MAY 2021

NSC

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Sustainability drives City tower

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Managing Director

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MAY 2021
Vol 29 No 5

Cover Image
SEGRO Logistics Park East Midlands GatewayPlot 12
Main client: SEGRO
Architect: Peter Haddon & Partners
Main contractor: Winvic Construction
Structural engineer: RPS Consulting
Steelwork contractor: Severfield
Steel tonnage: 5,300t

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

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Sustainable steel supports forward thinkers

Nick Barrett - Editor

This issue of NSC provides a snapshot of many of the challenges facing the construction industry and its clients as we emerge from the second COVID-19 lockdown; and reveals more than a few reasons to be cheerful.

Predictions of the death of the office seem to have been a tad premature, at least judging from the evidence of the developer optimism that underpins our story on the construction of the 50-storey tower at 8 Bishopsgate in the City of London. Any list of areas likely to suffer from a permanent exodus of staff to working at home in spare rooms, broom cupboards - or even on beds as many younger people are having to do - would have until recently featured the City.

Yet developer plans are being advanced for new City buildings and views on the future of the office from property experts have undergone a shift from the gloomy prognostications of only a few months ago. Some reduction in the office needs of many companies might be expected as the idea of a working week split between office and home is tried out, and repurposing of at least parts of some buildings might be required. But there is no sign of the mass permanent exodus predicted at the start of the pandemic.

COVID-19 might well be with us permanently, and other pandemics might flare up, which might even mean more office space is needed to accommodate social distancing. Owners and users of steel-framed buildings are at an advantage of course due to the inherent flexibility of steel, and the ease of reconfiguring to allow changed uses. There might be a shift in priority from services designed to heat and cool buildings to services that can ensure the healthy air changes that can limit the circulation of viruses, and retrofitting these will be relatively straightforward with cellular beam construction.

Building back greener will create more buildings with the sustainability ambitions of 8 Bishopsgate, which will be the tallest in the UK so far to achieve a BREEAM 'Outstanding' rating and is being said to be the UK's most sustainable commercial tower. With 30% less structural embodied carbon than London tall building benchmarks, 8 Bishopsgate is a stand-out development in many ways. Buildings like this are better able to project a corporate culture that others are attracted to do business with and to work for, and will be in demand by the more forward-thinking companies.

Any doubts that the recovery will be 'green' have surely disappeared now the Government has just adopted a new legally-binding target of a 78% reduction in carbon emissions by 2035 on the path to net-zero. The vital role that steel will play in achieving these targets can be seen throughout any issue of NSC. For example, in this issue we have the Newhurst Energy Recovery facility that will divert non-recyclable waste from landfill to create low-carbon energy instead, and Energy House 2 that can test the effectiveness of new construction products and systems at lowering carbon emissions.

With the lifting of COVID-19 restrictions still on track for June 21, positive forecasts for growth across many sectors, and sustainable steel construction leading the 'green' recovery, optimism about the year ahead is justified..

Tata Steel to upgrade Corby steel tube manufacturing site

Tata Steel has announced a major overhaul of its Corby steel tube making site in the East Midlands, which it said will give the business the best chance of a strong future.

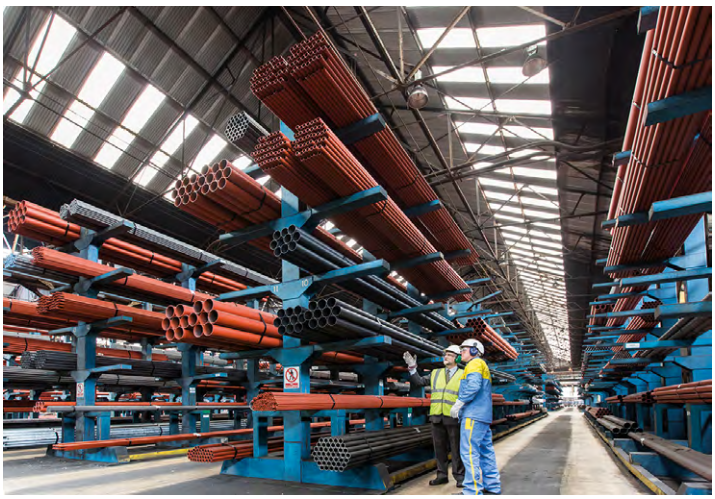
Manufacturing processes on the site will be brought closer together as part of the £25M scheme, which is being paid for in part with the sale of land freed up by the changes as well as savings from operational improvements.

The two-year investment project will see the creation of a single high-tech warehouse, the relocation and upgrading of the important rectangular hollow section (RHS) processing line and the cold mill (CFM).

Chairman of Tata Steel UK, Sandip Biswas, said: "Steel is, and will continue to be, an essential part of the UK's plans to decarbonise for the future.

"We need to ensure we are able to make and supply the products right here in the UK which will help transition to a net-zero future."

Tata Steel Corby Works Manager, Gary Blackman, said: "The programme is essential to ensuring a sustainable future for our site and generations of steel workers to come. It will enable us to reconfigure our operations and achieve the highest levels of operational efficiency."



V&A East begins to take shape at Olympic Park

Structural steelwork has begun to be installed on the V&A East project, which will create two interconnected sites in Queen Elizabeth Olympic Park, London.

As well as a new collection and research centre, a brand-new museum – V&A East, is being constructed at Stratford Waterfront.

Designed by Dublin-based architects O'Donnell + Tuomey, the museum structure is clad in precast concrete panels, which are supported on a system of heavy-duty circular steel columns.

Due to the sloping facades of the structure, the columns converge at ground level into a series of nodes that centralise the load path into the concrete foundation.

The nodes are prefabricated offsite to reduce site welding and weigh between 6t and 14t each.

"Due to the very complex nature of the cladding connections and column geometry they were cloud surveyed after assembly and again after welding to ensure fabrication was completed to a tolerance of +/- 5 mm," said Bourne Steel Project Director Russell Thomson.

The V&A East museum at Stratford Waterfront is part of the East Bank project, set up as part of the legacy of the London 2012 Olympic and Paralympic Games.

The museum will sit alongside UAL's London College of Fashion, a new mid-scale venue for Sadler's Wells, and new BBC studios for performance, rehearsal and broadcast.

Steelwork completes on Commonwealth Games stadium

Work on the redevelopment of the Alexander Stadium, which will host athletics as well as the opening and closing ceremonies for the 2022 Commonwealth Games in Birmingham, has reached a milestone with the completion of steel erection.

Working on behalf of main contractor McLaughlin & Harvey, BHC has fabricated, supplied and erected 1,400t of steelwork for the stadium's new West Stand.

Cllr Ian Ward, Leader of Birmingham City Council, said: "This is an exciting milestone and it is testament to the hard work and efforts of all involved that we have made such progress despite the challenges of delivery during the COVID-19 pandemic.

"We can now clearly see what the new stadium will look like when complete – congratulations to everyone who is working on the redevelopment."

William Hare achieves Carbon Zero certification

Steelwork contractor William Hare said it is the first UK fabricator to achieve the internationally accredited ISO 14064-1 Carbon Zero certification.

William Hare has, through the Achilles Carbon Reduce Programme, been measuring, managing and reducing its carbon footprint since 2010. In order to meet the growing demands of industry, and to be future-ready, the company said it has taken the next step to offset its unavoidable emissions to achieve Carbon Zero as an organisation.

William Hare Chief Executive and Chair Susan Hodgkiss CBE, said: "As a family-owned business, William Hare has always been conscious of the impact that the steel industry has on the environment, and we have been actively pursuing measures we can take to create a sustainable legacy for future generations.

"I am thrilled by the developments we have made so far; achieving the Carbon Zero certification underpins our desire to lead by example, ensuring our impact on the environment is minimised where practically possible. This is an important milestone in our journey towards Net Zero."

William Hare SHE Director Brian Hughes added: "We have been pursuing sustainable initiatives and developing innovative carbon reduction solutions with our industry partners to ensure steel continues to be recognised as a versatile, sustainable material choice for the future.

"We have made great progress and we are keen to continue to adapt our practices to remain at the forefront of the fight against climate change."

Katie Tamblin, Chief Product Officer at Achilles Information commented: "It's more important than ever to be able to measure and evaluate corporate sustainability efforts. We're delighted that William Hare selected the UK's only ISO 14065 accredited greenhouse gas certification scheme, Achilles Carbon Reduce, to certify their carbon zero status and tell their sustainability story with credibility and confidence."

Altrincham town centre being redeveloped with steel

Steel construction is progressing on the Chapel Square development in Altrincham town centre.

Comprising two five-storey steel-framed apartment blocks and a five-level steel-framed 300-space car park, the scheme will dramatically change the heart of the town.

Working on behalf of main contractor FK Group, Elland Steel Structures is fabricating, supplying and erecting approximately 688t of steel for project.

All three of the structures have been designed with precast floors, with 350t of steel being used for the car park, and 188t and 150t of steel being erected for apartment blocks A and B respectively.

Overall, the scheme will also include a restaurant, commercial space and a new public square with a landscaped garden and seating.

The development will also include large-scale highway improvements to Railway Street to help increase access to Chapel Square and Altrincham Hospital.

Cllr James Wright, Trafford Council's executive member for housing and regeneration, said: "The Chapel Square development is the latest scheme marking the redevelopment and regeneration of Altrincham town centre. The high-quality development will not only improve the area, but provide much-needed new housing in the centre of Altrincham.

"The scheme will bring more people into the town centre to live, which will add to both the daytime and night-time economy and ultimately benefit the overall economy of the town."

UK's tallest rollercoaster gets retracked

In time for Blackpool Pleasure Beach's reopening on April 12, Taziker Industrial has retracked additional sections of the Big One rollercoaster after successfully retracking four sections last year.

In February 2020, Taziker completed the retracking of 45m in four sections after working on the project during the off-season.

Due to the success of this, Taziker was commissioned to fabricate a further 75m of track for the Big One, as part of the amusement park's programme of continuous maintenance and development.

During the 2020/21 off-season, which started earlier than planned due to the COVID-19 lockdown restrictions, Taziker began the refurbishment at their Heywood facility in Greater Manchester.

Taziker performed 3D scanning using Trimble SX10 point cloud data so that key components could be modelled before the existing track was removed from the park.

The completed tracks were transported to Blackpool Pleasure Beach for fitting in March 2021 in preparation for its 125th season.

When the Big One opened to the public in 1994, it was the tallest and fastest rollercoaster in the world. Reaching a maximum height of 71m, it still holds the record for tallest rollercoaster in the UK.

NEWS IN BRIEF

Severfield said it has strengthened its commitment to reducing carbon emissions by signing up to the SteelZero initiative, which is led by international non-profit organisations, the Climate Group and Responsible Steel. Severfield is making a public commitment to transition to procuring, specifying, or stocking 100 per cent net-zero steel by 2050, with certain interim targets to be achieved by 2030.

The former site of the Rolls Royce engine factory at **Hillington Park** in Glasgow is set to become a major hub of industry again as a major £14M redevelopment project has begun. The development will see 13 new units with large secure yards ranging from 473m² to 2,300m² completed and available to the market by the first quarter of 2022.

Birmingham City Council has granted planning permission for a health innovation campus in Selly Oak, which will be designed for life science businesses, with a focus on those working in medtech, precision medicine, biopharma and digital healthcare. Phase one will include a home for the University of Birmingham's Precision Health Technologies Accelerator (PHTA), providing innovation and incubation spaces for businesses to engage with academics and clinicians.

Maple Grove Developments, part of the Eric Wright Group, has secured planning for the new AEW-designed £18M Pioneer Place leisure and retail scheme in Burnley. Funded by Burnley Borough Council with support from Lancashire County Council, the 3,388m² leisure-led scheme is anchored by an eight-screen Reel Cinema, as well as restaurants, bars, retail units, a public realm and a 125-space car park.

