Regulation, which is the legal basis for both UKCA and CE Marking.

The BCSA said there will be no disruption to the regular supply of fabricated structural steelwork from accredited sources. It has been mandatory for BCSA members to be compliant with CE Marking since the introduction of the harmonised standard for fabricated structural steelwork, BS EN 1090-1 on 1 July 2014. This will continue to be the case for UKCA Marking.

Steel completes at Sheffield's New Era development

Working on behalf of main contractor Bowmer + Kirkland, Shipley Structures has completed the steelwork erection for the two buildings that constitute phase two of the Sheffield New Era development.

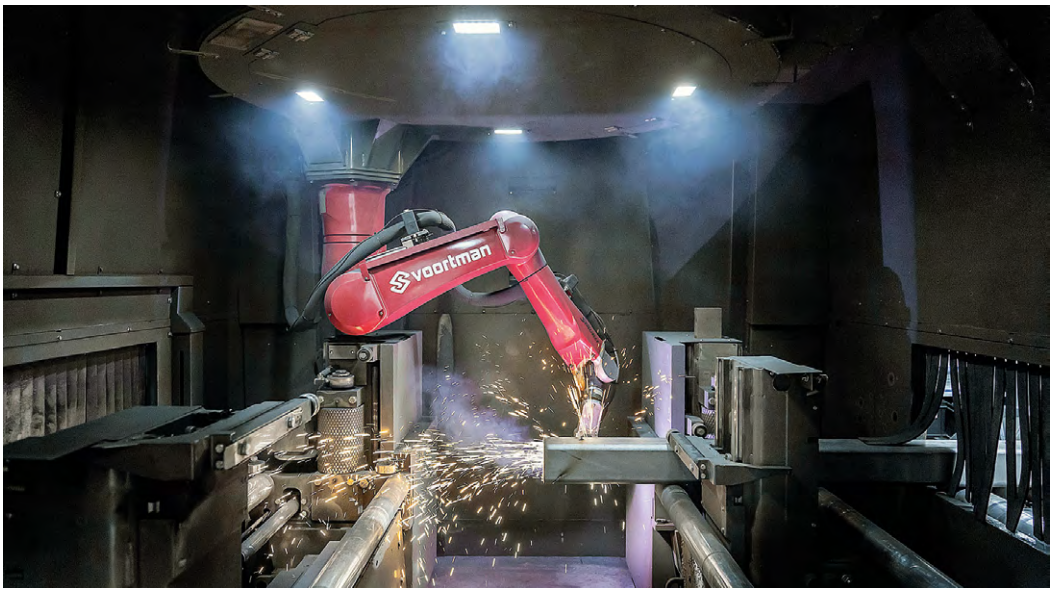
Known as blocks D and E, both are nine-storey steel-framed structures, with the former being a predominantly commercial building including a third-floor restaurant.

Block D required 570t of structural steelwork and was the final building to be erected. Shipley Structures Director Glynn Shepperson said: "In order to maintain the aesthetic requirements of the architect and client, diagonal steel bracing had to be omitted from the front elevation and the building returns, due to the high volume of glazing.

"While utilising shallow floor beams to limit the building height, the stability of the overall steel structure was maintained by the strategic use of temporary bracings until the ultimate composite design action of the frame was achieved."

The previously erected block E required 480t of steelwork and was completed last December. This L-shaped building will house retail on the ground floor and student apartments on the upper levels.

New robotic steel profile cutting solution from Voortman



Voortman Steel Machinery has announced the launch of its new V807 robotic thermal profile processor, which is a plasma and oxy-fuel coping solution.

The V807 is said to be the result of years of experience, research and development to drastically reduce the machine's footprint and improve installation time and logistics without any loss of processing power or throughput efficiency.

The company said the Voortman V807 has production capacity up to three times more than some other models in robotic thermal profile processing.

Input for designing the V807 came from Voortman Steel Group's own experience and expertise in structural steel fabrication. Voortman said a priority was placed on reducing the footprint of the machine, which allows the machine to be easily maintained and cleaned.

Voortman robotic structural steel processing machines are said to offer a high level of production and throughput, especially with fully-automatic material handling at the in- and out-feed of the machine.

The V807 is equipped with the state-of-the-art Voortman VACAM 4.0 machine control software. In combination with the new 24-inch multi-touch control panel and a simplified user interface it is said to take the user experience to a whole new level. Switching from plasma to oxy-fuel cutting is said to be a quick and simple procedure.

Voortman machinery is available in the UK and the Republic of Ireland through Cutmaster Machines. For more information contact: *info@cutmastermachines.com*

SCI launches new protocol for reusing steel

In an effort to help the steel construction industry reduce greenhouse emissions, the Steel Construction Institute (SCI) has launched a new protocol for reusing steel.

According to the SCI, a growing realisation of the urgent need to reduce or even eliminate, greenhouse gas emissions is focussing attention on what we build and what construction materials we use.

Although the focus has been on reducing operational impacts from heating, cooling and lighting, there is growing pressure to think more about the impacts of construction materials, so-called embodied impacts.

The steel manufacturing industry has made good progress in reducing its emissions, but efficiency is approaching the theoretical limit using existing technologies. Although some steelmakers are exploring exciting, new step-change technologies, easier, lower cost reductions can be made from demand-side measures particularly from using steel products more efficiently; this includes reusing as opposed to the current practice of recycling (by re-melting) structural steel.

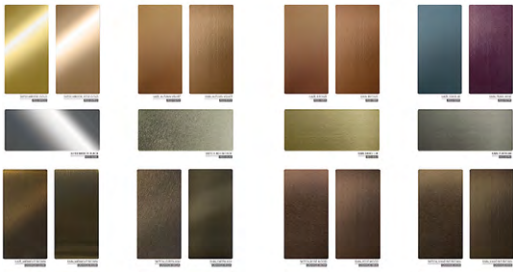
Building on recent national and international projects on structural steel reuse, SCI said it has developed a protocol to help facilitate the reuse of structural steel sections reclaimed from existing building structures.

The protocol proposes a system of investigation and testing to establish material characteristics, with advice for designers completing member verifications. The protocol places important responsibilities on the holder of salvaged steelwork including identification, assessment, control procedures and declarations of conformity.

The protocol is founded on the principle that given appropriate determination of material characteristics and tolerances, (re)fabricated salvaged steelwork may be fabricated and CE marked in accordance with BS EN 1090.

P427 – Structural steel reuse is available from the SCI Bookshop.

Colour stainless steel introduced to UK market



Kloeckner Metals UK has introduced coloured stainless steel, a solution that it said is not only durable and reliable but a true demonstration of high-end style and elegance.

Available in several colours, the company claimed the new product will allow architects greater creativity and flexibility when incorporating stainless steel sheets into their designs.

Additionally, various coloured Ti-ion Coating (PVD) and Nano Ceramic Coating (NCC) options will enable customers to achieve the surface texture they want.

A versatile product with dimensions customised by order, colour stainless steel sheets are said to be ideal for a variety of internal and external applications, such as cladding, ceilings, elevators and doors.

Kloeckner Metals UK Business Development Director Barrie Salter said: "We are extremely excited to introduce this new product to our existing stainless steel range.

"Throughout the years, we have built great working relationships with customers across the construction sector by offering high quality products and innovative design solutions. This product will be particularly appealing to architects and interior designers, allowing them greater creativity and flexibility when considering stainless steel as part of their design solutions."

Major Soho scheme starts to rise up

Steelwork erection is now underway for the Soho Place scheme in London's West End.

Working on behalf of Laing O'Rourke, BHC is fabricating, supplying and erecting the steel for this mixed-use development that sits above the Tottenham Court Road Crossrail Station.

The project comprises a 10-storey building with retail and office space, coupled with another nine-storey structure that is divided between further offices and a 600-seat theatre, which is said to be the first playhouse to be built in the West End for more than 50 years.

The development is due for completion in November 2021.

NEWS IN BRIEF

Steelwork contractor **Taunton Fabrications** has picked up two awards at Willmott Dixon's South West Supply Chain Awards ceremony. The company was nominated in both the Growth and Allsafe categories, with nominations being picked by employees of Willmott Dixon who have worked with suppliers and sub-contractors who they feel deserve recognition for their outstanding work.

Cleveland Bridge has delivered its fourth consecutive year of profits, achieving a turnover of £37M for its financial year ending 31 December 2018, with an operating profit of £1.2M. The company said it continued to grow its order book in this period and entered 2019 with a very strong order position and positive pipeline of projects. It also expects to make further investments to improve on its operational costs in 2020 as it delivers its strategic programme of continuous business improvement.

British Land has been given the go-ahead for its multi-million-pound Canada Water scheme in south London. The overall Canada Water Masterplan is a 53-acre, mixed-use scheme that will deliver: approximately 185,000m^2 of workspace to accommodate around 20,000 jobs; around 90,000m^2 of retail, leisure, entertainment, education and community space; and 3,000 new homes, of which 35% will be affordable.

Trimble Solutions (UK) Ltd has introduced the latest versions of its Tekla software solutions for the construction industry: Tekla Structures, Tekla Structural Designer and Tekla Tedds, which are now available for download. The 2019i updates are said to offer users a range of new features, enhancements and tools, all designed to help increase efficiency, improve productivity and collaboration and provide a more fluid working experience.

Sunderland City Council has awarded **Bowmer + Kirkland**, which has its North East regional office on the city's Rainton Bridge Business Park, the £42M contract for a new city hall. The new building, designed by award-winning FaulknerBrowns, will have 17,500m^2 floor space and will be constructed on the former Vaux brewery site, with construction expected to begin later this year and completion due in Autumn 2021.

PRESIDENT'S COLUMN

What's going on in the construction sector at the moment? On one hand, we have the statistics implying its all doom and gloom, and on the other hand, many of my customers are saying they've never been busier. How do we reconcile these conflicting sentiments, and what do they mean for us all?

The IHS Markit / CIPS UK Construction PMI has been in the doldrums for months, sitting well below the 50 break even point. Their latest data release for October was 44.2, following on from September's weak 43.3. Experian is expecting a flat year for construction this year, up 1.2% and the ONS new orders data for quarter 2 was 13.3% down, more than reversing the gains we saw in the first quarter of this year.

But when I speak to my customers, they all say they're flat out and never been busier tendering. So what's the story?

We all know that the large London commercial market remains soft; in the October UK Construction PMI survey, commercial activity fell for the 10th month running. However, I spend a lot of time on the road, and when I visit big cities like Manchester and Birmingham I see growth, commitment and a lot of big projects.

Cost, as usual, is at the fore and this is likely to account for the busy feel around tendering. When customers and main contractors are needing to drive costs down, it can often feel like the market is busy, both for main contractors and sub-contractors. But there's always a downside, with unrealistic cost models creating financial instability in the sector and driving down quality. It also means that the cowboys are awarded jobs that they're not properly qualified for, and the project cost and schedule are never met anyway. It's a real false economy.

We're also continuing to see a high level of insolvencies throughout the construction supply chain. And in response, many of the main contractors have reshaped, re-positioned and restructured to meet what they think conditions will be in the short to medium term.

Of course, it is prudent to take note of the conflicting signals and prepare for a downturn in the short term. But it is just as important to look at the long term and prepare for a new environment in construction. One with different contracting models, reshaped clients and updated methods of construction.

BCSA is helping its members on both fronts – providing advice and lobbying on the short-term commercial issues they are facing, while repositioning steel, the original offsite framing material, for the inevitable longer term changes to the construction sector.

Tim Outteridge
BCSA President and Jamestown Manufacturing

Severfield acquires power sector steelwork specialist

Leading steelwork contractor Severfield has entered into an agreement to acquire 100% of the share capital of Harry Peers, a full-service structural steelwork business, for a net initial consideration of £18M, payable in cash on completion.

The Board of Severfield said they believe that the long-term investment profile of Harry Peers's key positions in the highly-regulated markets of nuclear, process industries and power generation, enhances its areas of expertise and broadens its market exposure.

Harry Peers has also demonstrated capability in modular structural steel offerings, which Severfield will look to develop across its wider product range.

The nuclear sector, including both the defence and commercial sectors, in which Harry Peers commands a niche position with blue chip customers, is forecasted to grow through the UK Government's decommissioning investment programme.

The power generation market, including energy-from-waste ("EfW") plants, is forecast to grow on the back of the world economy seeking alternatives

to carbon fuels. The UK government has set a target of 15% of final energy consumption from renewable sources by 2020, meaning that 30% of electricity production will have to come from renewable sources.

Alan Dunsmore, Chief Executive Officer, Severfield commented: "This acquisition will help Severfield continue to deliver on its strategic objectives. Harry Peers's experience in specialist, highly-regulated, non-cyclical markets will enhance our future growth plans through expanding the Group's capabilities and sector reach."