Architecture Initiative has been given the go-ahead for a cinema and community venue at EMI's former manufacturing headquarters in Hayes, west London. Known as The Gramophone, the project will be the first cinema in Hayes for 70 years. The overall masterplan will also include 750 homes, a school, office space, and retail and leisure facilities.

PRESIDENT'S COLUMN

I didn't think anything would topple sustainability and steel section prices off the most talked about issues in the steel construction industry. Well cold rolled deliveries have managed to do it! I know many steelwork contractors are having some very difficult conversations with Tier 1 Contractors in relation to the delivery and price of cold rolled products. Cold rolled suppliers have an excellent track record of servicing steelwork contractors in a just-in-time fashion, but long-term relationships are being tested in the current climate. Where Tier 1 Contractors have won competitive orders with "old" prices and "old" lead-in's, somewhere along the line there are going to be problems. The secondary effects of the COVID-19 lockdowns are now being seen all through the supply chain.

I have heard on a number of occasions that some QS's believe that prices and lead-in's will reduce if clients delay for a while. I don't think this will happen in the short term. Steelwork contractors in the main are not benefitting from the price rises and they are certainly not benefitting from contracts being delayed. I don't think for one minute that supply chains to other framing material contractors are not floundering as well. One wonders however, whether the argument has turned from the traditional question of will that be a steel or a concrete job, to whether that building is now affordable?

Occasionally, analysts will inform the government that buildings are expensive, they may well be, but I don't think the average steelwork contractor is to blame. Over the years, I've seen plenty of accounts for steelwork contractors and it doesn't make for good reading when you consider the majority of buildings are bespoke and the risks steelwork contractors are asked to accept. Top-performing companies fail to make in the order of 10% net profit year-on-year and I'm sure that we will see reduced profits for many companies in the next set of accounts. In contrast, I recently received a "teaser" from a company selling garden sheds. Not making them in the UK of course; they will be shipped in and delivered pretty much straight to the garden. Nothing bespoke about these garden sheds, you get a few choices of style, but that's it. The average gross profit that company has been making is in excess of 50%. I'm just wondering what the average gross profit of bespoke steel "sheds" delivered in the UK will be in comparison.

Over the last twenty years the steel construction industry has taken pride in its efforts to reduce health and safety (H&S) incidents. I don't know of any MD where H&S is not high on their agenda. Threats of being fined and being prevented from working on site changed behaviour. There was a financial cost associated with the transition to a great H&S culture, but it was less than the threats associated with H&S incidents. I am concerned that similar costs will be incurred in changing behaviour on the equally important and emotive subject of sustainability. This time I think we will need to pass on some of these costs to the client, which will further challenge the affordability of buildings.

Mark Denham
BCSA President

First of three Preston Western Distributor bridges installed

Cleveland Bridge has completed the installation of the first of a trio of bridges that will form key elements of a major infrastructure project in Lancashire.

The 250m-long Lea Viaduct is part of the Lancashire City Council's £200M Preston Western Distributor project, which will link the A583 with the M55 motorway and is due to open in 2023.

The 2,607t steel viaduct will support the road infrastructure project's objective of creating access to new housing and business developments, supporting economic growth of the area, while also increasing capacity on the existing local road network.

Working in partnership with main contractor Costain and project engineers Jacobs and Atkins, Cleveland Bridge designed and fabricated the bridge in five 50m-long sections, each made up of five pairs

of girders to form a crossing over the Lancaster Canal and the Preston to Blackpool railway line.

The structure was installed during a six-week programme utilising a 600t-capacity crawler crane.

Over the next three months, the company will be installing the Becconsall Bridge and the Savick Brook Viaduct.

Winvic to construct UK's largest ever single occupier logistics park

Winvic Construction has been awarded the contract by IM Properties to build five large steel-framed industrial units at Mercia Park in Leicestershire. The units will be leased to Jaguar Land Rover (JLR), making this, what is said to be, the UK's largest single occupier logistics park.

Winvic is already working on Mercia Park, undertaking all of the Park's infrastructure and also building three buildings for DSV. Caunton Engineering

is erecting the steel for the DSV scheme, but no steelwork contractor has so far been appointed for the JLR development.

The five buildings for JLR consist of units two and four, which are the largest steel frames, offering 93,000m² and measuring 514m-long × 181m-wide. Units three and five are both 27,800m², while the smallest steel frame, unit one is 18,500m². All of the units will incorporate either two-storey or three-storey offices.

Jason Jasper, UK Project Director for IM Properties, said: "We've taken a 238-acre site from zero to development ready in four years. Typically, a scheme of this scale would be delivered in separate phases over a five-to-ten-year period. After years of investment and hard work, it will be exciting to see all of the buildings come out of the ground at the same time."

Contract awarded for £22.9M steel-framed Gateshead Quays multi-storey car park

Gateshead Council has awarded Willmott Dixon the contract to deliver a futuristic multi-storey car park in the Baltic Quarter of the town.

Appointed through the Scape National Major Works framework, the project will deliver 1,000 parking spaces as part of an extensive regeneration of the area, which also includes a landmark arena, conference and exhibition centre.

The project will involve constructing a 10-storey steel-framed car park, which will have 50 electric vehicle charge points, with the future potential for a further 300.

Other features include a new 'pay on exit' parking management system, a dedicated disabled parking area and spaces for motorcycles. To reduce the carbon footprint of the building, a large array of photovoltaic

(PV) panels will be situated above the top level of parking.

Peter Udall, Strategic Director Economy, Innovation and Growth, Gateshead Council said: "We are very excited to see this crucial piece of the Newcastle Gateshead Quays infrastructure work start on site.

"The car park is essential to the arena, conference and exhibition centre development, but will also provide much needed parking for the area."

Landmark central London entertainment venue completed

Work has been completed on the Outernet London project, a new immersive entertainment venue, set to help reinvigorate London's iconic Denmark Street music scene.

The development is said to have the world's largest high-resolution wrap-around screens with a live events space for up to 2,000 people. It also boasts retail, office and residential space across four new buildings and a number of refurbished existing buildings.

Main contractor Skanska said from the beginning of the project its team tackled some significant challenges; from the close proximity of the building's foundations to the Eastbound Crossrail tunnel and Tottenham Court Road Underground Station and Northern Line, to safe shutdown and reopening of the site to quickly put COVID-19 measures in place.

The biggest challenge was constructing the roof of the auditorium within the basement of a central London site. Skanska worked closely with steelwork contractor Severfield to lift the 400t steel and concrete roof into its final position, using a series of 75t jacks.

In total, Severfield fabricated, supplied and erected 2,400t of structural steelwork for the project.

Contractor named for net-zero scheme

Commercial real estate investor and developer, Firethorn Trust has appointed Winvic Construction to deliver its landmark 25.5-acre site, Ascent Logistics Park, in Leighton Buzzard, Bedfordshire.

Firethorn said that with a sharp focus on promoting sustainability, the contract was awarded to Winvic on the basis of its ability to deliver the requirement of a net-zero carbon scheme.

The highly-specified site design includes LED lighting to offices, electric vehicle charging points and solar power generation. Ascent Logistics Park will also feature generous outdoor amenity spaces with expansive landscaping, dedicated cycle and pedestrian routes and modern welfare facilities, which look to encourage a healthy working lifestyle.

Permission for construction to start at Ascent Logistics Park was granted by Central Bedfordshire Council in January, and work will commence imminently with the first units due to be delivered by Q4 2021.

Work set to begin on Canary Wharf steel-framed office enlargement

Skanska has begun work on refurbishing and enlarging 30 South Colonnade, an 11-storey steel-framed commercial office building in east London's Canary Wharf estate.

Working on behalf of its customer Quadrant and its joint-venture partner Oaktree Capital Management, Skanska will carry out extensive structural refurbishment of the existing building, add three new steel-framed floors and install new cladding.

To be known as YY London, the building is targeting BREEAM 'Outstanding' rating, while internally it will be fitted out to a Category A standard.

Skanska Managing Director Steve Holbrook commented: "Winning this contract is a great testament to the collaborative way of working the team adopted with our customer to deliver a transparent approach throughout the tender process.

"Their hard work to overcome any challenges meant they could find solutions that not only met the customer's bespoke requirements, but will also deliver a modern, sustainable building located in the heart of the vibrant Canary Wharf community."

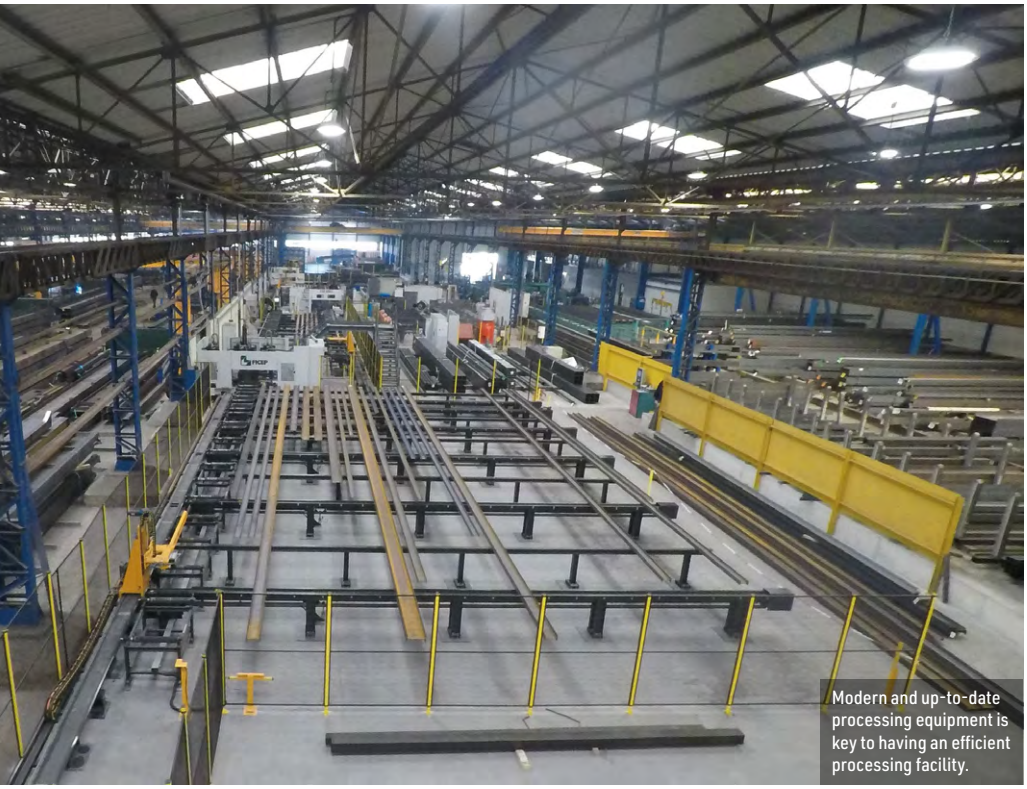
Diary

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

Thu 20, Fri 21, Thu 27, Fri 28 May 2021
Steel Connection Design
Online course
This course is for designers and technicians wanting practical tuition in steel connection design. The course concentrates on the design of nominally pinned connections, in accordance with BS EN 1993-1-8, considering vertical shear and tying.

Tue 15 June 2021
Continuous Composite Beams
Webinar
SCI/BCSA Members only
This webinar gives an introduction to the design of continuous composite beams in buildings according to Eurocode 4. Topics covered include different types of beam analysis, cross section design, member design and detailing.

Tue 22, Wed 23, Thu 24 June 2021
Steel Frames and Disproportionate Collapse Rules
Online course
A solid introduction into the design of steel-framed buildings to avoid disproportionate collapse. The guidance provided is in accordance with the current Building Regulations, the Eurocodes and Approved Document A, which all required that disproportionate collapse must be considered in the design of all buildings.



Modern and up-to-date processing equipment is key to having an efficient processing facility.

Driving efficiency in steel fabrication

Ficep is continually developing new ideas and technologies to meet the needs of its customers and industries served by its steel processing equipment

There's no question that the COVID-19 pandemic has accelerated the adoption of automation in many areas of manufacturing. The personnel limitations imposed by social distancing requirements have resulted in staff reductions and shop floor shortages, which in turn have impacted productivity.

This has led many steelwork contractors to investigate automated systems for structural steel processing that combine smart software, smart production machines, and smart handling systems. Together, these advanced technologies enable intelligent steel fabrication through the optimisation of plant layouts, processing efficiency and productivity across factories.

As more and more steelwork contractors turn to automation over the coming years, Ficep is well placed to support them. The business devotes 5% of its annual profits to new product development to meet the needs of modern fabricators and help them adapt to industry changes and challenges. From machinery to service and tooling, steel processors will be looking to improve worker safety and become leaner operations. Delivering business-wide efficiencies will remain a driving force, and automation will be key.

Joining the dots

Business efficiency does not start and end on the production line. The ability to integrate production and material planning; digitised workshop management through to transport management, with production analysis capability, is where people need to look to achieve overall productivity improvements.

Ficep's proprietary software, Steel Projects PLM, makes the link between the detailing office, the production office, and the workshop to help optimise workflow. BIM compatible, and designed to integrate with other popular Enterprise Resource Plannng (ERP) and management information systems such as Tekla PowerFab and STRUMIS, the software integrates back-office management systems with the shop floor to run projects from design to finished product.

It also tracks production information to provide real-time analysis. Data can be customised to track the performance indicators that matter in your business, with custom reports and KPI analysis available at any time, and at the touch of a button, via the Steel Projects PLM app.

Shop floor innovation

Taking this holistic view across the entire production facility enables Ficep to identify

Steel fabrication is today more and more reliant on automated processing equipment.

opportunities for productivity gains in all areas of business operations. One recent example of this is the addition of tool vending machines to the company's portfolio in 2020, which is giving steelwork contractors greater control over their tool stock inventory and saving them both time and money.

The vending machines make tools and consumables readily accessible for on-site operators. A swipe card system allows registered operators to select the item they need and the machine registers what is taken, when, and by whom, providing full traceability.

The Ficep team manages the tooling stock remotely, streamlining the process still further, reducing admin time and eliminating delivery time for customers. Additional time and administrative savings are made through automated weekly and monthly stock monitoring, which generates reports that enable the Ficep team to replenish tooling stock when required with no input required from the customer.

The final piece in the jigsaw

When a CNC machine sits at the heart of your production line, downtime is not an option. Making sure your equipment remains in optimal working condition is vital for achieving long-term productivity.

Proactive maintenance may not be top of your list when your machines are in good working order, but the second that an undetected fault causes production to grind to a halt and productivity levels to plummet, it may be time to call Ficep UK to discuss a service contract.

Ficep UK recognises the value of proactive maintenance and offers a number of flexible service contract options, including a custom option that enables customers to plan a schedule for CNC machine maintenance and service that is tailored to their business, machines, and manufacturing processes. The outcome is greater efficiency, peace of mind, and a lower risk of unplanned downtime; something everyone involved with steel construction is striving for. ■

Steel forms City's sustainable tower

An evolving design and high sustainability credentials have both been key ingredients for 8 Bishopsgate, the City of London's latest landmark high-rise development.

8 Bishopsgate is the latest addition to the City of London's high-rise cluster.

FACT FILE
8 Bishopsgate, London
Main client: **Mitsubishi Estate with Stanhope**
Architect: **WilkinsonEyre**
Main contractor: **Lend Lease**
Structural engineer: **Arup**
Steelwork contractor: **William Hare**
Steel tonnage: **8,500t**

Rising up on a plot bounded by two of the City of London's busiest thoroughfares, the latest steel-framed high-rise scheme in the square mile's eastern cluster is quickly taking shape.

Featuring a host of sustainability credentials, the EPC A rated building is set to be the UK's tallest structure to achieve a BREEAM 'Outstanding' rating. With 30% less structural embodied carbon than London tall building benchmarks, 8 Bishopsgate is a stand-out development in many ways.

The construction programme for this prestigious commercial project has unfortunately coincided with COVID-19 lockdowns, which led to some uncertainty as to when office workers will return, full time, to their regular places of work.

With the onset on the first lockdown last year, many commentators were suggesting that working practices would be radically altered, with working from home becoming the 'new' normal on a permanent basis.

However, property analysts are now suggesting the opposite and once the pandemic is over and the vaccination programme has been widely rolled out, the commercial property sector could be set for a significant boost.

According to Savills, every survey that has been done of office workers suggests that most will continue to spend the majority of their working week in traditional offices. Coupled with an end to (or at least a diminution of) Brexit-related uncertainty in the investment market, this could all be good news for the commercial sector.

Consequently, the construction of commercial developments has continued throughout the pandemic, with a view to better times ahead. The 50-storey 8 Bishopsgate, which on completion will be the square mile's fourth highest building, is the most prestigious office scheme currently under construction.

It will offer 52,900m² of office space in what is said to be the UK's most sustainable commercial tower.

According to WilkinsonEyre Director Oliver Tyler, sustainability has been a key design driver from the project's inception and one of the main goals was to achieve material efficiency.

"We've used bespoke fabricated steel sections throughout, which have been optimised for individual unique loads. By rationalising the building's frame, we need 25% less steel, which saves approximately 5,000 tonnes of carbon."

Another initiative to make sure the steel frame meets the project's high sustainability goals is to leave the majority of it exposed within the completed structure.

"The steelwork is painted offsite and once it is erected we only need to do some minor touch-up work," says Lend Lease Project Director Paul Gransby.

"The exposed steel frame provides the building with a modern industrial-looking office environment, but importantly we use less materials, which is good for sustainability, to enclose the columns and beams."

As the steelwork will be on show, a lot of care was taken with the choice and design of the connections. Two splice arrangements for the columns and bracings have been used by steelwork contractor William Hare. They are: an internal splice plate connection, with countersunk bolts that minimise protrusion from the outer section diameter; and a recessed end plate connection, which butt the connecting member's webs and flanges up against each other.

Starting at ground floor level, the steel frame incorporates three distinct blocks that are stacked-up to form the overall building.

Each has a unique identity related to the cladding module, the addition of fins to the mullions or how the structure is seen through it. While predominantly glazed in a double skin curtain walling, the lowest block is clad in stone to respond ▸14

Developing design

The history and evolution of the 8 Bishopsgate scheme goes back to 2015 when WilkinsonEyre won planning permission for a 40-storey centrepiece office development featuring a 'stacked' three block design.

"Following the approval of a number of other towers in the City's eastern cluster that impacted on our original proposals, we submitted a revised planning application in 2017," says WilkinsonEyre Director Oliver Tyler.

"Keeping the stacked design, which is best suited to the constrained site, our approved revised plans added 10-storeys to the tower, totalling an extra 11,000m² of office space."

The 50-storey tower encompasses three basement levels, ground floor retail and a public viewing gallery at its summit. ■

Steelwork begins on the 50-storey tower.

▸14

to the street level context.

The stacked design is the best shape to maximise the site's development potential and helps the structure step-down in a southerly direction to address View Management constraints associated with St Pauls.

A low-rise block extends up to level 11, a mid-rise one, which actually sits behind the lower block, starts at sixth floor and goes up to level 26, and then a slim high-rise block tops out at floor 48. A three-storey pavilion is then positioned above this floor, incorporating a public viewing gallery and plant zones.

The primary internal grid for the low and middle blocks is based around a 12m × 9m column pattern, using 620mm-deep plate girders with circular and rectangular openings to accommodate the building services.

"The column positions have been selected in order to mitigate any column transfers, whereby the internal columns in the low-rise block continue upward to become perimeter members on the mid-rise part of the project," explains Arup Project Engineer Jeremy Edwards.

Using the same column grid pattern, the high-rise block has no internal columns as beams span directly between perimeter steel columns and the core, creating 21-storeys of column-free space.

Recessed bolts have been used for their aesthetic value within the exposed steel frame.

Providing the stability for the 50-storey building are two concrete cores. The north core extends from the basement up to level 51, while the south core terminates at level 24.

Providing some extra stiffness to the structure, the mid-rise block is a braced box, featuring perimeter steel bracing that connects the two cores together and mobilises the perimeter columns to resist horizontal loads (see box story). This stiffens up the low and mid-rise blocks and allows for a narrower north core for the uppermost block.

Helping to further maximise available floor space, the building cantilevers out along its western elevation, over-sailing the pavement along Bishopsgate.

This overhanging west face reinforces the architectural concept, while providing 15% of the Net Internal Area, thereby improving the viability of the scheme and enhancing its identity.

"For the transfer of vertical loads, the west face can be viewed as a 20-storey truss, which is supported on its north edge by a series of raking

The building's steel beams have bespoke openings to accommodate the building services.

Bespoke and optimised steel sections have been used throughout.

columns that connect to the north core and by a series of further columns on the southern edge," adds Mr Edwards.

The western elevation overhang commences at level six and initially extends up to floor 26. This is the truss, and it forms a 5.5m-wide cantilever on the north, which increases to 9.5m wide at the south.

Further cantilevers begin at level 26 and 48, with the former overhanging by up to 3.8m. This feature is formed by three inclined columns, sat atop the truss and extending up to level 30 (four floors), where they are tied into the steel frame and anchored into the diaphragm.

Finally, the uppermost overhang at level 48 is created by two inclined columns, which extend up to floor 50, where they are also tied into the frame.

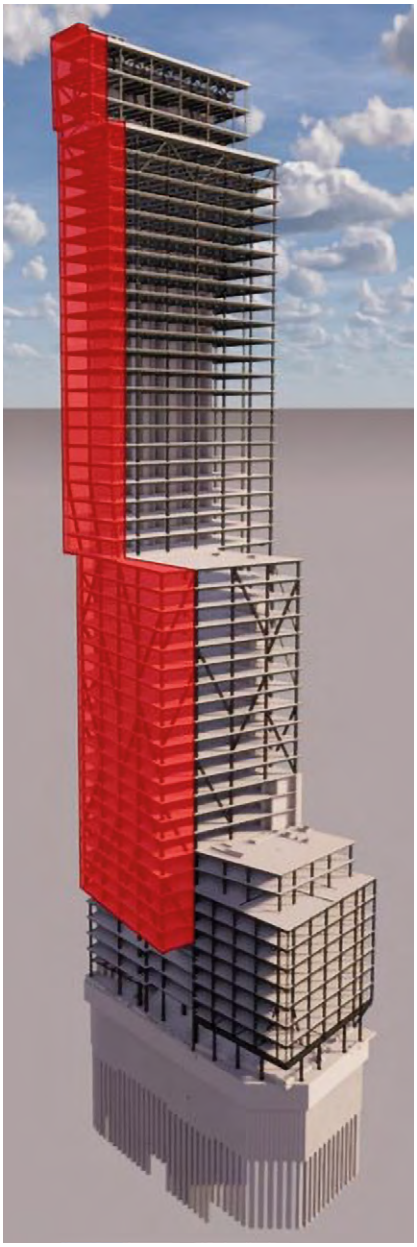
The stacked design also means the development has three main terraces facing south and west, at level 11, 26 and 48. Approximately 10% of the building is dedicated to shared space, both indoor and out. This includes 1,400m² of terraces, which will be adorned with evergreens and seasonal blooms.

The exposed steel frame provides the building with a modern industrial-looking office environment, but importantly we use less materials, which is good for sustainability, to enclose the columns and beams."

Communal amenity space for tenants extends to a 200-seat auditorium, a double-height space that is located at second floor level.

"This is a complex area and, because of its location, we had to install a temporary logistics deck of precast planks spanning across the auditorium, which will be removed to allow the fit out to commence once the structure above is complete," explains Mr Gransby.