Cantilevering Edinburgh hotel takes shape

An £18M four-star boutique hotel, featuring a steel-framed 6.7m cantilevering wing, is taking shape in Edinburgh's West End at Torphichen Street.

The 150-bedroom hotel is being built by Ogilvie Construction for Axcel Hospitality and will incorporate a restaurant, bar and leisure facilities. The project is due for completion in early 2020.

The eight-storey project has a hybrid design, featuring a main precast concrete element, which is enhanced with a steel-framed section that cantilevers over the thoroughfare, thereby enlarging the available footprint.

Hescott Engineering is erecting 300t of steel, which connects back to the concrete part of the hotel via steel plates and welded stubs that form the connection between the two frames.

Steelwork contractor's national recognition for new Behavioural Safety Charter

Cleveland Bridge UK has achieved national recognition for its newly-launched Behavioural Safety Charter.

Winning the prestigious Make UK award for Health, Safety and Well-being at the organisation's Manufacturing Awards, Cleveland Bridge was commended on its work to further safeguard the physical and mental health and safety of its employees.

Working with an external, best-practice safety consultancy, Cleveland Bridge has developed a bespoke, in-house behavioural safety training programme dedicated to improving employee well-being.

The comprehensive course was delivered to all Cleveland Bridge employees, over a period of five months with the aim of embedding safety consciousness into everybody's daily behaviour, so that working safely, identifying potential risks and taking action to address them, becomes second nature.

The training programme is said to have resulted

in several key initiatives including more visible communications about health, safety and well-being.

Chris Droogan, Managing Director of Cleveland Bridge, said: "Health and safety are critical to us and we are committed to maintaining and improving our employee health and well-being.

"We are very proud that our new Behavioural Safety Charter has already been recognised by the manufacturing industry and our commitment to recognising the importance of challenging attitudes and behaviours across the business."

Construction work powers ahead at Battersea

Steelwork erection is nearing completion on the iconic Battersea Power Station, which will house over 100 shops, restaurants and cafes, a 2,000-person capacity events venue, a unique chimney lift experience offering 360 degree panoramic views of London's skyline from a height of over 100m, new office space, 46,500m^2 of which will be home to Apple's new London Campus, and 253 new residential apartments.

Much of the building's fabric has been retained, including the majority of its original steel frame and brickwork facades.

The building is divided up into different sections, consisting of a central boiler house, with a turbine hall and switch house on both sides – east and west. Each section is being infilled with new steelwork.

Working on behalf of Battersea Power Station Development Company, William Hare will eventually erect close to 24,000t of steel at Battersea Power Station, which will open to the public in 2021.

Steelwork completes at Doncaster cultural centre

Containing 380t of structural steelwork, the frame for the Doncaster Cultural and Learning Centre has been completed by Hambleton Steel.

The new steel-framed building surrounds the frontage of the former Doncaster Grammar School for Girls. A glazed elevation will allow the retained structure to be visible from the street and thereby make it one of the borough's most eye-catching buildings.

Three existing buildings (Doncaster Central Library, Doncaster Museum and Art Gallery and the Library Services for Schools) will be consolidated into this new central hub.

The building will have the space and facilities to display exhibits that have been locked away from public view for years, including the town's famous Roman Danum Shield, which was unearthed in 1971, and the Royal Borough Charters.

The building's lower ground floor will also house a railway museum and exhibit two locomotives built in Doncaster.

A council spokesperson said: "Keeping this element of the former girls' school means we can preserve Doncaster's heritage and create a building that could possibly bring local and national awards.

The new building is set over four floors and covers much of the footprint of the former school. The steel braced frame supports metal decking and a concrete topping to form a composite flooring solution throughout the structure.

The completed Doncaster Central Library and Museum is due to open in August 2020.

Costume change for RSC workshop

Steel construction is playing a major role in the restoration and redevelopment of the Royal Shakespeare Company (RSC) costume workshop in Stratford-upon-Avon.

Home to the theatre's award-winning costume-makers since the 1950s, the workshop was in urgent need of repair.

The construction work combines the remodelling of the historic existing buildings with a three-storey steel-framed new build element.

The new steel-framed structure wraps around the historic buildings linking them to the existing RSC Headquarters and will create enhanced facilities for what is the largest in-house costume-making department of any British theatre.

The facility is one of the few theatres to have an in-house armoury where armour and weapons are made as well as workshops where experts craftspeople make everything from hats, corsets and leatherwork to jewellery and masks.

Designed by architects practice Aedas, the redevelopment will also create a new entrance to the RSC offices and costume workshop using the 1887 former scene dock doors, which were built for the original Shakespeare Memorial Theatre.

Working on behalf of main contractor Stepnell, Coventry Construction is fabricating, supplying and erecting the steelwork.

Diary

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

Wednesday 20 November 2019
Essential Steelwork Design 2 day course
This 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.
Manchester

Tuesday 10 December 2019
Realising the steel design - Webinar
Designers design, fabricators fabricate and erectors erect – but do these three components in the construction process align? This webinar will look at these in reverse order from the erector's point of view and what he needs to safely build the structure whilst maintaining its stability.

Steel takes stock

Despite an unsettled construction sector, Barrett Steel have had a markedly positive six months. The business has secured its position as one of the UK's largest steel stockholders, with over 110 thousand tonnes of stock in situ, through new acquisition and investment in the latest fleet and processing technologies.

Barrett Steel has been supplying the construction industry since 1866

Barrett Steel has been a proud supplier of the steel construction market for generations and despite recent uncertainties, has continued to invest in supporting the industry whilst securing jobs for many in the sector. Long-established as a key partner to construction businesses across the UK, the 6th generation family business prides itself on being the most versatile of providers to the construction industry. An industry that has been embedded right at the core of Barrett's success since the business began with Henry Barrett in Bradford back in 1866. Continuing this commitment, Barrett Steel are proud to continue their headline sponsorship of Steel for Life.

2019 has seen the number of Barrett depots across the UK rise to 30 operating sites and offices, with the acquisition of the former Parker Steel site in Shoreham being the standout investment for the group over the last 12 months. James Barrett, Group Managing Director commented, "This acquisition allows the Group to develop its presence in the south of England which complements our existing processing hubs in the North showing how positive we are about the future of the steel industry."

The acquisition of the Barrett Steel Shoreham site in August this year marked a very exciting time for the Barrett Steel Group. The Barrett Steel Shoreham site has provided the group with the perfect platform to service its ever growing customer base in the south of England. The acquisition added an exclusive and dedicated bulk receipts port facility to the business as well as six Ficep Saw-Drill lines, including two new Ficep Endeavour Saw-Drill lines, taking the total number of these machines within the group to four. This has enabled Barrett Steel to increase speed of supply across the UK on processed materials.

John Childs, Group Operations Director recently commented on the port facility. "We have safely discharged over 15,000 tonnes of steel stock in just six weeks thanks to the hard work of our dedicated team on site and the excellent work of Shoreham Port." Barrett Steel are delighted to have retained 50 staff at Shoreham and are looking to re-employ additional ex Parker employees who left their roles before Barrett Steel acquired the site. Barrett Steel believe passionate local employees are critical to the success of its businesses across its UK network.

Future investment planned for the Shoreham site includes adding further saw and angle lines whilst simultaneously upgrading the materials handling equipment and cranes currently on the site.

One of the biggest new additions to Shoreham this month has been the arrival of six new HGVs, consolidating Barrett Steel's commitment to a greener fleet. Barrett Steel's environmental credentials in the reduction of CO_2 and equivalent emissions have recently been recognised by Masternaut, with the awarding of a Gold Certificate.

As a key market for Barrett Steel, the construction sector is mainly supplied from the group's largest division, General Steels. As part of the General Steel Division, Barrett Constructional Steel (based out of Barrett's Bradford head office) focuses exclusively on larger steelwork contractors, who are likely to have unique and challenging requirements due to the larger size and complexity of their projects. The General Steels division provides all the steel elements needed to create modern structures including heavy structural sections, steel plate, tubular sections, light sections, flats and angles.

Barrett Steel prides itself on being a one stop supplier for the construction industry. Daniel Redgwick, Commercial Director of Barrett Constructional Steel supported this by commenting, "We are proud to offer the complete package to our customers. We carry an extensive range of material ex-stock and within the Group have access to a wide range of state-of-the-art added value processing, meaning we can tailor our offering to the market requirements at every level. Not only do we possess the stock depth on our core steel offerings, but we also have access to a wide range of ancillary products used by the construction sector regularly on many projects which enables us to be the perfect partner in supply."

Continuous investment in quality and productivity enhancing state-of-the-art equipment continues for the group

Barrett Steel plans to add further saw and angle lines at the Shoreham facility

"Over 150 years working hand in hand with the construction industry has enabled Barrett's to be in tune with the challenges our customers are facing daily."

Barrett Steel has recently acquired the former Parker Steel site in Shoreham

in 2019/2020. This is in line with the current restructuring of the Barrett Steel Tubes business in Dudley to a dedicated manufacturing hub and centre of excellence for section/hollow section processing. The site is home to 12 laser processing machines including the LT20 Jumbo laser which lends itself perfectly to the processing of constructional components due to its capacity to laser hollow sections up to 508mm in diameter and 14 metres in length. This investment in processing within stockholding allows contractors to focus on design, more challenging fabrication operations and the erection process.

The acquisition of Shoreham has also boosted Barrett Steel's dedicated profiling team based at the C Roberts Steel Services site in Rotherham. Tom Barrett, Group Commercial Director and current Managing Director of the C Roberts depot spoke about the growth of the team commenting, "It is a notably exciting time for the Barrett Group, and we have seen extensive growth in our profiles team here at Rotherham. We are enjoying working in partnership with the team at Shoreham to expand our profiles offering across the UK. With the profiler at Shoreham expanding our Rotherham capacity plus a further two HD plasma machines and a new laser due on site as we move towards 2020, we will be better positioned than ever to offer a complete package to our construction customers across the UK."

Today steel stockholders need to offer an ever varied supply of processed material into the construction sector. James Barrett commented, "Over 150 years working hand in hand with the construction industry has enabled Barrett's to be in tune with the challenges our customers are facing daily. Recently, we have noticed that site dates are finalised but then, due to hold ups with drawing release, our customers are often faced with increasingly shortening lead times for fabrication and supply. At Barrett's we work seamlessly with our customers to not only ensure stock availability at short notice but to ensure, where we can, that our investments in advanced processing can assist our customers to hit ever tighter schedules."

The experience entwined in the Barrett Steel operation means not only does the group have the scope to supply a wide variety of stock and processed products, but additionally their long-established supply chain relationships pass on an enormous amount of benefits to the customer. Whether it's sourcing different types of stock, such as nonstandard specification for the nuclear construction sector, or by reducing costs for end-users thanks to single-source operation, their supply chain allows reduction in costs and transport requirements across the board.

There is no escaping the ever-changing political landscape and the threat Brexit poses to many of the UK's industries. However Barrett Steel are reassuring customers they continue to monitor the overall situation and they have put procedures in place in preparation for the various scenarios the steel industry faces. What is for certain in these current times is that Barrett Steel's team of experts can boast significant levels of technical knowledge. This level of knowledge and understanding of the sectors they are servicing allows them not only to create tailored solution-based offerings to assist their customers with the ever-changing challenges they face but backs that up with the investment in stock, transport and the processing capabilities required to cater perfectly to the construction industry for many generations to come.

Barrett Steel is a headline sponsor of *Steel for Life*

STEEL for life

Capital scheme

Optimising the number of floors within an overall city centre height limit led the design team to choose a steel-framed solution for Edinburgh's Capital Square commercial scheme.

Edinburgh's largest speculative office development, located within the City's Exchange business district is quickly taking shape with the aid of steel construction.

The eight-storey steel-framed building will offer 11,380m² of office accommodation, spectacular views across the city from its upper levels and a double-height reception area.

Highlighting the need for Grade A office space in the Scottish capital, the top three levels have already been let to Brodies LLP, said to be Scotland's largest law firm, while another law firm, Pinsent Masons, has let two floors.

The building sits on top of a three-level reinforced concrete basement that accommodates a 110 space public car park. From the ground floor slab upwards, the structure is entirely steel-framed.

According to BAM Construction Senior Site Manager Derek Cooper, a steel solution for the superstructure was chosen primarily for its speed and ease of construction. The steelwork erection began in May, and by the end of September BHC had completed the majority of the frame, excluding some square hollow section (SHS) ladder frames that will support architectural fins either side of the entrance. These SHS sections will be retrofitted later in the construction programme.

Blyth & Blyth Associate Brett Steyn agrees and adds: "The other key driver for the Capital Square development is the limitation in the overall building height given the location of the site in the centre of Edinburgh.