8 Bishopsgate is due to be complete by the end of 2022. ■



West face bracing

According to Arup, a stochastic search algorithm was used to assess hundreds of bracing arrangements on the building's west face, with the most efficient arrangements developed further for the design.

The bracing sections span four floors and node out with the edge beams and the perimeter columns. The columns are tied into the floorplates they pass through. The stochastic arrangement utilises the diaphragm to resolve the horizontal component of the forces at bracing ends. Careful assessment has been carried out to ensure the horizontal loads generated on each braced box floorplate have been worked through and that no component is over-utilised.

The columns and bracing on this face are typically 450mm × 450mm fabricated H-sections with plate thickness ranging from 30mm to 80mm. Where larger forces exist, the section depths have been increased and in isolated locations double webbed H-sections have been used. ■

Inland port expands with steel

SEGRO Logistics Park East Midlands Gateway is continuing to expand with the construction of one of the largest temperature-controlled distribution centres in the country.

Covering an area of 700 acres, SEGRO Logistics Park East Midlands Gateway (SLP-EMG) has been described as a game-changing distribution hub (inland port) due to its comprehensive transport links and geographic location (see box).

With planning consent for up to 557,000m² of logistics accommodation, the Park is already home to a diverse mix of customers, including Games Workshop, XPO Logistics, Shop Direct, Amazon and Kuehne+Nagel.

Adding to this existing customer roster, the Park is currently expanding further with the construction of a huge distribution centre, which has been leased to DHL. Known as Plot 12 and aiming to achieve a BREEAM 'Excellent' rating, the unit covers an area of 64,474m² and includes two mezzanine levels and a couple of attached two-storey office blocks.

Commenting on this latest development, Andrew Pilsworth, Managing Director, National Logistics at SEGRO, says:

"The latest addition with DHL at SLP-EMG continues to highlight the demand for modern, sustainable space that is supremely well located.

"We have now contracted over half the available space, securing inward investment and creating jobs across the region. There's a vibrant atmosphere on site and it's good to see the high levels of activity of our customers during these uncertain times."

Winvic Construction is undertaking the build of Plot 12. It has a long history on this site, having previously constructed six of the Park's seven existing distribution centres. Winvic has also undertaken a huge earthmoving operation to prepare the ground for all of the planned structures and constructed the 50-acre Strategic Rail Freight Interchange. This programme involved over half a million cubic metres of plateau, screening and topsoiling, with a plant fleet of 65 vehicles moving approximately 105,000m³ of earth every week.

Requiring a total of 5,300t of structural steelwork, Severfield is fabricating, supplying and erecting the steel for this huge structure. Severfield also has a long and successful association with SLP-EMG, having previously erected three distribution centres on the Park (see NSC January 2019).

Measuring 260m-long × 240m-wide and with a maximum height to the top of the stair tower of 42m, the building is said to be the largest temperature-controlled distribution centre in DHL's current property portfolio.

According to Winvic Design Manager Mihir Mehta, the main challenge for this job was not so much the size of the structure, but the incorporation of possible design amendments.

"We had to design the structure with one eye on the future and possible variations, which was especially challenging in the absence of a fully developed M&E design. However, design parameters were set out early in the process in coordination with the client team and all the consultants involved."

Overall, the structure consists of high and low bay column-free areas, with the former reaching an impressive height of 33m, while the low bays are 18m-high. In total, there are five high bay areas, with spans up to 33m-wide, alongside three low bay spans, which are up to 34m-wide.

The low bays wrap around the high bay zones in an inverted L-shape, with one 18m-low bay span running the full 260m length of the structure. It is in this area that the project's main design amendment has occurred.

FACT FILE
SEGRO Logistics Park East Midlands Gateway Plot 12
Main client: **SEGRO**
Architect: **Peter Haddon & Partners**
Main contractor: **Winvic Construction**
Structural engineer: **RPS Consulting**
Steelwork contractor: **Severfield**
Steel tonnage: **5,300t**

The structure's five high bay areas are 33m-high and have column-free spans of 33m.

Inland port

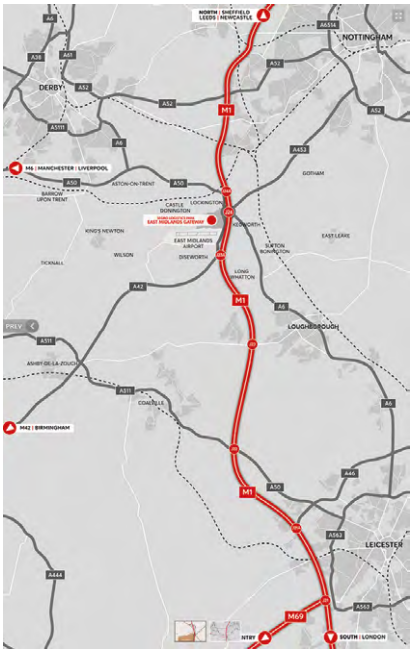
SEGRO Logistics Park East Midlands Gateway is an inland port boasting road, rail and air transport links.

Located in the centre of England, directly next to East Midlands Airport, with Nottingham 13 miles to the north east, Leicester 20 miles to the south and Derby 14 miles to the north west, the Park also has direct access to Junction 24 of the M1 motorway.

Another key asset is the Park's on-site rail terminal, operated by Maritime. This is now fully operational with trains transporting goods across the UK, linking other strategic rail freight interchanges and major UK ports such as Southampton, Felixstowe, London Gateway and the Channel Tunnel.

Since construction began on the site in 2017, SEGRO has invested £100M in earthworks, upgrading transport and road infrastructure, including building a new by-pass around the local village of Kegworth.

Once the site is fully developed, over 7,000 direct jobs will have been created. Those working on site have free access to the 24/7 electric shuttle bus to transport them from the train or bus station to site. ■



"As we already anticipated the requirement for the mezzanine levels, the steel frame and the columns, which are larger members than elsewhere in this part of the structure, were designed to accept the extra loads."

Plot 12 features two attached office blocks.

Running the full length of the east elevation, two mezzanine levels were added to the scope of works quite late in the design process.

"Ordinarily, structural steelwork additions to a job amount to a few hundred tonnes, but the mezzanines are very substantial and require 1,800t of the project's overall steel tonnage," explains Severfield Operations Director Stephen Jay-Hanmer.

"As we already anticipated the requirement for the mezzanine levels, the steel frame and the columns, which are larger members than elsewhere in this part of the structure, were designed to accept the extra loads."

For the erection process, which completed last month (April), Severfield used up to six mobile cranes, with capacities ranging from 60t to 90t. The cranes had to erect some large members, such as the high bay columns, which had to be designed with a splice connection at approximately midpoint (18m).

Because of the height of the high bay columns and the splice connection, temporary bracings had to be installed during the erection of these parts of the structure.

For the roof, each span – for both high and low bays alike - two cranes were used. Each crane lifted one roof beam, which was then connected to column. Once this connection was made and with cranes still holding the beams, the members were bolted together at the apex forming a single span, which then allowed the cranes to release the beams.

Summing up, Winvic Project Manager Mark Gould says speed of construction was vital on this scheme due the amount of M&E needed for such a large temperature-controlled structure. The steel erection programme also had to be coordinated with all of the other follow-on trades, such as the cladding.

In areas were the high and low bays connect, the cladding had to be installed to the higher parts of the structure during the steel erection programme, as access would have been problematic once the entire frame was up.

"The erection started in the eastern part of the structure with the mezzanine and the attached office blocks. This wasn't the direction we would ordinarily have chosen, but it allowed office fit-out and the racking system installation, for the mezzanines, to get started early," says Mr Gould.

Plot 12 is due to be complete by September and operational by the end of the year. ■

The low bay areas have impressive spans up to 34m-wide.

Power in the frame

Steel construction has proven to be the ideal framing solution for an energy-from-waste facility with a complex and challenging shape.

Finding alternative methods for the treatment of non-recyclable waste has been one of the main challenges facing local authorities, business and industry throughout the UK for a number of years. Coupled with the need to invest in greener and renewable sources of energy, one solution has seen a number of energy recovery facilities constructed up and down the country.

One example is the Newhurst energy-from-waste (EfW) facility in Leicestershire, which is being built by a joint venture between Covanta, Biffa and Green Investment Group (GIG).

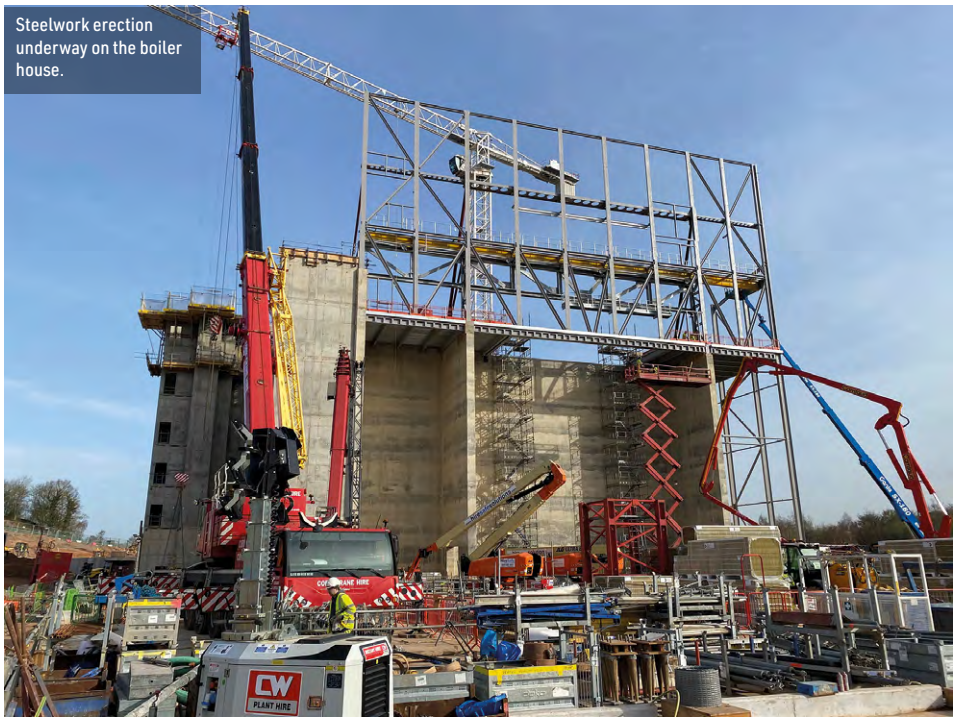
Located just off the M1 motorway in a former quarry, the Newhurst EfW facility is a significant addition to the UK's waste management infrastructure. It supports the Government's drive to both reduce reliance on landfill and the UK's ability to treat more non-recyclable waste without relying on export to European facilities. The facility will use proven technology to provide up to 350,000 tonnes of annual treatment capacity for non-recyclable waste and will also generate up to 42 megawatts of electricity, which is enough to power around 80,000 homes.

Once complete, Covanta and GIG will together own 50% of the state-of-the-art facility, with Biffa, the primary waste supplier for the facility, owning the remaining half of the project. Covanta will operate the facility under a long-term operations and maintenance agreement.

"The Newhurst EfW facility will provide important sustainable waste treatment capacity in the drive to move non-recyclable waste away from landfill and combat climate change," said Owen Michaelson, President, Covanta Europe.

"Biffa has a leading role to play in developing the recycling and energy from waste facilities that the UK needs if it is to become a low-carbon, resource-efficient economy," adds Mick Davis, Biffa's Chief Operating Officer.

Construction of the facility is being led by Hitachi Zosen Inova (HZI), a global leader in EfW engineering and construction, under a turnkey Engineering, Procurement and Construction (EPC) contract.



Steelwork erection underway on the boiler house.

Over 300 jobs are being created during the construction period, providing related benefits to the local economy. Many opportunities are also being created for the local supply chain with a commitment from the project to purchase goods and services from nearby companies wherever possible.

HZI began work on site in 2019 and began by demolishing a number of buildings once used by the former quarrying operation. Preparing the ground in readiness for the main steelwork erection programme also involved the installation of concrete raft foundations.

Working on behalf of HZI, Billington Structures is the project's steelwork contractor, fabricating and supplying 2,860t of structural steelwork. The company will erect approximately half of this steel tonnage, with the other half being supplied to the project for other contractors to install along with the facility's process equipment. This part of the steel package consists of support structures, gantries and maintenance walkways.

The main Newhurst EfW steelwork programme includes five structures that Billington is erecting. They are: the tipping hall, waste bunker, bottom ash building, fire tank/pump room and a six-storey administrative block. The buildings are all inter-connected and in the final state, they will resemble one large structure.

"A lot of the overall structure is curved in plan and creating this shape along with the roof is ideally suited to steel construction"

FACT FILE
Newhurst Energy Recovery facility, Leicestershire
Main client: **A JV between Covanta, Biffa and Green Investment Group**
Main contractor: **Hitachi Zosen Inova**
Structural engineer: **Doran Consulting**
Steelwork contractor: **Billington Structures**
Steel tonnage: **2,860t**

The structure reaches its highest point at the boiler house.

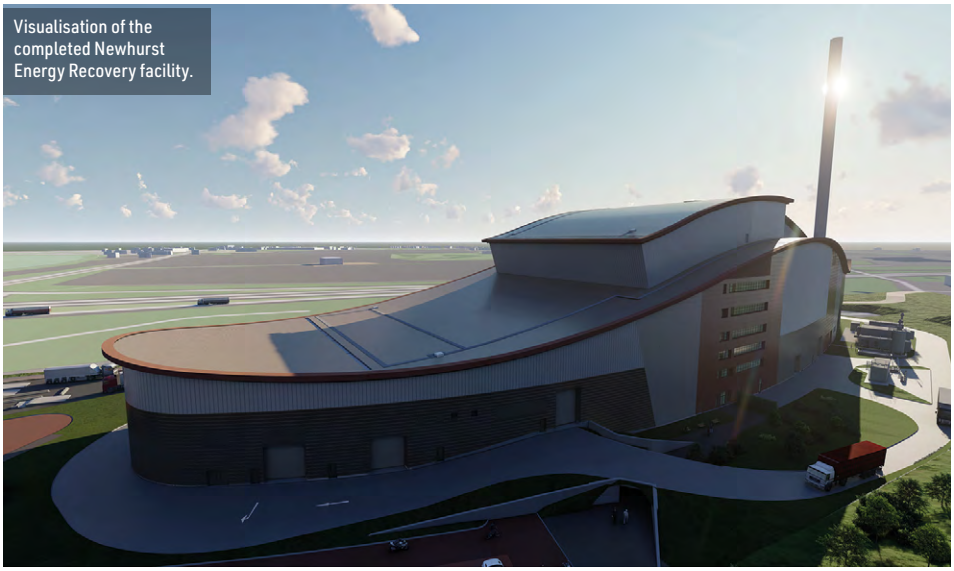
Topping the majority of the facility is a curved roof, which changes in geometry along its length from concave to convex and then back to concave.

A series of curved plate girders forms this wave-like roof structure and according to Paul Keown, Doran Consulting Project Engineer, this could not have been done in anything other than steel.

"A lot of the overall structure is curved in plan and creating this shape along with the roof is ideally suited to steel construction," he adds.

HZI Civil Project Manager Ben Sissons says steelwork offers the only viable and economic solution for constructing an EfW facility.

"The size and complexity of the individual buildings, and their long spans is best constructed with steelwork," he says. "The steelwork is also erected around the installation of processing equipment, so sequencing and temporarily propping large structural elements is vital and couldn't really be achieved with any other form of construction."



Visualisation of the completed Newhurst Energy Recovery facility.

One of the main challenges for Billington Structures has been erecting a series of 25m-tall columns that sit on top of a 25m-high concrete waste bunker.

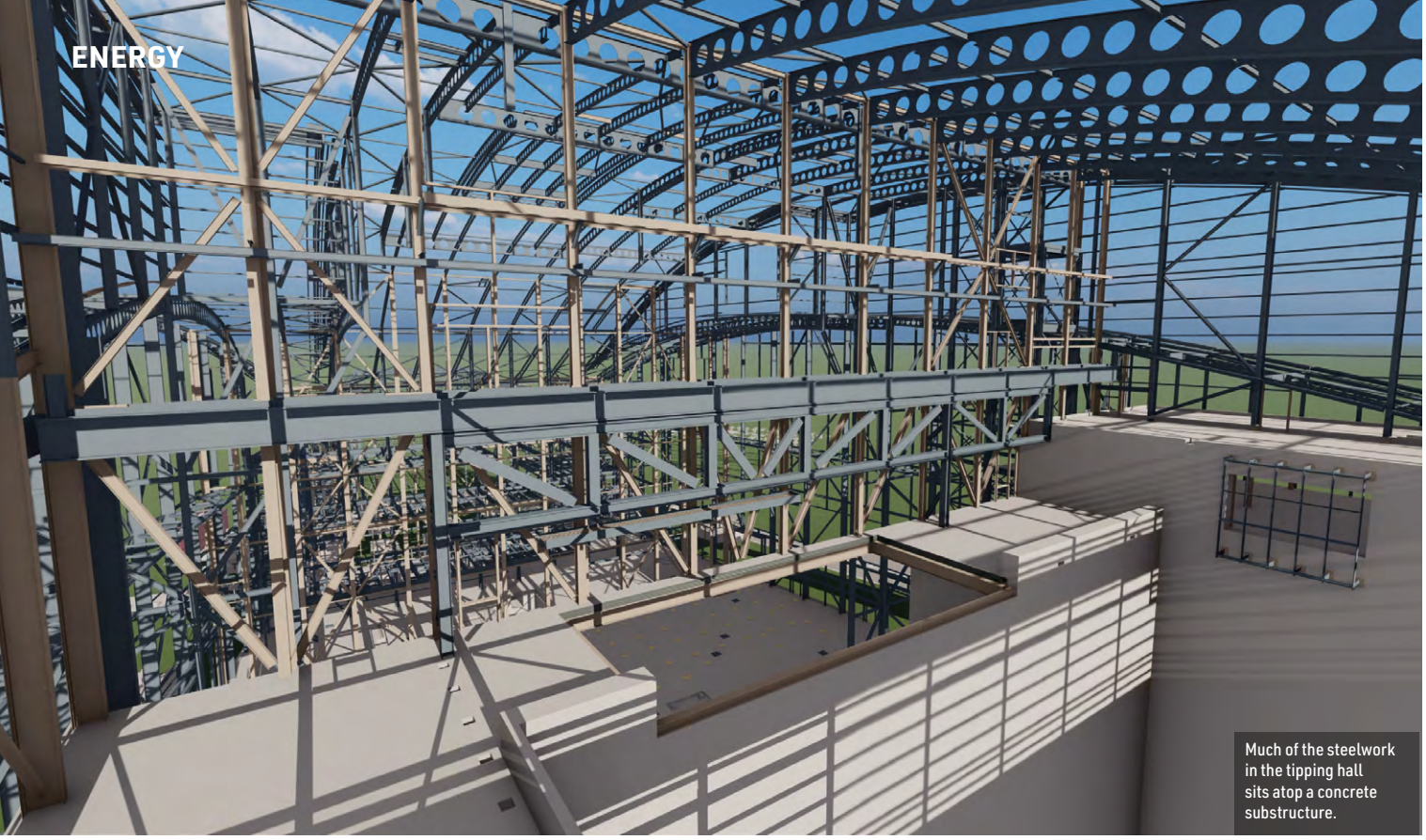
These columns support the building's 32m-wide curved roof, and had to be temporarily supported during the erection process. The supports couldn't be removed until the roof rafters, which came to site in two 16m-long pieces, had all been installed along with the bracing, which then provided the frame's stability.

The waste bunker building also has two overhead gantry cranes, which run along crane beams supported from the top of the main columns. Supporting the crane beams and minimising any vibrations from the cranes, which operate 24 hours a day, mean the column sections are larger than would ordinarily be needed.

Separating the waste bunker building from the adjoining boiler house is a fire wall, which is formed by a series of composite panels that are attached to a 23m-high truss. The truss also supports a series of columns that support the roof and a floor that accommodates hoppers.

Bringing the truss to the site in one piece and then erecting it would have proven to be problematical, not just for transportation reasons, but also because a large crane would have been needed, and space on this busy site is at a premium.

Consequently, the truss was brought to site ▸20



Much of the steelwork in the tipping hall sits atop a concrete substructure.

▸19 in small elements which were then erected individually.

Stability for such a large complex facility has been achieved by a number of solutions. The waste bunker building contains a large concrete bunker, which is rigid and therefore provides this building with much of its stability.

Elsewhere, the other buildings use a combination of roof and wall bracings. The exception is the six-storey office block that utilises two concrete stair cores for its stability.

The office building sits adjacent to the boiler house and the waste bunker. The top floor of the office block is a control room, overlooking the waste bunker and accommodating the crane control area.

The Newhurst EfW facility is due to be complete in 2023. ■

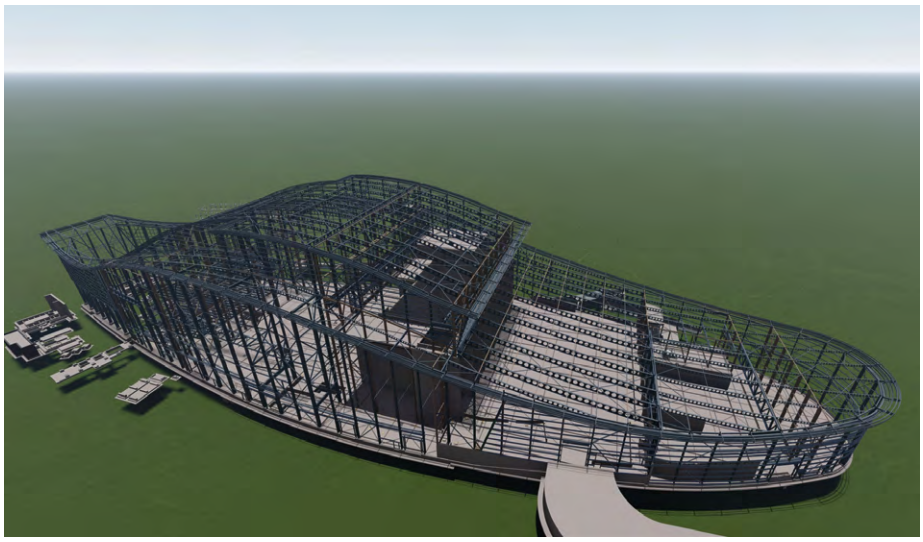
Verification of curved steelwork

The verification of curved steelwork is not addressed directly in design standards. David Brown of the SCI offers guidance on the issues to be considered

The Newhurst EfW facility is a good example of the graceful curved lines which can readily be achieved with structural steelwork. The steel frame has members curved in plan, curved in elevation, and in some locations, curved about both axes. Design standards such as BS EN 1993-1-1 cover the verification of straight members, so some modification is needed when members are curved. Guidance is presented in SCI publication P281. Although this publication was prepared for designs in accordance with BS 5950, the principles may be readily adapted for design in accordance with the Eurocodes.

Curvature is commonly produced by cold rolling straight members, or by fabricating members from profiled plate. Cold rolling substitutes the original pattern of residual stresses with those due to the rolling process. These new residual stresses are generally not of concern for members curved in elevation. When load is applied to curved members, there will be a complementary radial component. For members curved in elevation, this radial load will introduce out of plane bending stresses in the flanges. This effect can be allowed for by using a reduced design strength.