"The height limitation meant that any transfer level or structures would impact on the overall number of usable floorplates that could be achieved. The column grid adopted on site was therefore typically defined to provide a suitable layout for the car parking levels below, while providing clear open office floorplates above. The grid is irregular in both directions in order to accommodate the best parking layout and traffic flow."

The office floorplates typically have spans of 10.5m for the secondary beams with spans of between 7.5m to 9m for the primary beams.

Meanwhile, the floor-to-ceiling heights

Some of the offices will have views of Edinburgh Castle

"Steelwork deliveries were kept to a minimum and the loads erected almost immediately."

were critical in optimising the number of levels the design team could achieve within the overall height limit. This lead to the use of cellular beams to accommodate the services within the structural zone, thereby negating the need to increase the floor-to-ceiling heights.

The structural zone is set at a standard 610mm height and accommodates beams with 400mm cellular openings. The only exception to the cellular beam design is the area of the building that accommodates the exit of the main ducting from the central vertical riser.

This area had to be considered differently due to the size of the ducts. The ventilation ducts were consequently accommodated beneath non-cellular beams, which were installed within the depth of the slab, so as not to interfere with the important floor-to-ceiling heights.

The floorplates remain the same all the way up the building until the upper two levels, which have steps that provide space for outdoor terraces.

There are two terraces, on levels six and seven, while a plant screen extending up from the roof of the structure provides the appearance of a third step.

Visualisation of the main entrance

Photo © Aaron Courtney

"Most columns within the walls of the steps are situated on main steelwork lines, and therefore do not require transfer structures," explains Mr Steyn.

"However, additional steelwork has been provided to tie the columns in all directions and some columns are situated off main steelwork lines. This required transfer beams, which span between secondary beams transferring the loads back into the main frame of the building."

Lateral stability for the steelwork is provided by two concrete stair and lift cores located on the north and south elevations. These were constructed prior to the steelwork beginning as part of the early concreting programme that also included the construction of the three-storey deep basement car park and the ground floor slab.

Commenting on the construction programme, Mr Cooper says: "This is a very confined site, hemmed in on three sides by existing buildings with only one access route for materials, which is via the busy Morrison Street.

"Steelwork deliveries were kept to a minimum and the loads were erected almost immediately. A concrete frame, on the other hand would have required more deliveries, which would have been problematical."

Once delivered, all of the steelwork was erected via the site's two tower cranes, with the heaviest elements weighing 6t, which was easily within the crane's lifting capacity. The 6t sections are the lowest columns, founded on the ground floor slab.

The site was previously occupied by a 600-space automated car park that used robots to park and retrieve vehicles, allowing cars to be stacked in a way that took up half the space of its competitors.

Once this structure was demolished, one of the first tasks BAM Construction had to undertake was the installation of a contiguous piled wall. This provided the lateral support for an excavation process to deepen the existing basement and for the installation of the core's foundations.

"Because of the confined nature of the site, all of the concreting works had to be completed before we could begin the steelwork programme for the superstructure," says Mr Cooper.

This prestigious development is aiming to achieve a BREEAM 'Excellent' rating and is scheduled to be complete by May 2020.

FACT FILE
Capital Square, Edinburgh
Main client: BAM Properties, Hermes Investment Management
Architect: Hurd Rolland
Main contractor: BAM Construction
Structural engineer: Blyth & Blyth
Steelwork contractor: BHC
Steel tonnage: 1,000t

Cellular beams have been used throughout for service integration

Photo © Aaron Courtney

Water treatment taps into steel

The largest building has a standout dual-curving roof

Steel construction's long span qualities have been utilised on the largest building at the UK's newest water treatment facility.

FACT FILE
Williamsgate Water Treatment Works, Cumbria
Main client: United Utilities
Main contractor: Advance (a joint venture between Balfour Beatty Utilities and MWH)
Structural engineer: MWH
Steelwork contractor: Border Steelwork Structures
Steel tonnage: 500t

Forming part of the £300M West Cumbria Water Supplies Project, Williamsgate Water Treatment Works is a brand new facility set in the middle of the county's countryside.

Located a few miles north of Cockermouth, the facility will perform a vital function for the overall project. It will treat raw water, fed to it from Thirlmere Reservoir, before a new network of pipes takes the treated water to two new service reservoirs, where it will be stored and ready to supply customers in West Cumbria.

The main driver behind the project is to provide a resilient water supply to West Cumbria following the Environment Agency's decision to withdraw the abstraction licence for Ennerdale Lake, one of the area's current water sources, by 2022.

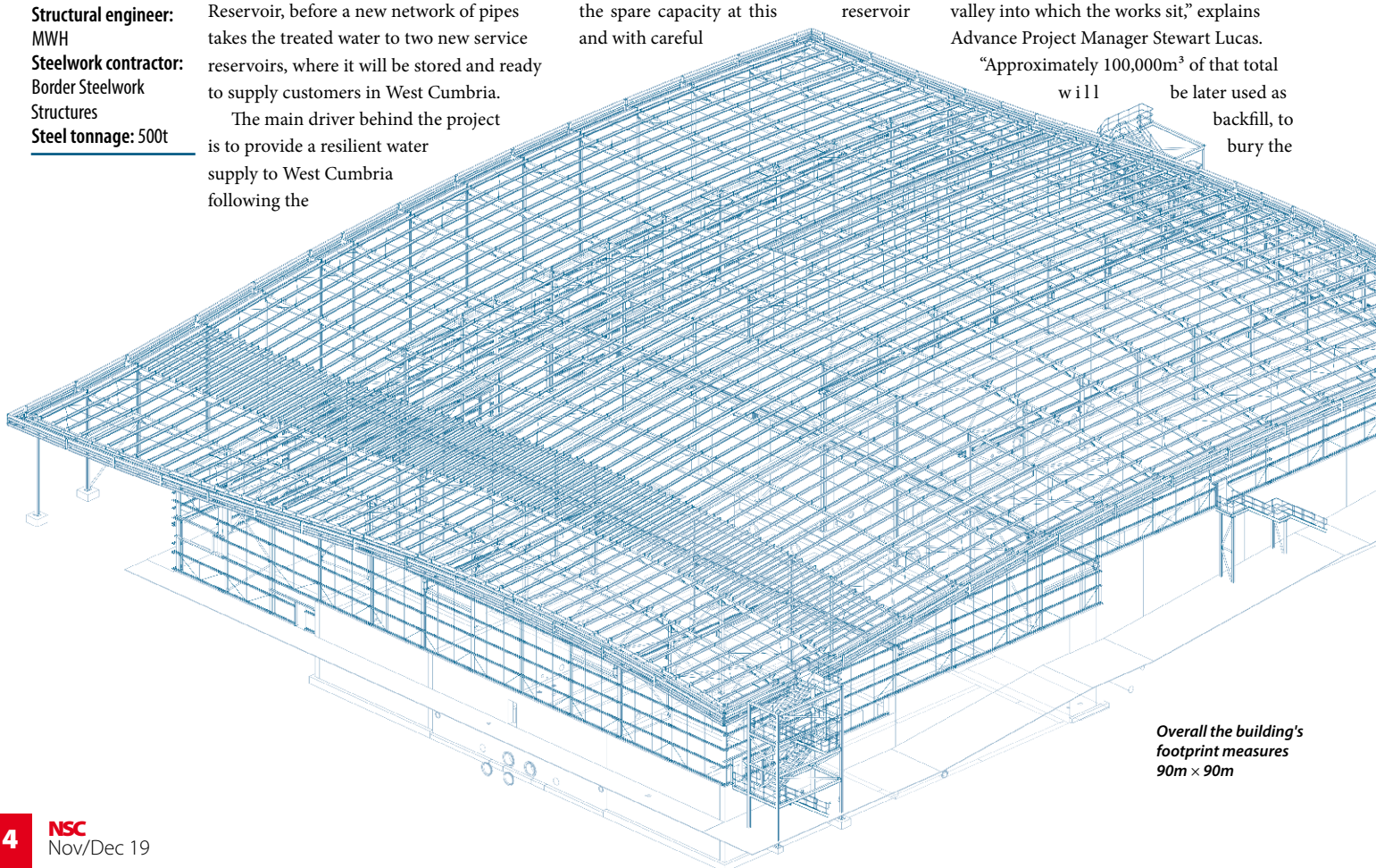
Consequently, the project involves United Utilities (UU) having to link West Cumbria with the rest of its North-West England water network via a major new pipeline from Thirlmere. By tapping into the spare capacity at this reservoir and with careful planning, UU says it will make sure there is minimal long term environmental impact.

As well as the new water treatment works, the project also involves the construction of over 100km of water pipes, new pumping stations and underground service reservoirs.

A lot of consideration went into the choice of location for the water works in order to limit its impact. The site has been designed to merge into the natural contours of the surrounding environment.

"We've moved around 300,000m³ of earth to reshape the site and create a deeper valley into which the works sit," explains Advance Project Manager Stewart Lucas.

"Approximately 100,000m³ of that total will be later used as backfill, to bury the



Overall the building's footprint measures 90m × 90m

A large earthmoving programme was needed before steel erection could begin

"The project has been a great example of partnership working…"

treatment water tank and thereby lessen the impact on the landscape."

The largest structure at Williamsgate, housing the main water treatment facilities, is the Rapid Gravity Filtration Building (RGFB), which is a large steel frame.

Measuring approximately 90m × 90m, the structure has dual-curving roof, to be topped with sedum, a design specifically chosen as it will help it blend into the countryside.

"The framework to the building was designed to BS EN 1993-1-1. As the structure sits on a substructure of concrete walls and slabs, of varying levels, and has a dual wave-form roof, the design considered to be the best solution for the superstructure was a combination of braced steel frames and portalised bays where a clear span was required," explains Border Steelwork's Technical Manager Ian Elliott.

As well as fabricating, supplying and erecting the steelwork, Border is also responsible for the RGFB's roof and wall cladding, including the installation of the sedum. The steel erection programme started once the groundworks and the extensive concreting had been completed.

Internally, the RGFB is divided into three main areas, an initial filtration zone, a chemical dosing area – where chemicals are added to further enhance the water quality, and a second stage filter area. All of these areas are of a different size and their internal configuration also varies due to the differing sizes of the water tanks and equipment.

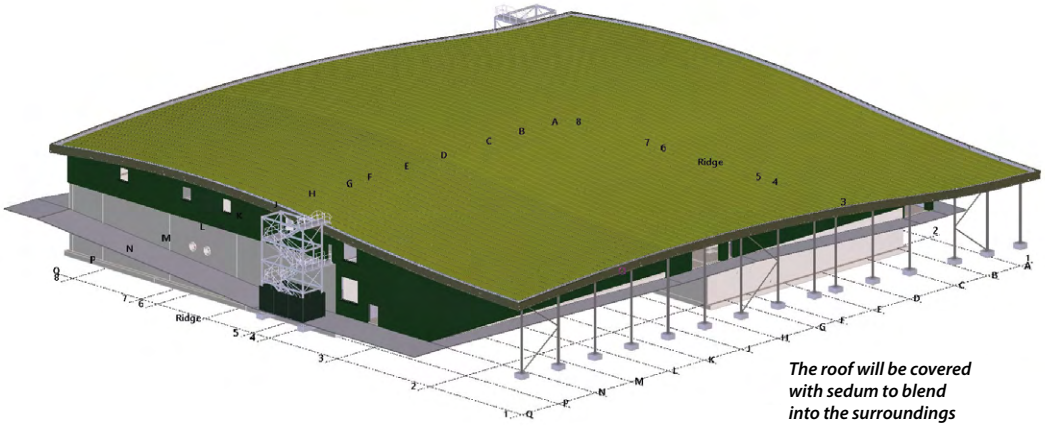
Concrete walls, that compartmentalise the entire building, presented the steel erection team with their biggest challenge.

"Because of the walls, it was impossible to run MEWPs into many areas of the building, so we had to lift them into the structure by crane so our erectors could bolt the splice connections," says Border's Contracts Director Stuart Airey.

"We then removed the MEWPs via gaps we left in the roof steelwork."

The initial filtration zone is five bays wide, with each one measuring up to 16m-wide. The widest central zone also features an overhead gantry crane, with its rail beams supported by the internal columns.

The fifth bay, is an open canopy which runs the length of the building, covering an access road. For design purposes, this area was treated as a lean-to in the structural analysis.



The roof will be covered with sedum to blend into the surroundings

Internal partition walls for the central flocculation zone (main gallery) run at 90-degrees to the adjacent zones. This again has five bays with the largest having a 21m-wide clear span.

Lastly, the final stage filtration zone also has a longest span of 21m, in a zone that also incorporates another overhead gantry crane.