For members curved in elevation (i.e. web vertical), the primary issue is the resistance to lateral torsional buckling, which is modified depending on which flange is in compression. If the convex flange is in compression, the member is less stable than a straight member. If the concave flange is in compression, the member is more stable, though the recommendation is that the resistance is conservatively taken as that of a straight member. The key step is to calculate a modified elastic critical buckling moment (M_{cr} in the Eurocode, M_{E} in BS 5950 and P281). Design to the Eurocode then follows the normal process.



Members curved on plan generally experience torsion, so hollow sections would be an ideal member and are simple to verify. Deflections will always need careful consideration, particularly for longer spans and small radii. If universal sections are specified, they will twist, which may be noticeable and have a particularly adverse effect on anything supported by the steelwork. Any flexibility in end connections will accentuate the deflection, so connections are usually detailed with robust connections and widely spaced bolts to carry the torsion. ■

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Exposed frame creates landmark research facility

A secondary steel frame supports the building's feature glazed facade.

FACT FILE
The National Robotarium, Heriot-Watt University, Edinburgh
Main client: **Heriot-Watt University**
Architect: **Michael Laird Architects**
Main contractor: **Robertson Construction**
Structural engineer: **Tetra Tech**
Steelwork contractor: **BHC**
Steel tonnage: **390t**

Housed in a fully-exposed steel-framed building, construction is underway on a world-leading research facility for robotics and artificial intelligence.

Based at Heriot-Watt University's Edinburgh campus, the National Robotarium will be the largest and most advanced facility of its type in the UK.

Supported by £21M from the UK Government, and £1.4M from the Scottish Government as part of the Edinburgh and South East Scotland City Region Deal, the facility will be a stand-out landmark building within the university campus.

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

"The project suited the use of steel because of the long spans involved," says Tetra Tech Director Stephen Alford. "Plus, in order to achieve the architectural design that incorporates exposed services, cellular steel beams and a supporting steel frame was the best option."

The National Robotarium will be a centre of excellence for pioneering research. It will create innovative solutions to global challenges using cutting-edge research, product design and industry collaboration. Bringing together academics and global companies, the facility will provide a catalyst for entrepreneurship and is expected to deliver sustainable economic benefit to Edinburgh, the UK and beyond.

The 3,700m² building will house three distinct research and development areas, providing bespoke facilities for Robotics & Autonomous Systems (RAS), Human Robot Interaction (HRI) and High Precision Manufacturing.

It has also been announced that the National Robotarium will spearhead research into ways to manage trust between humans and autonomous systems to support adoption in scenarios that require human interaction, such as in self-driving cars or autonomous wheelchairs.

Aiming to achieve a BREEAM 'Excellent' rating, the project's design focuses on sustainability and energy efficiency. In winter, the intelligent façade will provide solar heat and recycle warm air. An ecological zone will integrate sustainable urban drainage systems, while a solar PV array will be installed on the roof. Electric vehicle charging spaces will also be available.

"Adding to our sustainable credentials, no materials left the site during or after our preliminary cut and fill programme that levelled the previously sloping site," adds Robertson Construction Senior Project Manager Richard Cairns.

A ground stabilisation programme was then undertaken, which involved the installation of stone piled foundations to a maximum depth of 3m.

The 14-week steel erection programme was then able to commence in early April, work that has required BHC to fabricate, supply and erect 380t of structural steelwork.

"As well as achieving the desired design, a steel-framed option was the best solution for this scheme as it offered the quickest and most cost-efficient construction programme," adds Mr Cairns.

Based around a regular 6m column grid, with internal spans of up to 12m, all of the steelwork, including the connections, are left fully exposed in the completed scheme. Beams and columns are painted offsite with a decorative finish, which has cut-down onsite activities as the steel only needs to be touched-up with paint to repair any knocks or scratches.

The upper level of the two-storey building, which will accommodate offices, is formed with steel beams supporting metal decking and a concrete topping to create a composite flooring solution.

Supporting the metal decking, the cellular beams, which are up to 610mm-deep, accommodate the building services within their depth. The


"In order to achieve the architectural design that incorporates exposed services, cellular steel beams and a supporting steel frame was the best option."
BHC begin the steelwork erection programme with the initial braced bays.

The column-free forum (atrium) will act as meeting place within the completed research centre.

use of Building Information Modeling (BIM), played a significant role in helping to achieve the coordination of services with the required penetrations in the steel beams.

By accommodating services within their depth, the use of cellular beams also allowed the project to maximise floor-to-ceiling heights and thereby minimise the overall height of the building.

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

Measuring 24m × 12m, the forum is a multi-purpose area, acting as a meeting point, auditorium, general break-out and circulation space.

The forum is topped by a series of six triangular rooflights that will allow plenty of natural daylight to penetrate into the building.

"A lot of work was required to coordinate the frame's bolted connections," adds Mr Alford. "As they are all exposed, we wanted the most visually-pleasing connections, which was particularly important in the forum, where we have roof level nodes that connect up to six beams."

Stability for the steel-framed building is derived from a combination of vertical and horizontal bracing as well as some portalised bays.

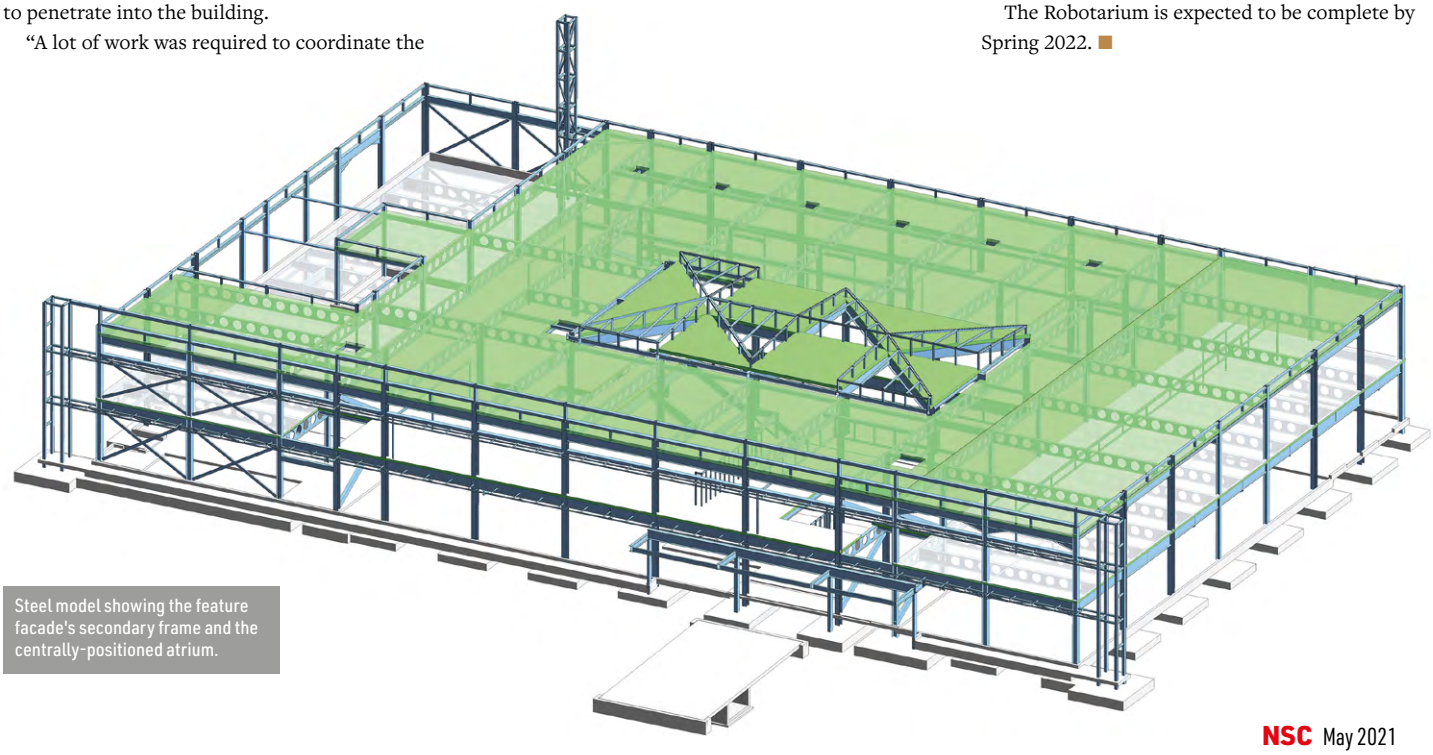
The building's façades are all braced, including the front elevation, which features the double-skin. The main façade's glazing creates a stand-out feature for the Robotarium and is supported by a separate lightweight box section frame that connects to the building's main steel frame at first floor level and roof level.

This secondary frame extends beyond the main building at either end to form two wings, and extends upwards beyond the roof level of the structure, before two right angled joints return the frame downwards to connect to the main steel frame.

There is a 1m-deep gap between the secondary and main steel frames, inside of which there are discretely positioned maintenance walkways.

Summing up, Mr Cairns says: "The National Robotarium building is designed to be as innovative as the research taking place within its walls. The commitment to sustainability and the wellbeing of its staff and students mean the facility will be equipped with state-of-the-art technology for energy efficiency and production and will boast considerable green space. The building will be certified to 'Fitwel' standards, meaning its design meets strict criteria for supporting occupants' health, wellbeing and productivity."

The Robotarium is expected to be complete by Spring 2022. ■



Steel model showing the feature facade's secondary frame and the centrally-positioned atrium.

Sat either side of a core, two large research chambers will be able to accommodate typical detached houses.

Steel creates university test centre

The University of Salford is constructing a steel-framed centre that will facilitate the testing of building materials in all-weather conditions, in order to evaluate their green credentials.

Reducing greenhouse gas emissions in order to tackle climate change is of upmost importance to all national governments and industries alike.

The UK Government, for instance, has a target to reduce the nation's emissions by at least 68% by 2030, compared to 1990 levels. Over the past decade, the UK has cut carbon emissions by more than any similar developed country and was the first major economy to legislate for net-zero emissions by 2050.

The construction sector and its supply chain are at the forefront of the drive to create a greener and cleaner world, and a bespoke facility, being built at the University of Salford, will help the sector's businesses test their products and services in order to see how effective they are in lowering consumers' carbon footprint and reducing energy bills.

A series of 18m-high columns form the structure.

Known as the Energy House 2, the £16M facility, that is part-funded by the European Regional Development Fund, will investigate the future of housing, looking at issues such as offsite construction, smart homes, and energy use. It builds on the work Salford has already done with its existing Salford Energy House, a project which has enabled key changes to UK housing stock to save energy.

The new and larger facility will have two large chambers, each measuring 21m-wide x 12m-high, with the ability to achieve temperatures of between -20˚C to +40˚C and simulate wind, rain, snow, and solar light. It will target a global market, with environmental conditions of 95% of the world's population able to be replicated.

Bowmer + Kirkland Project Manager David Mills explains: "One chamber will accommodate two detached houses, similar in size and design to the typical 1930s stock found throughout the country. Researchers will be able to gain insight into how insulation materials, smart energy products and cladding respond to various climate conditions.

"The other chamber will be available for hire to any business that wants to test a product, be it a house, mobile home or caravan, or any other equipment."

Construction work began on the former university campus car park site in August 2020. Two 2m-deep pits were excavated on the footprint of both chambers and then a series of 10m-deep CFA piles were installed along with ground beams to support the energy house's main steel frame, and the subsequent internally constructed buildings.

A constrained site has meant coordination between trades has been key to keeping the job on schedule.

Above the reinforced concrete slab, the pits were then backfilled with gravel. This material will allow drainage, services and typical foundation solutions to be installed for the various research programmes.

"It is a very constrained plot, surrounded by railway lines and the busy existing university campus. In order to alleviate traffic movements on and off site and minimise the disposal of excavated material, we have reused all of the excavated material, predominantly for the backfilling," says Mr Mills.