The dual-curving roof that spans the entire RGFB is formed with curved rafters in one direction, that have stepped faceted purlins between them to form the curve in the other direction.

As the roof will be entirely covered with sedum, which will exert heavier loads than a traditional standing seam roof, lateral sway/deflection had to be considered, using a 1 in 50 year return wind loading calculation.

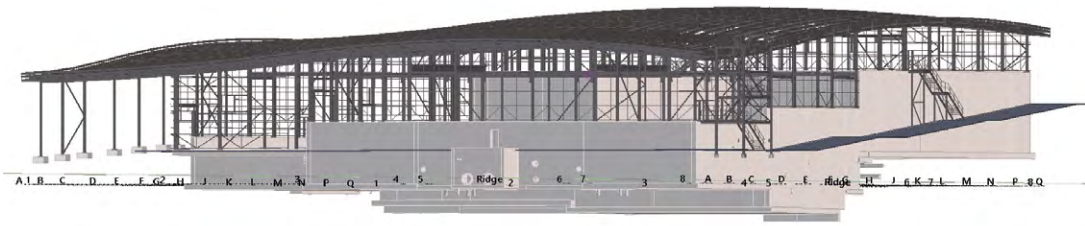
The building's roof also features a 2m-wide overhang around its full perimeter, which follows the curve of the roof, and contains the gutter. The design for this part of the steel frame had to consider general imposed loads, as well as the loading of a full capacity gutter.

Meanwhile, the upstand of the perimeter along the overhang was designed to consider lateral loads from the bespoke stainless steel edge protection.

Once the Williamsgate Water Treatment Works is completed in 2022 and the wider network and infrastructure is ready, the site will be capable of treating 80 million litres of water every day.

In summary, Ian Tomlinson, United Utilities Project Manager, says: "The project has been a great example of partnership working - and not just with our contractors, but also with our process colleagues who will eventually operate the treatment works.

"We've used the latest 4D modelling, Building Information Management (BIM) tools and virtual reality tours to specify the exact design detail, before a spade even hit the ground. That all adds up to a smooth construction process and a great final result."



Much of the steelwork is founded on a concrete substructure

Frame keeps project in good health

A steel-framed solution has provided a new health centre with a future-proofed flexible design and the desired clear spans. Martin Cooper reports from Greenock.

Plans to deliver a modern, state-of-the-art health and care centre for the populace of Greenock are progressing on schedule as the steel frame for a new facility is now complete.

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

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

"We need accommodation that helps us deliver services where there is an emphasis in delivering more care outside hospitals and in local communities.

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

Including ground floor, the steel-framed centre is a four-storey structure measuring approximately 60m x 50m. Its stability is derived from cross bracing, predominantly located around stairwells.

Most of the floors have very few internal columns, thereby providing the clear open-plan layout that the client wanted. The longest beams are 11m, and the steel members support metal decking to form a composite flooring solution.

"A steel-framed solution was chosen not just for its spanning qualities, but also because we wanted minimal internal columns to provide a flexible design whereby partition walls can be moved in the future if room sizes need to be reconfigured," explains Hoskins Architects' Alastair Cassell.

This large nearly square-shaped building is also arranged around an open centre, which will accommodate an inner landscaped courtyard.

The courtyard, like the building will be stepped, as the entire site slopes from north to south and from east to west. From the south-east corner of the overall site to the north west corner, there is a 15m drop in ground level, while the gradient within the footprint of the building is 7m from south to north.

The severe topography of the site meant the project needed an extensive groundworks programme, which included the construction of a retaining wall that extends around the majority of the

FACT FILE
Greenock Health and Care Centre
Client: Hub West Scotland
Architect: Hoskins Architects
Main contractor: BAM Construction
Civil and structural engineer: BakerHicks
Steelwork contractor: Hescott Engineering
Steel tonnage: 480t

The project will aid the regeneration of Greenock

Bracing is located around the stairwells

The footprint of the building incorporates a sloping site

building's footprint.

Further highlighting steelwork's flexibility, BAM Assistant Site Manager Lewis MacMillan says: "We got most of the retaining wall constructed before the steelwork erection started, as many of the columns are founded on the wall.

"However, in some areas we had to leave steel ground beams out, in order to complete the groundworks. These beams did not affect the overall stability of the frame, and so they were installed later in the programme."

As well as the retaining wall, the groundworks also included the installation of the frame's foundations, which consist of pad foundations and concrete mass-fill to the rock below.

The sloping site also affects the building's floor levels, as along the main northern elevation the structure reaches the maximum four-storeys high and also includes a small basement area. However, along the east and west elevations, the ground floor can only extend along one-third of the structure's length, before it has to end at the slope's retaining wall. Consequently, this means the first floor is at ground level along the back (south) elevation of the building.

Adding some more variety into the design, the north and most of the eastern elevations both incorporate the maximum four levels, while the other two sides of the building are only two-storeys high. Because of the slope and the lack of any ground floor along the back elevation, the building only needs to step down one floor level in this area to incorporate the two storeys.

Commenting on the project's challenging ground conditions, Hescott Engineering Director Chris Scott says: "The erection of the steel frame was difficult due to the sloping nature of the site. The difference in level between the lowest base and the highest base is quite significant and consequently, steelwork loads had to be scheduled to suit where the cranes and MEWPs could be positioned."

An access road behind the centre and a large laydown area on the eastern side, which will eventually form a car park, provided Hescott its main positions for its cranes during the erection programme.

The standout feature of the centre's steelwork is probably the first part of the building most visitors will see. The entrance features a propped cantilever that creates a column-free way in with a glazed screen set 3m back from the column line.

This cantilever is formed by a transfer structure comprising two 356 × 406 × 634 UC beams that are positioned at first floor level and support the three levels of structure above.

Summing up, Caroline MacVey, Senior Civil & Structural Engineer at BakerHicks and Structural Engineering Lead for the Greenock project, says the advantages of using steel frames are numerous.

"Steel's high strength-to-weight ratio and versatility gives us as engineers so much more freedom to achieve ambitious designs. Through being both light and strong it allows for long spans and open, column-free spaces that just aren't possible with a lot of other materials.

"On top of this, it's highly economical and as its fabricated offsite it can be brought in and rapidly erected, which helps speed up the construction process. The majority of our structural designs now are in steel as it just offers so much more."

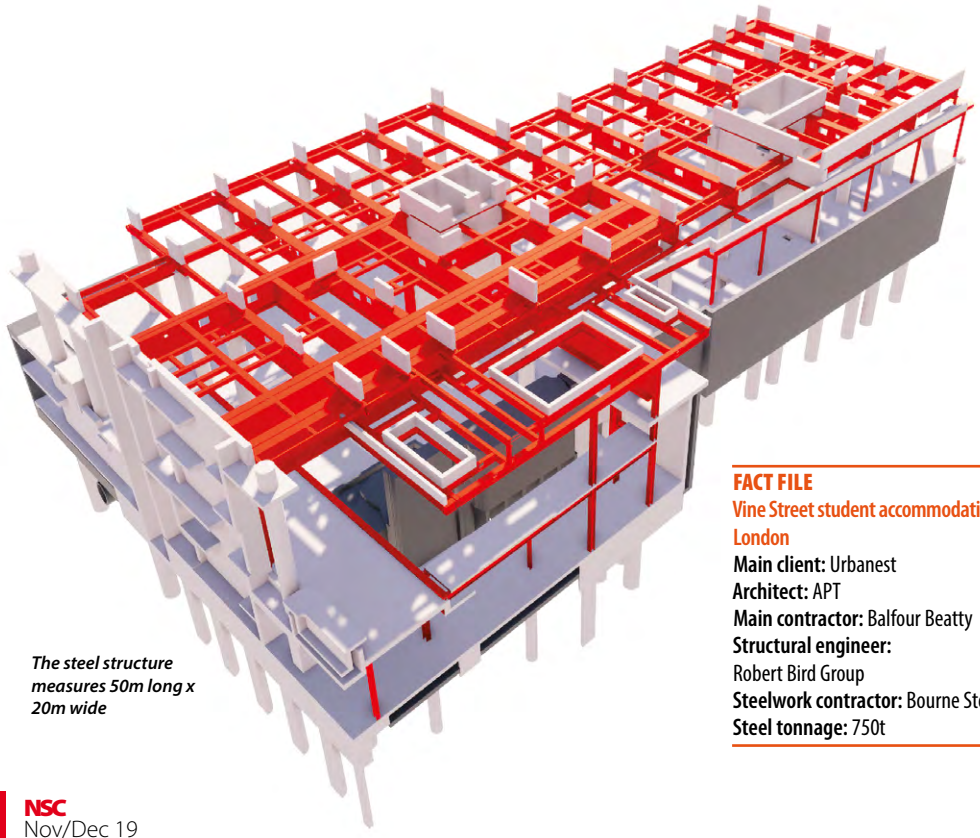
The New Greenock Health and Care Centre is due to be complete by August 2020.

> *"Steel's high strength-to-weight ratio and versatility gives us as engineers so much more freedom to achieve ambitious designs."*

Two cores provide the stability and access to the residential apartments above

History lesson

The need to preserve and exhibit Roman remains has dictated the design and configuration of a steel transfer structure that supports a new student accommodation block in London.



The steel structure measures 50m long x 20m wide

FACT FILE
Vine Street student accommodation, London
Main client: Urbanest
Architect: APT
Main contractor: Balfour Beatty
Structural engineer: Robert Bird Group
Steelwork contractor: Bourne Steel
Steel tonnage: 750t

Tucked behind Fenchurch Street railway station in the City of London, a new student accommodation-led mixed-use scheme is quickly taking shape, thanks to the support and spanning qualities of structural steelwork.

The project consists of four towers, three of which are concrete-framed and reach heights of between 14-storeys and 12-storeys, while a fourth is a steel-framed six-storey structure (see box).

The latest scheme from Urbanest, a developer and operator of student accommodation, the project will provide 654 student beds, alongside 5,500m² of Grade-A offices and space for start-up businesses.

Urbanest describes the project as its most ambitious scheme to date and all of the beds are to be offered exclusively to students from King's College London, through a long-term nominations agreement.

Another aspect of the scheme will be the inclusion of a three-storey museum that will exhibit some previously concealed remains of a bastion tower and part of the 4th century wall that once encircled Roman London.

These archaeological remains, which are set to be made readily accessible to the public, were the main driver for the design of a large steel structure as Robert Bird Group Engineer Liam Guntrip explains. "In order to span 17.5m over the wall, create sufficient internal space for the museum and other facilities, while also supporting an

accommodation block above, we opted to design a large steel transfer structure.

"After considering concrete options we found steelwork provided the most buildable design. Concrete construction would have been problematical due to the difficulty of forming concrete over the Roman wall."

Measuring approximately 50m × 20m, the deck is 10m-high and accommodates two basement levels and a ground floor, while supporting a 14-storey student accommodation block above.

Split into two distinct parts, the transfer structure encompasses two cores that will serve the accommodation tower, while also providing the steelwork with some stability.

The northern section, that spans the Roman remains will accommodate a three-storey gallery and museum with an underground public viewing platform, café and exhibition space.

The southern half of the steel transfer structure also contains some long spans and will accommodate a ground floor student reception area fronting Vine Street, and two basement levels containing space for entrepreneurial start-up businesses, and back-of-house facilities such as bicycle storage areas and a loading bay.

Prior to the steelwork erection beginning, main contractor Balfour Beatty had already encased the Roman remains in order to prevent any damage during the construction programme.

"We also tweaked the connection design of the steelwork beams that span the Roman remains, so all of the bolts could be tightened from outside of the sensitive area," explains Bourne Steel Divisional Manager Andy Davies.

To create the column-free space over the remains, two parallel 17.5m-long girders have been installed at first floor level.

As they are positioned in the middle of the transfer structure at the furthest point from any vehicular access point, there was a need to redesign these members in order to limit the size of crane needed to lift them into place.

The girders are consequently formed from channels, which were spliced together in-situ, to form a 25t section. There are eight 1,850mm-deep pieces in total; four needed to complete each girder.

A 500t-capacity mobile crane, which required a road closure, was needed to install these large girders. To minimise disruption, Bourne Steel's erection programme for the initial phase was completed in just one weekend.

This consisted of nine truckloads of steelwork, with the heaviest member being over 22t and measuring 13m-long × 1.8m-deep with 120mm thick flanges and 45mm thick webs..

"To coordinate nine deliveries over one weekend was always going to be a challenge, but we had an excellent team and successfully installed 180t of steelwork. We even had time for Balfour Beatty and our team to sign off the largest plate girder, which sits encapsulated above the Roman wall," adds Mr Davies.