The steel braced-frame is formed with a series of 18m-high columns arranged around the perimeter of the rectangular-shaped building.

They create the two adjacent chambers, that sit either side of a 7m-wide central core that separates the two research areas.

A series of 21m-long cellular beams spans the two chambers and creates the desired column-free spaces.

"As the structure's columns are so high, we had to prop them during the erection sequence until we had formed a box with three other columns and the

FACT FILE
Energy House 2, The University of Salford
Main client: **The University of Salford**
Architect: **Bond Bryan Architects**
Main contractor: **Bowmer + Kirkland**
Structural engineer: **Curtins**
Steelwork contractor: **EvadX**
Steel tonnage: **350t**

connecting high level cellular beams," says EvadX Project Manager Andrew Roberts.

Although it does contain some cross bracing, the core does not provide the structural stability for the building, as this is derived from further bracing located all around the Energy House's perimeter.

However, what the central core does provide the Energy House with is three floors that accommodate plant space, control rooms, monitoring equipment, welfare, viewing areas, offices and a staircase.

Above the core and the two chambers, the structure has a fourth floor that spans the entire footprint of the Energy House and accommodates state-of-the-art ventilation and air handling equipment. This uppermost level as well as the floors within the central core are formed compositely with steelwork supporting metal decking and a concrete topping.

Explaining the overall design of the steel-framed facility, Curtins Technical Director Victoria Checkley says: The chambers have to be fully-insulated and so the steel frame sits outside of the thermal panels that surround the structure's interior.

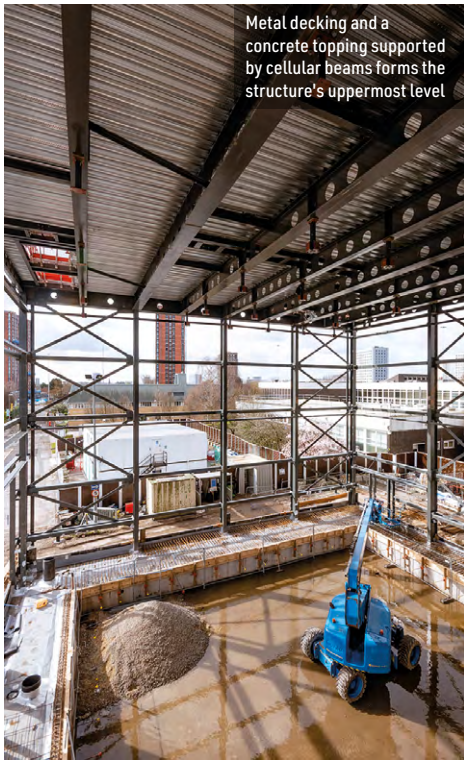
"However, the insulation is pierced at roof level, in both chambers to accommodate steel hangers, attached to the underside of cellular beams via thermal breaks. The hangers hang down half a metre and support a steel lattice gantry that will be used to store research equipment."

The internal steelwork was installed by EvadX on a return visit to site, approximately one month after the main steel frame was completed.

The Mayor of Greater Manchester, Andy Burnham, is said to be an advocate of the work undertaken by the team at the existing Energy House and commented that the research and testing that takes place has and will play a role in his vision to make the region a leading green city and carbon neutral by 2038.

He said: "A key part of delivering Greater Manchester's target to be carbon neutral by 2038 is in reducing emissions from our homes. We need our buildings to become more energy efficient and use renewable energy more effectively, and Energy House 2 will help us define how to achieve this. The facilities on offer are unique in the UK and will help businesses to test new equipment and mechanisms to reduce carbon emissions."

The construction of the research facility is expected to be completed later this year. ■



Metal decking and a concrete topping supported by cellular beams forms the structure's uppermost level

Impact on car park structures

Designing car park steelwork for impact has two aspects – the structural resistance and the selection of an appropriate steel sub-grade. David Brown of the SCI offers advice on both issues.

Advisory Desk 456 was prepared as a response to reports of designers circumnavigating the requirement to design internal columns for impact. Without turning to any design standard it seems entirely to be expected that accidents will happen within car parks leading to impact on any unprotected structural elements. There is plenty of evidence in car parks that vehicles can and do hit walls and barriers – regularly.

BS EN 1991-1-1 Annex B covers "Vehicle barriers and parapets for car parks" and gives a method for calculating the horizontal characteristic force on a barrier from vehicle impact. Logic demands that if a vehicle can hit a barrier, it can equally hit a column, if unprotected, so this Annex can be used to calculate the force applied to any unprotected element.

It seems that some designers are looking at the UK National Annex to BS EN 1991-1-7, and in particular at clause NA.2.16. In clause NA.2.16 the NA states that the equivalent static design force due to vehicular impact should be taken from Table 4.2 of BS EN 1991-1-7, unless the structure is Consequence Class 3. If the structure is Consequence Class 3, the National Annex directs the designer to Table NA.9.

Table 4.2 of BS EN 1991-1-7 includes traffic categories of motorways, main roads, country roads, courtyards and parking garages. It is absolutely clear that this table refers to impact on a structure from the outside – motorway velocity is not anticipated inside a multi-storey car park.

Car park structures become Consequence Class 3 if they have more than 6 storeys, when Table NA.9 applies. Table NA.9 also has classes of road including motorway, trunk roads etc – it is equally clear that this table applies to impact from outside a building. There can be no mistake – the note to the table states categorically that "these equivalent design forces are applicable outside a building; for columns inside any multi-storey building used for car parking the value must be taken from BS EN 1991-1-1 Annex B".

It is reported that for Consequence Class 2 car park structures (those not exceeding 6 storeys), some designers suggest that they are not required to look at Table NA.9, and therefore avoid the note that internal columns should be designed for the forces in BS EN 1991-1-1 Annex B. This thought process does leave an unanswered question as to what forces should then be used. It seems that in this situation, designers are using the forces associated with external impact, from Table 4.2 of BS EN 1991-1-7, ignoring that fact that it is not applicable for impact internally and ignoring the inconvenient logic that if a vehicle can hit a barrier, it can also hit an unprotected internal column. The attraction of this thought process is that Table 4.2 of BS EN 1991-1-7 specifies a mere 75 kN for columns in "courtyards and parking garages", in contrast to the higher forces determined from Annex B of BS EN 1991-1-1.

Annex B of BS EN 1991-1-1 should be used to determine the impact forces on unprotected elements within a multi-storey car park, whatever their Consequence Class.

Impact force according to Annex B of BS EN 1991-1-1

The characteristic impact force F is given by:

$$F = 0.5mv^2 / (\delta_c + \delta_b)$$

where:

- m is the mass of the vehicle in kg, taken as 1500 kg for vehicles with a gross mass not exceeding 2500 kg
- v is the velocity of the vehicle in m/s, taken to be 4.5 m/s
- δ_c is the deformation of the vehicle, taken to be 100 mm
- δ_b is the deformation of the barrier (or in this case, the column)

Clearly δ_b is a function of the member stiffness and the applied load, so some iteration is needed to find the force F.

Considering a column supporting four storeys above, the ultimate axial load $N_{b,Ed}$ is approximately 3850 kN. This value is based on a column grid of 7.2 m × 15.6 m, a variable action of 2.5 kN/m² and a permanent action of 3.56 kN/m². If the storey height is 3.5 m, a 305 UC 118 in S355 would be appropriate, with $N_{R,Ed} \approx 4115$ kN.

As a first guess, the deformation δ_b has been taken as 5 mm.

Then $F = 0.5 \times 1500 \times 4.5^2 / (100 + 5) = 145$ kN

Annex B specifies that the load is applied at 375 mm above floor level, so the column has been analysed as shown in Figure 1, with the load applied 825 mm from the node – based on half a 600 mm deep beam and a 150 mm slab, plus 375 mm. The ends of the analysis member have been modelled as fixed, which is considered to be a reasonable assumption for continuous columns and the sudden application of the load.

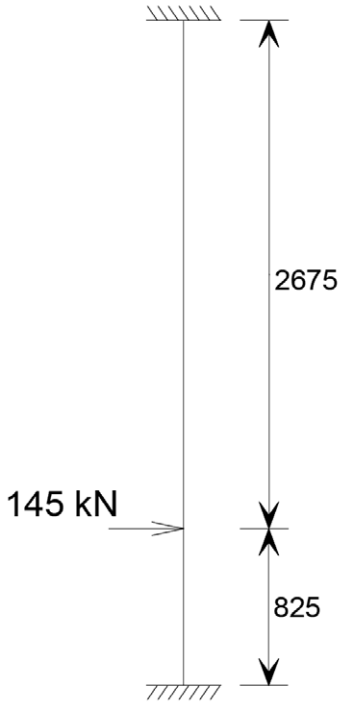


Figure 1: Analysis model

To make life easy, the member was modelled with a node at the point of load application, so the deflection could be extracted readily from the analysis results. Two cases must be considered – load applied to either axis.

In the major axis, under a load of 145 kN, the deflection at the point of load application is 0.21 mm.

The force F_{major} is revised to $0.5 \times 1500 \times 4.5^2 / (100 + 0.21) = 152$ kN.

Under this load, the deflection does not change significantly, so the characteristic force F is taken as 152 kN.

In the minor axis, under a load of 145 kN, the deflection at the point of load application is 0.64 mm

The force F_{minor} is revised to $0.5 \times 1500 \times 4.5^2 / (100 + 0.64) = 151$ kN.

Under this load, the deflection does not change significantly, so the characteristic force is taken as 151 kN

The bending moment due to this load is 73.2 kNm at the adjacent support (72.8 kNm in the minor axis)

Column verification

The impact on the column is an accidental situation (despite the frequency one sees damage in a car park) and therefore the column is verified under a combination of actions according to equation 6.11b of BS EN 1990.

The characteristic axial load from the permanent actions is 1600 kN, and from the variable actions is 1120 kN, leading to a total of 2720 kN.

From the UK NA to BS EN 1990, Table NA.A1.1 gives ψ_1 as 0.7

Thus the design combination axial load is $1600 + 0.7 \times 1120 = 2384$ kN

The accidental action is unfactored in equation 6.11b, so the design bending moment is 73.2 kNm in the major axis.

The column should be verified in combined bending and axial compression, using expressions 6.61 and 6.62 of BS EN 1993-1-1. This involves laborious determination of the interaction factors if proceeding with manual calculations, so to use a spreadsheet or other software would be a wise decision at this point.

Thankfully, there is a convenient software for combined axial compression and bending available on *steelconstruction.info*. Entering the input parameters, the results are shown in Figure 2 (over page) for the major axis.

The complication of calculating the C_1 factor was avoided by setting the moment at both ends to be 73.2 kNm. A uniform moment is the most onerous, so the approach is conservative. With both resulting utilization factors less than 1.0, the column is satisfactory.

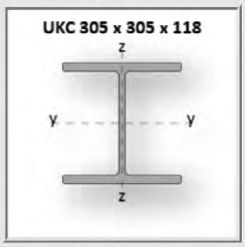
The results for the minor axis are shown in Figure 3 (over page).