"However, this wasn't the project's largest member, this was a beam that was over 20m-long x 1.25m-deep with 80mm thick flanges and 50mm thick webs, weighing 27t. This plate girder was installed using a smaller 250t-capacity crane."

As well as providing the required long ▶20

The six-storey block sits adjacent to an existing medical centre

Light frame construction

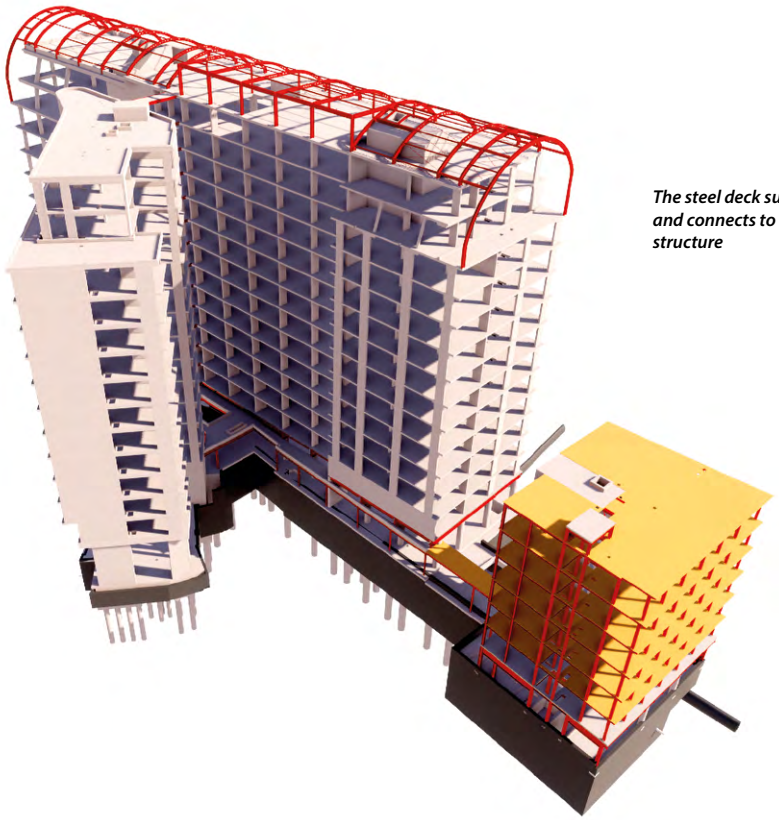
The overall project also includes a steel-framed six-storey student accommodation block that sits adjacent to the transfer structure and has an entrance on Crosswall.

Joined by a covered walkway, the two steel structures are both structurally independent, while the design of the accommodation block has also been driven by Roman remains.

"The block has been designed to infill an area between two existing buildings, it also has a lightweight frame because we could not install piles as there are further remnants of the Roman wall beneath its footprint," explains Robert Bird Group Engineer Liam Guntrip.

Consequently, to keep the building's weight to a minimum, it will be constructed on shallow raft foundations and will then utilise a steel frame with lightweight Metsec joists supporting a plywood floor.

Erected around a single stability-giving concrete core, the steel frame will have a 5m × 5m column grid pattern. Bourne Steel will begin the erection of this part of the project in February 2020.



The steel deck supports a 14-storey block and connects to a six-storey steel-framed structure

▶19 internal spans, the transfer structure will also support 14-storeys of student accommodation. In order to have sufficient strength and robustness, the structure's columns are all plated 356 x 406 x 467 sections.

Bourne Steel completed the transfer structure in September, allowing the project team to start constructing the student accommodation block above.

Summing up, Balfour Beatty Project Manager Andy Cross says:

"Engaging Bourne at an early stage in the project enabled us to create a robust strategy for delivering this challenging aspect of project works.

"Regular stakeholder consultation, meticulous planning, and coordination of programmed works, in collaboration with our supply chain, ensured a well-executed delivery, finishing ahead of schedule and mitigating any disruptions to local residents or businesses. The feedback has all been extremely positive."

The entire project is targeting a BREEAM 'Excellent' rating upon scheduled completion in 2021.

Bourne Steel unload the project's largest plate girder

Transfer Beams

The creation of large open spaces in the lower levels of buildings for particular uses, or to display archaeological remains as at Vine Street, involves the provision of transfer structures to carry the structures above. Richard Henderson of the SCI discusses some of the issues.

Transfer structures support one or more columns from floors above. The structures are clearly more critical elements than normal floor beams simply in view of the greater floor area that is supported by the transfer structure. When designing structures to resist accidental actions, transfer beams, their connections and their supporting structures need careful consideration.

SCI publication P391[1] suggests all transfer beams should be subject to an assessment to determine whether the standard approaches for Class 1, Class 2a or Class 2b can be adopted. An assessment is required for Class 3 buildings anyway. Eurocode 1 Part 1-7[2] defines ways of achieving appropriate levels of robustness to mitigate the effects of accidental events.

In Class 1 and Class 2a buildings (lower risk group) with low and medium consequences of failure, transfer structures are recommended to have at least the minimum level of horizontal tying for Class 2a buildings. Enhanced tie forces are recommended to take account of the additional load supported by the transfer structure.

In Class 2b buildings, three alternative methods of designing for robustness are available, tying, notional removal and key element. Notional removal is likely to be an unviable design approach (although mentioned in BS EN 1991-1-7 in this context) so tying and key element design are expected to be most suitable.

If tying is adopted, increased horizontal tie forces to account for the additional load from the columns supported above are recommended (as for Class 2a). Additionally, the connections of the columns to the transfer structure should be designed to resist tension.

If the key element approach is adopted, P391 suggests that both the transfer structure and its supporting columns should be designed as key elements.

Class 3 buildings require a specific risk assessment to be undertaken. Transfer structures should at least be designed following the Class 2b guidance. The risk assessment would identify if additional measures should be undertaken to achieve an appropriate level of risk.

The proportions of the transfer beams in the Vine Street project: 1.8 m deep beams with 120 mm thick flanges and 45 mm thick webs underline the significance of their function.

1. Structural robustness of steel framed buildings, SCI P391
2. Eurocode 1 – Actions on structures Part-1-7: General Actions – Accidental actions

Bespoke design for city gateway

Two New Bailey takes shape with One New Bailey in the foreground

Steel-framed commercial buildings, each with their own individual design, are taking centre stage on a multi-million-pound development in Salford. Martin Cooper reports.

FACT FILE
Two New Bailey, Salford
Main client: The English Cities Fund
Architect: Allford Hall Monaghan Morris [AHMM]
Main contractor: Bowmer + Kirkland
Structural engineer: Integra Consulting Engineers
Steelwork contractor: Severfield
Steel tonnage: 2,500t

Creating a gateway between Salford and Manchester, New Bailey, is part of the wider £650m, 50-acre Salford Central masterplan delivered by The English Cities Fund – a joint venture between Muse Developments, Legal & General and Homes England, in partnership with Salford City Council – that contains an array of commercial, retail and residential buildings.

Located along the Salford side of the River Irwell, New Bailey, gets its name from the prison that stood on the site until being demolished in 1872.

Because of the plot's historic significance, an extensive archaeological investigation was undertaken prior to the main construction works getting underway in 2014.

Phil Marsden, Project Manager at The English Cities Fund, said: "New Bailey and the wider Salford Central masterplan was brought forward to change what was being used as a surface car park, into a new, vibrant destination where people would want to live, work and relax. High-quality individuality in design, along with right mix of partners and a strong, progressive client in Salford City Council has enabled us to achieve just that."

"Every office block has a different design team which gives the estate a unique selling point as the buildings have an individual look."

Bowmer + Kirkland is one of the main contractors for the scheme. Its work has so far included three steel-framed commercial blocks and a Premier Inn hotel. The latter structure was completed before the dig got underway as it sits slightly outside of the footprint of the former prison walls.

Of the office buildings, One New Bailey was completed in 2017 [with Billington Structures as steelwork contractor] and currently the firm is building units Two and Three [see box]. A fourth office building is also on the drawing board, as part of the masterplan.

Meanwhile, a further part of the overall New Bailey scheme, currently consisting of three residential towers and another multi-storey car park is simultaneously being built by Morgan Sindall Construction.

"Every office block has a different design team, which gives the estate a unique selling point as the buildings have an individual look," explains Bowmer + Kirkland Contracts Manager, Shaun Thomas.

Two New Bailey is an 11-storey office block, offering 17,300m² of floor space, a basement car park and is aiming to achieve a BREEAM 'Excellent' rating.

Contributing to the development's individualistic feel, this building is a stand-out structure that boasts an external steel exo-skeleton, while internally, the majority of the steel frame will also be left exposed.

Explaining the exposed steelwork design

The steel frame has a cantilevering entrance

choice, AHMM Senior Architect, Dan Farmer, says it is all about refining Salford's industrial heritage and creating a 21st Century warehouse as an office space with character.

"The steel frame is the real driver for this project and having an exo-skeleton meant that we were able to highlight the steelwork and dispense with the usual clutter that surrounds many buildings.

Having so much exposed steelwork meant a lot of attention has been paid to the connection design and the paint specification. All of the steel frame's bolts are countersunk as they were considered to have a more aesthetic look, while the majority of the steelwork will be repainted late in the programme to ensure it has the best possible finish.

The exo-skeleton is not just an architectural and aesthetic feature, the steel beams and columns around the perimeter are load-bearing and structurally-integral to the scheme.

Third on the block

Also, known as Plot B3, Three New Bailey is a seven-storey building that will provide 14,500m² of office space.

The BREEAM 'Excellent' rated office block is situated adjacent to Salford Central station and will have secure parking accommodated within disused railway arches. The entire building has been fully let to HM Revenue and Customs.

Although this building is not as tall as its neighbours, it is a long rectangular structure measuring almost 100m in length, which allows it to have significant floorplates.

"In the early design stages, we reviewed several options and a steel frame proved to be the most efficient way of achieving the long spans which were required to minimise the number of internal columns within the floorplate," says Cundall Principal Engineer Clare Dawson.

To this end, the scheme contains only five centrally-positioned internal columns creating two 15m-wide spans that run the length of the building.

These two long spans are created with a series of Westok cellular beams that integrate all of the building's services within their depth.

Stability for the frame is derived from reinforced concrete shear walls predominantly located around the stairs, lifts and risers within the central area of the building.

An interesting feature of the building is its 6m × 6m column-free corner zone that incorporates the ground floor entrance.

"To achieve this, we designed the structure above to act as a series of Vierendeel trusses at each floor level," explains Ms Dawson.

"Meanwhile, the façade comprises precast masonry panel sections which connect together in sequence to create a weaving effect. Careful consideration had to be given to the connection details, sequencing of installation of the façade system and building movements due to temperature and lateral loading."

The precast panels will attach to a series of brackets, which were welded to the perimeter beams by EvadX during the fabrication programme.

Three New Bailey is due to be complete by early 2021.

FACT FILE
Three New Bailey [Plot One]
Main client: The English Cities Fund
Architect: Make Architects
Main contractor: Bowmer + Kirkland
Structural engineer: Cundall
Steelwork contractor: EvadX
Steel tonnage: 1,340t

Steel cores provide the stability

Allowing the external steelwork to be even more of a stand-out feature, the internal floorplates and façade are set-back 800mm behind the skeleton.

Beams that penetrate the façade have a thermal break inserted into their length to negate any effects from the weather. The thermal breaks, which are bolted between two steel members and are hidden within the façade's depth, arrived on site already installed within the steelwork as this process was undertaken by steelwork contractor Severfield during its fabrication programme.

Based around a 12m × 12m grid pattern, the building has minimal internal columns, allowing the office floorplates to have the desired long uninterrupted and flexible spans.

Fabsec beams, used to integrate the building's services within their depth, support metal decked flooring. The underneath of the decking will be left exposed within the completed scheme, along with the services and duct work, adding to the overall industrial look.

Stability for the building is derived from a steel braced core. The decision to go for a steel core instead of a concrete one was all down to availability as Integra Consulting Engineers Director Rory Harris explains. "At the time, there were a number of concrete projects underway in the region and we thought there could be material availability issues, so we went with a steel core.

"It was a similar price in the end, but had the advantage of being erected along with the main steel frame."

Two New Bailey is due to be completed in mid-2020.

The glazed façade sits inside of the exoskeleton

Bolt slip in connections

The effect of bolt slip in truss connections is an issue that is raised with SCI from time to time in various contexts. Richard Henderson discusses some of the issues.

Introduction

The deflection of a truss can be estimated using various analytical methods and often a stick finite element (FE) package will be used to determine the member forces and the deflections under the different load cases. The calculated deflection depends on the assumptions made in the analysis about the nature of the joints – whether pinned or rigid.

Truss Joint types

In BS EN 1993-1-8, three categories of bolted connection loaded in shear are identified:

- Category A: bearing connections where the bolts act in shear and bearing;

Connections made with preloaded bolts:

- Category B: slip-resistant at serviceability limit state;
- Category C: slip-resistant at ultimate limit state.

Connections in category B must also be designed for shear and bearing in the ultimate limit state and Category C for bearing and net area. Fewer bolts will be required in Category B connections than in Category C ones.

SCI recommends adopting joints made with preloaded bolts where members are spliced and deflection is of concern because this allows the deflection of a truss to be better controlled. Category B joints are usually sufficient but Category C joints maybe specified in special cases (eg with oversize or slotted holes). In theory, once the joints are made, the subsequent deflection of the structure is due only to the elastic deformation of the members.

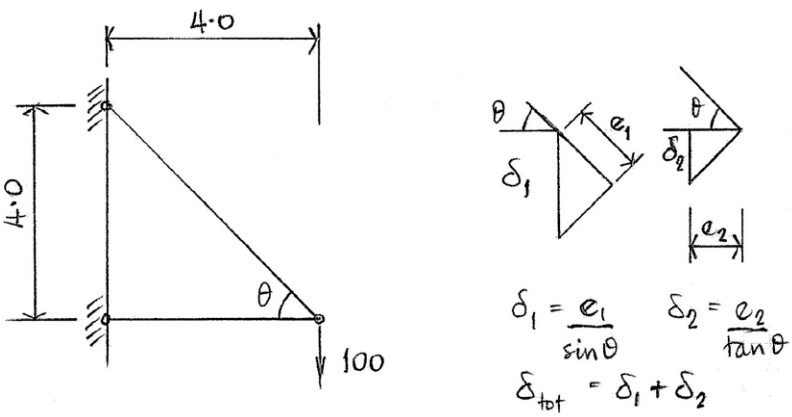


Figure 1 Bracket arrangement

Predicting deflections in trusses

As discussed in the introduction, an FE model of a truss will deliver the deflections of the structure as well as the member forces for a given load case. The actual deflection of a truss made with Category A bolted joints may well be greater than the predicted deflection, because the joints may slip when the load comes onto the structure and the bolts take up their loaded position. The deflection will be more significant if holes are oversize or slotted. This effect may be predicted by using virtual work methods which assume a pin-jointed model and adding an allowance for the slip at each bolted connection to the extension of the member due to the internal forces. This can be illustrated by example.

Example 1

Consider a two element pin-jointed bracket connected to rigid supports as shown in Figure 1. Estimate the total deflection if there is a 2 mm slip in each bolted connection.

Considering the elements separately for displacements that are small relative to the lengths of the members, if there is a change in length in the elements of 2 mm due to bolt slip, the vertical deflection in millimetres resulting from the extension of the diagonal is 2/sinθ and 2/tanθ from shortening of the horizontal member. The total deflection is therefore 2 × (1/sinθ + 1/tanθ) = 4.8 mm for θ = 45°.

The same calculation by virtual work is given in Table 1.

Element		Diagonal	Strut	Total (mm)
Area (mm²)	A	470	667	
Length (m)	L	4√2	4	
Member forces (kN)	p_1	100√2	100	
Member forces due to unit load	p_2	√2	1	
Member flexibility (mm/kN)	L/EA	0.0573	0.0286	
Member deformation (mm)	p_1 L/EA	8.1	2.9	
Deflection due to member deformation (mm)	$p_2 p_1$ L/EA	11.5	2.9	14.4
Slip (mm)	s	2.0	2.0	
Deflection due to slip (mm)	p_2 s	2.8	2.0	4.8
Total deflection: $\Sigma p_2 (p_1 L/AE + s)$				19.2

Table 1 Bracket deflection

Both methods give the same deflection due to bolt slip.

▶26

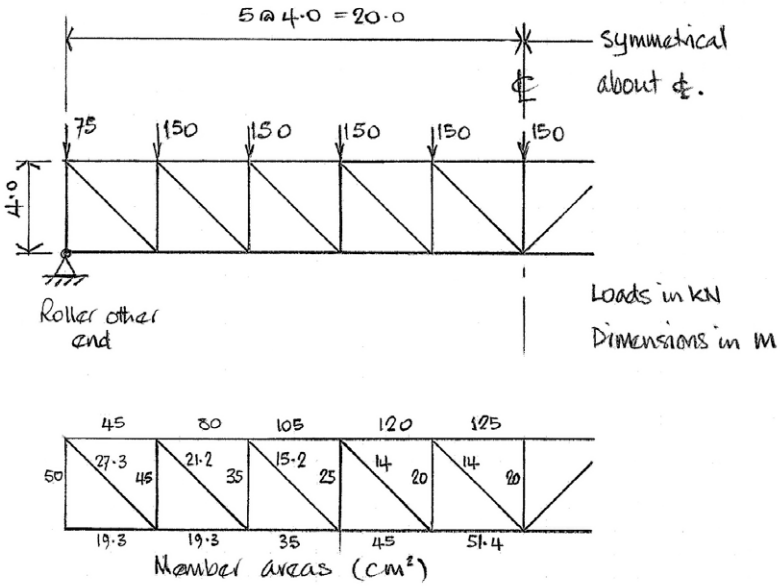


Figure 2 Truss arrangement

▶24

Example 2

To illustrate the effect of bolt slip consider a pin jointed Pratt truss (N frame), shown in Figure 2. Member areas are based on a tensile stress of 350 MPa and 150 MPa in compression, with the area limited to a minimum value.

The deflection of the truss centre under the total design load is estimated to be 175 mm (span divided by 230), calculated by virtual work. An FE model gives a deflection of 179 mm. The deflection can be apportioned to 110 mm of bending deflection (deformation of the truss booms) and 65 mm of shear deflection, from the bracing members. Making this distinction is useful if the deflection is to be reduced because the elements making the greatest contribution to the total deflection can be identified.

In estimating the effect of bolt slip, it is assumed that with automated saw and drill lines, the accuracy of holing is such that slip can occur in all holes simultaneously. If all the members are bolted with 2 mm oversize holes and 1 mm of slip is assumed at each end of a member, a total of 2 mm per member, the deflection increases by 43% to about 250 mm. The effect on the mid-span deflection of other assumptions about which members experience slip is shown in Table 2. Possible scenarios are 1) that pipe-flange type bearing splices are effected in compression booms with no slip; 2) that both booms are effectively continuous with the bracing members bolted to them and 3) that the truss is shop-welded with bolted splices.

Condition	Deflection (mm)	% increase
No slip	175	-
All members bolted, 1 mm slip in each joint	250	43
No slip in compression boom, 1 mm slip in other joints	220	26
No slip in booms, 1 mm slip in bracing joints	200	14
1 mm slip at 2 bolted splices in booms and diagonals	190	9

Table 2 Effect of bolt slip on deflection – 2 mm slip per member

If the most unfavourable assumptions are made about the position of the bolts in their holes a slip of 4 mm at each end of a member is theoretically possible as shown in Figure 3.

The corresponding deflections are set out in Table 3. It can be seen that the theoretical increase in the mid-span deflection is very large. This is not surprising when the elastic deformations in the compression members are about 3 mm and an average of about 5 mm in the tension members.

A truss designed with joints made with preloaded bolts of Category C where the friction coefficient assumed in design is not achieved may well experience increased deflection in service. However, the magnitude of the increased deflection is uncertain. The potential percentage increases indicated in Tables 1 and 2 are unlikely to be realized for several reasons.

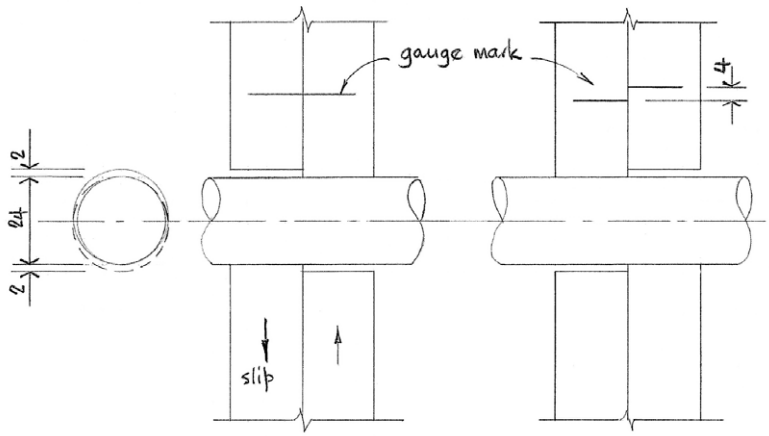


Figure 3: Worst case slip

Condition	Deflection (mm)	% increase
No slip	175	-
All members bolted, 8 mm slip in each joint	470	269
No slip in compression boom, 8 mm slip in other joint	350	200
No slip in booms, 8 mm slip in bracing joints	270	55
Slip at 2 bolted splices in booms and diagonals	242	38

Table3 Effect of bolt slip on deflection – 8 mm slip per member

Discussion and conclusion

It is almost certainly not the case that each joint in each member will slip by the same amount, because the force carried per bolt will not be uniform throughout. For example if the number of bolts required in a joint is 6.2, determined by dividing the design load by the bolt resistance, 8 bolts will be provided. This suggests that the possibility of any dynamic effects due to a sudden slip in all the joints is unlikely.

The absolute worst-case increased deflection set out in Table 3 will not occur because in practice the bolts will never be installed in every joint such that the maximum slip can occur. According to the NSSS, the maximum deviation from the intended position of a hole in a group of holes is 2 mm so it is anticipated that there will be some variation in the position of the bolt holes in a group (meaning some bolts will already be in bearing) and reduce the potential slip.

Kulak and others[1] discuss the behaviour of bolted joints and state "High strength bolts are usually placed in holes that are nominally 1/16 in. [1.6 mm] larger than the bolt diameter. Therefore the maximum slip that can occur in a joint is equal to 1/8 in [3.2 mm]. However, field practice has shown that joint movements are rarely as large as 1/8 in. and average less than 1/32 in [0.8 mm]. In many situations the joint will not slip at all under live loads because the joint is often in bearing by the time the bolts are tightened. This might be due to small misalignments inherent to the fabrication process. In addition slip may have occurred under dead load before bolts in the joint were tightened. Generally, slips under live loads are so small that they seldom have a serious effect on the structure".

In practice therefore, the maximum slip at each joint may well be no more than 1 mm.

If further reading is desired, a design guide for single storey steel buildings[2] published by Arcelor Mittal and others includes a section on estimating deflection due to bolt slip.

1. Geoffrey L Kulak, John W Fisher, John H Struik, Guide to design criteria for bolted and riveted joints, Second Edition, AISC, 2001
2. Steel buildings in Europe, Single storey steel buildings, Part 5 Detailed design of trusses Section 3.6 *https://constructalia.arcelormittal.com/en/news_center/articles/design_guides_steel_buildings_in_europe*

New and revised codes & standards

From BSI Updates October 2019

BS EN PUBLICATIONS

BS EN 508-2:2019
Roofing and cladding products from metal sheet. Specification for self-supporting products of steel, aluminium or stainless steel sheet. Aluminium
Supersedes BS EN 508-2:2008

BS EN 10025-2:2019
Hot rolled products of structural steels. Technical delivery conditions for non-alloy structural steels
Supersedes BS EN 10025-2:2004

BS EN 10025-3:2019
Hot rolled products of structural steels. Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels
Supersedes BS EN 10025-3:2004

BS EN 10025-4:2019
Hot rolled products of structural steels. Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels
Supersedes BS EN 10025-4:2004

BS EN 10025-5:2019
Hot rolled products of structural steels. Technical delivery conditions for structural steels with improved atmospheric corrosion resistance
Supersedes BS EN 10025-5:2004

BS EN 10025-6:2019
Hot rolled products of structural steels. Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition
Supersedes BS EN 10025-6:2004+A1:2009

CORRIGENDA TO BRITISH STANDARDS

BS EN ISO 3581:2016
Welding consumables. Covered electrodes for manual metal arc welding of stainless and heat resisting steels. Classification
Corrigendum, August 2019; Corrigendum, May 2018

UPDATED BRITISH STANDARDS

BS EN 1993-1-5:2006+A2:2019
Eurocode 3. Design of steel structures. Plated structural elements
Amendment, September 2019; Amendment, July 2018

BS EN ISO 15614-1:2017+A1:2019
Specification and qualification of welding procedures for metallic materials. Welding procedure test. Arc and gas welding of steels and arc welding of nickel and nickel alloys
Amendment, August 2019; Corrigendum, May 2018

BRITISH STANDARDS REVIEWED AND CONFIRMED

BS ISO 15510:2014
Stainless steels. Chemical composition

BS ISO 16143-2:2014
Stainless steels for general purposes. Corrosion-resistant semi-finished products, bars, rods and sections

BS ISO 16143-3:2014
Stainless steels for general purposes. Wire

BRITISH STANDARDS UNDER REVIEW

BS EN ISO 1127:1997
Stainless steel tubes. Dimensions, tolerances and conventional masses per unit length

BS EN ISO 3452-5:2008
Non-destructive testing. Penetrant testing. Penetrant testing at temperatures higher than 50°C

BS EN ISO 3452-6:2008
Non-destructive testing. Penetrant testing. Penetrant testing at temperatures lower than 10°C

BS EN ISO 9445-1:2010
Continuously cold-rolled stainless steel. Tolerances on dimensions and form. Narrow strip and cut lengths

BS EN 10266:2003
Steel tubes, fittings and structural hollow sections. Symbols and definitions of terms for use in product standards

BS EN 10349:2009
Steel castings. Austenitic manganese steel castings

BS EN ISO 11126-9:2004 (BS 7079-F9:2004)
Preparation of steel substrates before application of paints and related products. Specifications for non-metallic blast-cleaning abrasives. Staurolite

BS EN ISO 11474:2014
Corrosion of metals and alloys. Corrosion tests in artificial atmosphere. Accelerated outdoor test by intermittent spraying of a salt solution (Scab test)

BS EN ISO 11782-1:2008
Corrosion of metals and alloys. Corrosion fatigue testing. Cycles to failure testing

BS EN ISO 11782-2:2008
Corrosion of metals and alloys. Corrosion fatigue testing. Crack propagation testing using pre-cracked specimens

BS EN 14532-1:2004
Welding consumables. Test methods and quality requirements. Primary methods and conformity assessment of consumables for steel, nickel and nickel alloys

BS EN 14532-2:2004
Welding consumables. Test methods and quality requirements. Supplementary methods and conformity assessment of consumables for steel, nickel and nickel alloys

BS ISO 14347:2008
Fatigue. Design procedure for welded hollow-section joints. Recommendations

NEW WORK STARTED

EN ISO 898-2
Mechanical properties of fasteners made of carbon steel and alloy steel. Nuts with specified property classes. Coarse thread and fine pitch thread
Will supersede BS EN ISO 898-2:2012

EN ISO 14341
Welding consumables. Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels. Classification
Will supersede BS EN ISO 14341:2011

EN ISO 15792-1
Welding consumables. Test methods. Test methods for all-weld metal test specimens in steel, nickel and nickel alloys
Will supersede BS EN ISO 15792-1:2008+A1:2011

EN ISO 15792-2
Welding consumables. Test methods. Preparation of single-run and two-run technique test specimens in steel
Will supersede BS EN ISO 15792-2:2008

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AD 435: Beams supporting precast planks: checks in the temporary condition

The purpose of this note is to remind designers of their responsibility for basing their design on a safe method of erection. This is particularly necessary if structural stability in the part-erected condition is not evident.

The CDM (2015) regulations consider this in Regulation 11 where "(1) The principal designer must … ensure that, so far as is reasonably practicable, the project is carried out without risks to health or safety. …

"In fulfilling the duties in paragraph (1), the principal designer must identify and eliminate or control, so far as is reasonably practicable, foreseeable risks to the health or safety of any person –

(a) carrying out or liable to be affected by construction work; …".

BS EN 1090-2:2018 addresses this issue more directly in paragraph 9.3.1 which states that the design basis method of erection shall consider amongst other things the following: "d) stability concept for the part-erected structure including any requirements for temporary bracing or propping".

SCI publication P401: Design of composite beams using precast concrete slabs in accordance with Eurocode 4 states in Section 3.6 "The stability of the steel beams during the erection of the floor units and the placement of the structural topping must be considered. The designer should take due account of the floor erection process (which will usually require erection in 'bays' to avoid excessive re-siting of the crane). Should a particular sequence of erection or temporary support be necessary, this should be noted in the specification and on the drawings. The placement of the precast concrete units should be carefully controlled in order that out of balance construction loads are kept within the limits assumed in the beam design …".

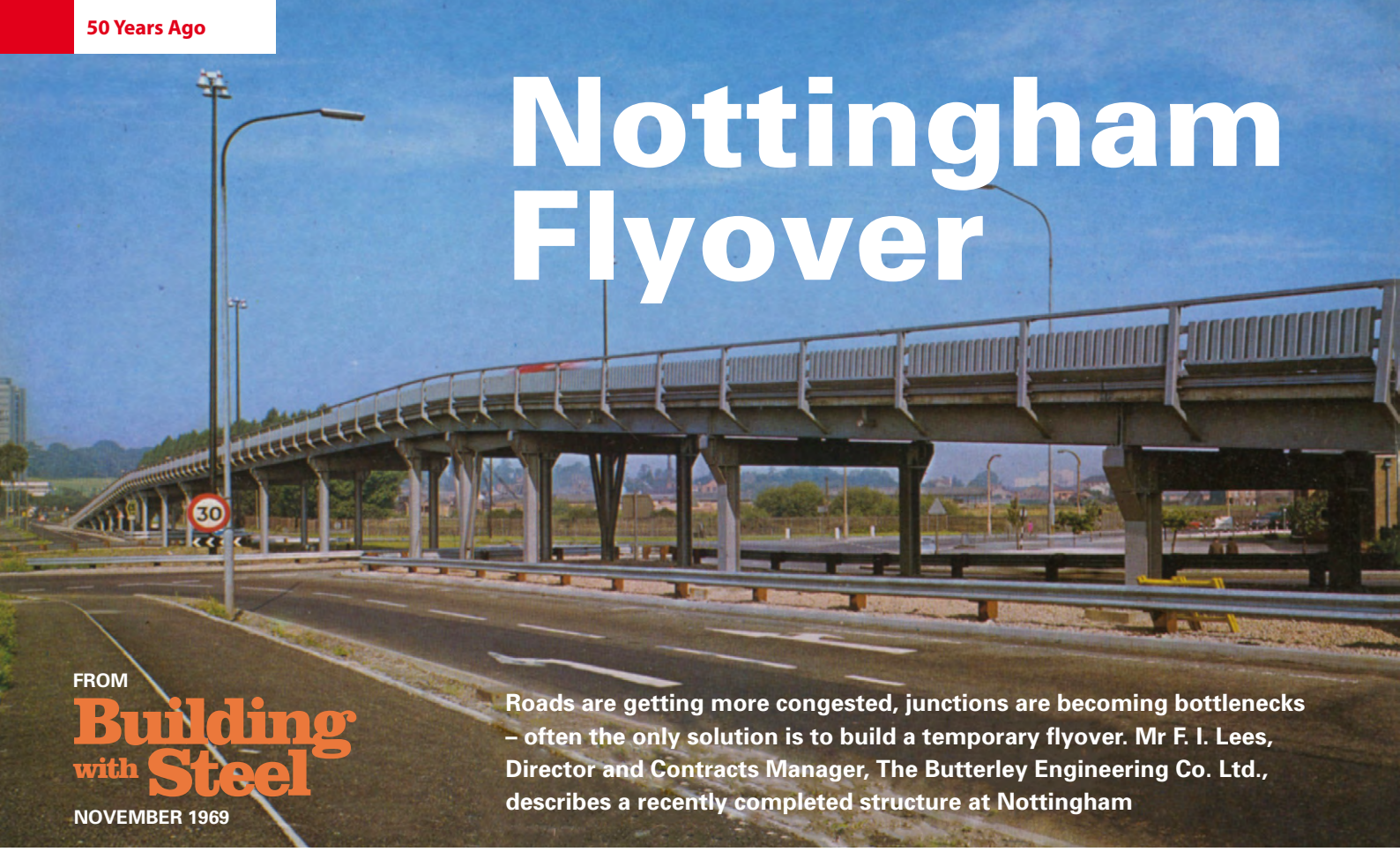
Section 4 of the publication discusses the checks for torsion which should be carried out in the event that an out-of-balance load results from the assumed erection sequence. Such conditions may result from:

1. The assumed erection sequence;
2. Unequal plank spans on either side of the beam;
3. Planks spanning in different directions on either side of the beam;
4. The sequence of placing the in-situ topping.

Other relevant issues are the effectiveness of the lateral restraint provided by the precast planks and the specification of additional restraint if the planks are inadequate by themselves. (See P401, Section 3.6).

Contact: **Richard Henderson**
Tel: **01344 636555**
Email: **advisory@steel-sci.com**

Nottingham Flyover



FROM
Building with Steel
NOVEMBER 1969

Roads are getting more congested, junctions are becoming bottlenecks – often the only solution is to build a temporary flyover. Mr F. I. Lees, Director and Contracts Manager, The Butterley Engineering Co. Ltd., describes a recently completed structure at Nottingham

Clifton Boulevard Trunk Ring Road Flyover at Abbey Street Junction was opened to traffic on the 29th July 1969.

The scheme was designed by Mr. F. N. Little, the Nottingham City Engineer, on behalf of the Ministry of Transport, utilising a flyover of the Braithwaite 'Fliway' design which was awarded a prize in the competition sponsored by the Ministry of Transport in 1964. Its design is such that it can be dismantled for re-erection elsewhere when traffic conditions on an existing site necessitate works of greater magnitude.

In the present case, the existing roundabout was designed as two levels so that a flyover could be added. The flyover carries Clifton Boulevard (Trunk Outer Ring Road) traffic across the A453 route to Birmingham. By removing the 'through' group of traffic from the ground level roundabout its traffic capacity has been increased, and conditions for pedestrians crossing near the junction have also been made safer and more convenient.

Clifton Boulevard has 24ft wide twin carriageways and an 18ft central reservation. Near and alongside the flyover the outer kerb lines are set back to give 23ft. Lighting is by three 80ft high-mast columns carried on foundations at ground level.

To reduce interference with traffic during construction and for convenience on site, a storage and casting yard was established about 600 yards away from the job. During erection, units were transferred from here to the site by mobile crane and low loader. The location of the foundations was governed by the presence of two large sewers beneath the roundabout. It was necessary to use 45ft spans over the roundabout with 36ft spans for both approaches. The flyover has open guardrailing on either side, the running surface being concrete. The portal trestles are protected by 'Armco' type crash barriers.

The flyover carries a two lane carriageway designed to take the loadings in the Construction and Use regulations of the Ministry of Transport. It comprises 10 spans of 36ft, 6 spans of 45ft and 4 spans of 18ft. Total spanned length is 702ft plus the approach ramps on solid, giving a total flyover length of 833ft. The width is 25ft 4in overall and between kerbs 22ft. The headroom to the ground level roundabout is 16ft 9in and the gradient is 1 in 15 for the approach spans and 1 in 83 for the centre spans. The foundations are 18in nominal bored piles approximately 25ft long, established in dense sand, with reinforced concrete pile caps and tie beams.

The deck spans of the Braithwaite 'Fliway', which are simply supported on portal frame steel trestles, are prefabricated to single traffic lane width and are of steel and concrete construction acting compositely. Each unit comprises two longitudinal universal beams joined by a series of transverse members. Welded studs provide the composite shear connection with the 7in thick reinforced concrete deck slab.

The flyover is anchored to each abutment and also has two intermediate portal braced bays to cater for longitudinal forces. These forces are transmitted through the composite deck units via the cast 'Meehanite' bearings, which allow for expansion and rotation movements, and rubber compression pads between the ends of the units, which are pre-compressed during erection.

The parapets are fabricated from rectangular hollow sections and act as crash barriers. The uprights are bolted to the slabs and to the main longitudinal steel beams. Special joints are incorporated in the longitudinals to cater for expansion and to maintain continuity of strength from end-to-end of the 'Fliway'. PVC coated steel splash panels and flashings are provided.

225 tons of steelwork were used in the superstructure and protection was by grit blasting followed by a four coat paint system. Erection of the deck units was completed in ten days, without interference to traffic at peak period, using a 50 ton capacity lorry-mounted mobile crane.

Two main contracts were placed, one for the foundations and the other for the steel superstructure, approach ramps and decking and other miscellaneous work above foundation level. Two main contractors were GKN Foundations Ltd for the foundations and the Butterley Engineering Co Ltd for the superstructure and associated work. Site investigation was by Le Grand Adsco.

Street lighting was designed by the City Lighting Engineer. Roadworks, direction and other signs were carried out by the City Engineer's Department. The total cost of all the work, including foundations, superstructure, site investigation and alterations to statutory undertaker's services, was £160,000. Of this total, the superstructure approach ramps and other miscellaneous work above foundation level came to £79,000 and this cost, divided by the total area of flyover (833ft long by 25ft 4in wide), represents 75/- 0d per sq ft. Similarly the foundations represent a cost of 19/- 0d per sq ft.

Temporary flyovers often provide the only solution to the problems caused by our ever-increasing traffic density. Since the first temporary flyover was built in Birmingham some nine years ago several cities and large towns have found that this type of structure has been the only feasible method of achieving traffic flow without massive reconstruction and high expense. Similar structures have been built for instance at Bristol, Kingston and Barking and in each of these the main framing has been made from steel which lends itself particularly well to the reduction of dead load and simplicity of fabrication both on and off site. It is certain that many more temporary flyovers will be erected in the years ahead and although planned for only a limited life it is reasonable to suppose that many will be giving good service years after their original time span has been reached.

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Call for entries for the 2020 Structural Steel Design Awards

The British Constructional Steelwork Association and Trimble Solutions (UK) Ltd have pleasure in inviting entries for the 2020 Structural Steel Design Awards.

Now in their 52nd year, the Awards celebrate the excellence of the United Kingdom and the Republic of Ireland in the field of steel construction, particularly demonstrating its potential in terms of efficiency, cost-effectiveness, aesthetics and innovation.

"Trimble are proud to again be associated with the SSDA and look forward to another successful Awards that showcases the breadth and depth of talent and expertise within our steel construction industry", Richard Fletcher, Managing Director, Trimble Solutions (UK) Ltd.

Why enter?

If your project is shortlisted, your company would have the kudos of being part of a prestigious Awards scheme - one with a long history, focussed solely on steel construction and the only one where expert judges visit every shortlisted project to truly appreciate its qualities. In addition, you'll receive:

- Free publicity for you, your project and your client, both online and in the construction press.
- Free attendance at a major Awards event in central London for your project team.
- Recognition of excellence for your project, be it large or small.

How to succeed?

Plan ahead and involve the whole project team from the outset in preparing a high-quality submission, don't leave it to the last minute. Read the entry criteria and particularly the 'Submission Material' section on the entry form and provide exactly what is required, nothing more, nothing less. In addition:

- High quality photos will portray your project at its best.
- A well written, flowing description of the context, concept design, outstanding features and key construction details will allow the judges to swiftly appreciate the essence of your project.
- Broad representation from all parties at the judges' visit will demonstrate collaboration and enthusiasm.

To find out more and download an entry form visit https://www.steelconstruction.info/Structural_steel_design_awards or call Chris Dolling (BCSA) on 020 7747 8133

Closing date for entries: Friday 21st February 2020

BCSA

Trimble

Steelwork contractors for buildings

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

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

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

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

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

BIM BIM Level 2 assessed

QM Quality management certification to ISO 9001

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

Notes

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A & J Stead Ltd	01653 693742			●	●					●	●			●	●		3			Up to £400,000
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
Access Design & Engineering	01642 245151					●				●	●			●	●	✔	4			Up to £4,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3	✔	●	Up to £4,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●									✔	2	✔	●	Up to £3,000,000
Advanced Fabrications Poyle Ltd	01753 653617				●	●	●	●		●	●			●	●	✔	2			Up to £800,000
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*
Apex Steel Structures Ltd	01268 660828					●	●			●	●			●	●		2			Up to £3,000,000
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2			Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●		●	●		2			Up to £800,000
ASME Engineering Ltd	020 8966 7150			●	●	●		●		●	●			●	●	✔	4		●	Up to £4,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●			●	●			●	●	✔	2			Up to £1,400,000
Austin-Divall Fabrications Ltd	01903 721950				●	●		●		●				●	●	✔	2			Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2	✔	●	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 £4,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●		●	●			●		●	●	●	✔	3		●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●		●	●	●			✔	4		●	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✔	4			Up to £6,000,000
Cook Fabrications Ltd	01303 893011			●	●		●	●		●	●	●		●	●		2			Up to £1,400,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●	●	●	●	●	●		●	●	✔	4			Up to £1,400,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £40,000
D Hughes Welding & Fabrication Ltd	01248 421104				●	●	●	●	●	●	●		●	●	●	✔	4			Up to £800,000
Duggan Steel	00 353 29 70072	●	●	●	●	●	●	●	●		●				●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	3			Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	●	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●			●	✔	3		●	Up to £3,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●	●	●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●			●		●	●	●	●	●		●	●	●	✔	3		●	Up to £2,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●		●	●				●		2			Up to £2,000,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	2			Up to £1,400,000
G.R. Carr (Essex) Ltd	01286 535501	●		●	●			●			●			●	●	✔	4			Up to £800,000
H Young Structures Ltd	01953 601881			●	●	●	●	●						●	●	✔	2		●	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●			●	●		●		✔	4		●	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●			●	●				●	✔	2			Up to £1,400,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●		●				●	●	✔	3			Up to £2,000,000
J & A Plant Ltd	01942 713511				●	●									●		4			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●		●			4			Up to £6,000,000*
Kiernan Structural Steel Ltd	00 353 43 334 1445	●		●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4			Up to £6,000,000
LA Metalworks	01707 256290				●	●				●	●			●	●	✔	2			Up to £2,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		●	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	4		●	Up to £2,000,000
M J Patch Structures Ltd	01275 333431				●					●	●				●	✔	3			Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £2,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £1,400,000
Maldon Marine Ltd	01621 859000				●	●			●	●				●		✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						3			Up to £3,000,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £1,400,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●			●	●				✔	4		●	Up to £2,000,000
North Lincs Structures	01724 855512			●	●					●	●				●		2			Up to £400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		●	Up to £3,000,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●							●		2			Up to £400,000
Painter Brothers Ltd	01432 374400	●			●				●	●	●				●	✔	3			Up to £6,000,000*
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £800,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●			●	●	✔	3			Up to £6,000,000
S H Structures Ltd	01977 681931	●			●	●	●	●	●	●	●	●			●	✔	4	✔	●	Up to £2,000,000
SAH Engineering Ltd	01582 584220			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
SGC Steel Fabrication	01704 531286				●					●				●	●	✔	2			Up to £200,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●		●			●	●			●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		2			Up to £1,400,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £1,400,000
Steel & Roofing Systems	00 353 56 444 1855	●		●	●	●	●				●	●		●	●	✔	4			Up to £3,000,000
Structural Fabrications Ltd	01332 747400	●			●	●		●	●	●	●			●	●	✔	3		●	Up to £1,400,000
Taunton Fabrications Ltd	01823 324266				●	●				●	●			●	●	✔	2		●	Up to £2,000,000
Taziker Industrial Ltd	01204 468080	●		●	●		●			●	●		●	●	●	✔	3			Above £6,000,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●			●	●			●	●	✔	2			Up to £400,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●			●	●	✔	3	✔	●	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 Haley Engineering Ltd	01278 760591				●	●	●									✔	4		●	Up to £4,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
WT Fabrications (NE) Ltd	01642 691191			●	●	●	●				●			●	●	✔	4			Up to £40,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

Steelwork contractors for bridgeworks

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

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

- **FB** Footbridges
- **CF** Complex footbridges
- **SG** Sign gantries
- **PG** Bridges made principally from plate girders
- **TW** Bridges made principally from trusswork
- **BA** Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
- **CM** Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
- **MB** Moving bridges
- **SRF** Site-based bridge refurbishment
- **FRF** Factory-based bridge refurbishment
- **AS** Ancilliary structures in steel associated with bridges, footbridges or sign gantries (eg grillages, purpose-made temporary works)
- **QM** Quality management certification to ISO 9001
- **FPC** Factory Production Control certification to BS EN 1090-1
  1 – Execution Class 1 2 – Execution Class 2
  3 – Execution Class 3 4 – Execution Class 4
- **BIM** BIM Level 2 compliant
- **SCM** Steel Construction Sustainability Charter (● = Gold, ● = Silver, ● = Member)

Notes

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

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

BCSA steelwork contractor member	Tel	FB	CF	SG	PG	TW	BA	CM	MB	SRF	FRF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
AJ Engineering & Construction Services Ltd	01309 671919	●			●	●	●	●	●	●	●	●	✓	4				●	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 £4,000,000
Cementation Fabrications	0300 105 0135	●		●	●	●	●					●	✓	3			✓	●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	●	✓	4			✓		Up to £800,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	●	✓	3			✓	●	Up to £1,400,000
ECS Engineering Services Ltd	01773 860001	●			●	●	●		●			●	✓	3					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	✓		✓	●	Up to £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●	●	●		●	✓	4			✓	●	Up to £2,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●	●	●	●	●	●					●	✓	4			✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £4,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	●	Up to £2,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499									●		●	✓	3			✓		Up to £800,000
Structural Fabrications Ltd	01332 747400	●		●	●	●	●			●	●	●	✓	3				●	Up to £1,400,000
Taziker Industrial Ltd	01204 468080	●		●	●	●	●	●	●	●	●	●	✓	3		✓	✓		Above £6,000,000
Underhill Engineering Ltd	01752 752483	●	●	●	●	●				●	●	●	✓	4	✓		✓		Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●		●	✓	4	✓	✓	✓	●	Above £6,000,000
Non-BCSA member																			
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓	●	Up to £4,000,000
Centregreat Engineering Ltd	029 2046 5683	●		●	●	●	●	●	●	●	●	●	✓	4					Up to £2,000,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓		Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●	●	●	●		●	✓	4			✓	●	Up to £1,400,000
Ekspan Ltd	0114 261 1126	●				●			●	●	●	●	✓	2					Up to £400,000
Francis & Lewis International Ltd	01452 722200											●	✓	4			✓	●	Up to £2,000,000
Harrisons Engineering (Lancashire) Ltd	01254 823993	●		●	●	●	●	●	●	●		●	✓	3		✓			Up to £1,400,000
Hollandia Infra BV	00 31 180 540 540	●	●	●	●	●	●	●	●		●	●	✓	4					Above £6,000,000*
HS Carlsteel Engineering Ltd	020 8312 1879									●	●	●	✓	3			✓		Up to £200,000
IHC Engineering (UK) Ltd	01773 861734	●										●	✓	3			✓		Up to £400,000
In-Spec Manufacturing Ltd	01642 210716								●	●		●	✓	4			✓		Up to £400,000
Kelly's Welders & Blacksmiths Ltd	01383 512 517											●	✓	2			✓		Up to £200,000
Lanarkshire Welding Company Ltd	01698 264271	●		●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £2,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●			●	●	●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●		●	✓	4		✓	✓	●	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
Control Energy Costs Ltd	01737 556631
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	08457 504030

Company name	Tel
Inspire Insurance Services	02476 998924
Kier Construction Ltd	01767 640111
McGee Group (Holdings) Ltd	020 8998 1101
Sandberg LLP	020 7565 7000

Company name	Tel
Structural & Weld Testing Services Ltd	01795 420264
SUM Ltd	0113 242 7390

Industry Members

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

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

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

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9	10	CE	SCM	BIM
International Paint Ltd	0191 469 6111						●					N/A		
Jack Tighe Ltd	01302 880360						●					N/A		
Jamestown Manufacturing Ltd	00 353 45 434288	●										M		
Joseph Ash Galvanizing	01246 854650						●					N/A		
Jotun Paints (Europe) Ltd	01724 400000						●					N/A		
Kaltenbach Ltd	01234 213201					●						N/A		
Kingspan Structural Products	01944 712000	●										M	●	
Kloeckner Metals UK	0113 254 0711								●			D/I		
Lincoln Electric (UK) Ltd	0114 287 2401					●						N/A		
Lindapter International	01274 521444									●		M		
MSW UK Ltd	0115 946 2316	●										D/I		
Murray Plate Group Ltd	0161 866 0266								●			D/I		
National Tube Stockholders Ltd	01845 577440								●			D/I		
Peddinghaus Corporation UK Ltd	01952 200377					●						N/A		
PPG Architectural Coatings UK & Ireland	01924 354233						●					N/A		
Prodeck-Fixing Ltd	01278 780586	●										D/I		
Rainham Steel Co Ltd	01708 522311								●			D/I		
SDS/2 Ltd	07734 293573		●									N/A		
Sherwin-Williams Protective & Marine Coatings	01204 521771						●					N/A	●	
Structural Metal Decks Ltd	01202 718898	●										M		
StruMIS Ltd	01332 545800		●									N/A		
Stud-Deck Services Ltd	01335 390069	●										D/I		
Tata Steel – Tubes	01536 402121				●							M		
Tata Steel – ComFlor	01244 892199	●										M		
Tension Control Bolts Ltd	01978 661122						●			●		M		
Trimble Solutions (UK) Ltd	0113 887 9790		●									N/A		
Vale Protective Coatings Ltd	01949 869784						●					N/A		
voestalpine Metsec plc	0121 601 6000	●										M	●	
Wedge Group Galvanizing Ltd	01909 486384						●					N/A		
Wightman Stewart (WJ) Ltd	01422 823801					●						N/A		