Impact and steel sub-grade

When specifying a steel sub-grade, designers will refer to BS EN 1993-1-10 and the UK National Annex. Hopefully, they will use PD 6695-1-10 as a much easier approach if fatigue is a design consideration, and SCI publication P419 if fatigue is not a concern. However, these resources only allow for a modest strain rate ▸28

Output

Section	UKC 305 x 305 x 118
Buckling Length	3.5 m
Steel Grade	S355
Design Strength	345 N/mm^2
Axial Compression	2348 kN



Major axis moment varies linearly from 73.2 kNm to 73.2 kNm

Minor axis moment varies linearly from 0 kNm to 0 kNm

$M_{b,y,Rd}$	= 648 kNm	$C_{m,LT}$	= 1.00	$k_{y,y}$	= 1.060
$M_{c,z,Rd}$	= 309 kNm	$C_{m,y}$	= 1.00	$k_{z,y}$	= 0.956
$N_{b,y,Rd}$	= 4930 kN	$C_{m,z}$	= 0.60	$k_{y,z}$	= 0.475
$N_{b,z,Rd}$	= 4120 kN			$k_{z,z}$	= 0.792

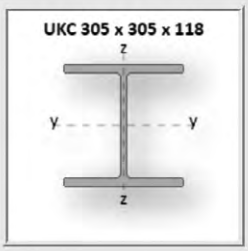
Expression 6.61 = 0.597

Expression 6.62 = 0.678

Figure 2: Column verification – major axis moment

Output

Section	UKC 305 x 305 x 118
Buckling Length	3.5 m
Steel Grade	S355
Design Strength	345 N/mm^2
Axial Compression	2348 kN



Major axis moment varies linearly from 0 kNm to 0 kNm

Minor axis moment varies linearly from 72.8 kNm to 72.8 kNm

$M_{b,y,Rd}$	= 675 kNm	$C_{m,LT}$	= 0.60	$k_{y,y}$	= 0.638
$M_{c,z,Rd}$	= 309 kNm	$C_{m,y}$	= 0.60	$k_{z,y}$	= 0.905
$N_{b,y,Rd}$	= 4930 kN	$C_{m,z}$	= 1.00	$k_{y,z}$	= 0.792
$N_{b,z,Rd}$	= 4120 kN			$k_{z,z}$	= 1.320

Expression 6.61 = 0.663

Expression 6.62 = 0.88

Figure 3: Column verification – minor axis moment

▸27

covering most transient and persistent design situations. In clause 2.3.1(2), BS EN 1993-1-10 notes that for other strain rates (e.g. impact loads), the tabulated values must be modified.

The first challenge is to determine the strain rate, so the equations of motion once learned in physics lessons finally have some use. The mass is known, and the force, so the acceleration can be determined from $F = m.a$

Knowing the acceleration, the initial and final velocities, the time can be determined from $v = u + a.t$

With some trivial rearrangement, $t = \frac{um}{F} = \frac{4.5 \times 1500}{152 \times 1000} = 0.044$ seconds.

The maximum stress due to the impact is when the force is applied in the minor axis.

The stress is $\frac{M}{W_{z,el}} = \frac{72.8 \times 10^6}{598 \times 10^3} = 123$ N/mm^2

The strain is therefore $\frac{123.6}{210000} = 5.89 \times 10^{-4}$

and the strain rate = $\frac{5.89 \times 10^{-4}}{0.044} = 0.0134$/sec

Due to this high strain rate, the reference temperature in Table 2.1 of BS EN 1993-1-10 must be reduced by $\Delta T_{\dot{\varepsilon}}$ given by:

$$\Delta T_{\dot{\varepsilon}} = -\frac{1440 - f_y(t)}{550} \times \left(\ln \frac{\dot{\varepsilon}}{\dot{\varepsilon}_0}\right)^{1.5} = -\frac{1440 - 345}{350} \times \left(\ln \frac{0.0134}{1 \times 10^{-4}}\right)^{1.5} = -21.6°$$

It should be noted that in the above expression, $\dot{\varepsilon}_0$ has been taken as 1×10^{-4}/sec. This is not at all clear in clause 2.3.1 of BS EN 1993-1-10 where the value of $\dot{\varepsilon}_0 = 4 \times 10^{-4}$/sec appears. Designers would be forgiven for using this latter value, but this is the value allowed for in the tabulated values, not the value to be used to calculate $\Delta T_{\dot{\varepsilon}}$. Although not given in the code, the use of $\dot{\varepsilon}_0 = 1 \times 10^{-4}$/sec is explained in Reference 1, and confirmed in the draft prEN 1993-1-10.

The steel sub-grade may now be determined. Because of the temperature shift, immediate use of the final tables in either PD 6695-1-10 or P419 is not possible. The following example demonstrates the application of the UK National Annex provisions, assuming fatigue is not a design consideration, and therefore using information from P419. The NA references are to the UK NA to BS EN 1993-1-10.

Firstly, NA.2.1.2.2 specifies that in the UK, the use of Table 2.1 in the Eurocode is limited – only the section for $\sigma_{Ed} = 0.75 f_y(t)$ may be used. P419 presents data for an extended range of reference temperatures in Table 4.1 for $\sigma_{Ed} = 0.75 f_y(t)$, which will be used in this example.

It is assumed that the steelwork is external, so the service temperature T_{md} is -15°C.

It is assumed that the steel is welded generally, with no particular onerous details. From NA.2.1.1.2, $\Delta T_{RD} = 0°C$

It is assumed that there are no stress concentrations, so from NA.2.1.1.3, $\Delta T_{Rg} = 0°C$

If the steel is JR sub-grade, the test temperature is room temperature, 20°C. According to table NA.3, the difference between the test temperature and the service temperature is 20 – (-15) = 35°C and the value of $\Delta T_{RT} = -30°C$

Under the previous calculated axial load of 2348 kN and the moment of 72.8 kNm, the cross section is all in compression, so according to Table NA.5, $\Delta T_{R\sigma} = 30°C$

Allowing for the adjustment $\Delta T_{\dot{\varepsilon}} = -21.6°C$, the reference temperature becomes:

$T_{Ed} = -15 - 21.6 - 30 + 30 = -36.6°C$

An extract of Table 4.1 from P419 is shown in Figure 4.

Steel Grade	Sub-Grade	Charpy energy CVN at T (°C)	Charpy energy CVN J_{min}	Reference temperature T_{Ed} (°C) $\sigma_{Ed} = 0.75 f_y(t)$ 70	60	50	40	30	20	10	0	−10	−20	−30	−40	−50
S355	JR	20	27	200	200	200	200	200	200	200	177	114	77	54	40	30
	J0	0	27	200	200	200	200	200	200	200	200	200	177	114	77	54
	J2	−20	27	200	200	200	200	200	200	200	200	200	200	200	177	114

Figure 4: Extract from Table 4.1, P419

From Figure 4, the limiting thickness even at -40°C is 40 mm, compared to the actual flange thickness of 18.7 mm, so JR is satisfactory.

A design case could be considered where the vehicle strikes the column in an otherwise empty car park. The axial load is then reduced to 1600 kN. Under this load, the compression is 106 N/mm², so there is a net tension of 17.6 N/mm² on the extreme fibres.

Therefore, 17.6/345=0.05 and from Table NA.5, $\Delta T_{\dot{\varepsilon}} = 20°C$.

$T_{Ed} = -15 - 21.6 - 30 + 20 = -46.6°C$

At -50°C, the limiting thickness is 30 mm, still more than the flange of 18.7 mm and JR remains satisfactory. ■

1 Sedlacek, G, et al
Commentary and worked examples to EN 1993-1-10 "material toughness and through thickness properties" and other toughness oriented rules in EN 1993
Joint Research Centre, 2008

AD 461:
Anchorage of bars in the troughs of composite slabs

Introduction

Traditional practice in the UK uses continuity over the supports, combined with a small contribution from the decking in the span, to provide composite slab hogging and sagging moment resistances that are sufficient to support the loads in a fire situation. Fire tests have validated such an approach. The hogging resistance is significant under fire conditions because the reinforcement (normally in the form of fabric mesh) in the upper part of the slab remains relatively cool and has a reasonable lever arm. The contribution of the decking is small because, acting as external reinforcement, it is directly exposed to the fire and so loses much of its strength. An apparent idiosyncrasy of this approach is that end continuity is normally ignored for ambient temperature design (although it is relatively much less significant in that condition).

When there is no physical continuity at the slab ends the sagging resistance alone will not be sufficient to resist loads in a fire unless bars are placed in the troughs to act as the lower layer of reinforcement, and ensure adequate sagging resistance. Because they are insulated through the provision of concrete cover they remain relatively cool and thus retain significant, if not full, strength. The provision of bars in the troughs is common practice across Europe for all composite slabs, a situation that is reflected in EN 1994-1-1 Annex D (an Informative Annex that is not adopted according to the UK National Annex).

Anchorage of reinforcing bars

Any reinforcing bar requires anchoring before it can resist a tensile force. Anchorage is typically, and most easily, achieved by having sufficient length of bar surrounded by concrete. Eurocode 2 gives rules for anchorage lengths. To ensure the most up-to-date information, although it is not yet publicly available the table below is taken from the latest draft of the 'new' prEN 1992-1-1. It is worth noting that anchorage lengths may be reduced when bars are subject to a lower level of stress.

	Anchorage length l_{bd} / Ø							
Ø [mm]	f_{ck} [MPa]							
	20	25	30	35	40	45	50	60
≤ 12	47	42	38	36	33	31	30	27
14	50	44	41	38	35	33	31	29
16	52	46	42	39	37	35	33	30
20	56	50	46	42	40	37	35	32
25	60	54	49	46	43	40	38	35
28	63	56	51	47	44	42	40	36
32	65	58	53	49	46	44	41	38

NOTE: the values of l_{bd} / Ø are valid for a rebar cover greater than $c_d \geq 1.5$ Ø and for rebars with a design strength of σ_{sd} = 435 Mpa in good bond conditions. For bars in poor bond conditions the values should be multiplied by 1.20. For the cases where σ_{sd} < 435 Mpa the values may be multiplied by (σ_{sd} / 435), but l_{bd} / Ø ≥ 10.

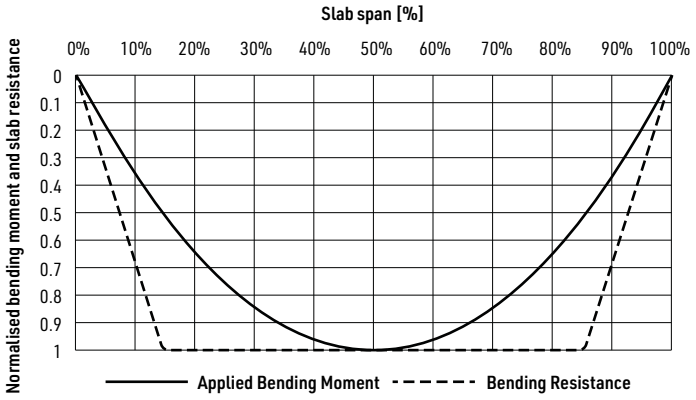
The 'new' prEN 1992-1-2 says that the values given above are also applicable to fire conditions, and when there is no shear reinforcement (as is the case with a composite slab) anchorage lengths should be determined assuming poor bond condition, i.e. increased by 20% as per the note in the table above. However, we propose that this increase need not be applied in the case of composite slabs as it reflects the tendency of concrete to spall when an RC slab is exposed to fire, and the presence of decking prevents such spalling.

Example

For a situation with a 12 mm bar (which is at the upper end of the typical range) in concrete with a characteristic strength of 35 N/mm² (also at the upper end of typical), using information from the table below left the anchorage length needed to achieve yielding of the bar is 12 × 36 = 432 mm. For a 3 m span slab the full strength of the bar could therefore be relied upon anywhere in the middle 70% of the span. For the 15% at either end the sagging resistance will build up linearly from zero at the support. This development of resistance (giving a tri-linear envelope) can be compared to the development of applied moment to see whether the bar anchorage will be adequate. For uniformly distributed loading the applied moment envelope is of course parabolic. The table below shows applied moment and moment resistance at certain distances from the support. The table shows that at only 5% of the way 'into' the span, say 150 mm, the bars would already have sufficient anchorage to generate over one-third of their resistance as ambient temperature, which is more than adequate to resist the applied moment. Values of applied moment and moment resistance are also plotted in the figure below, as a function of span.

Distance into span (%)	Applied moment[1]	Moment resistance[2]
5	0.19	0.35
10	0.36	0.69
20	0.64	1.00

1. expressed as a proportion of the mid-span applied moment
2. expressed as a proportion of the mid-span moment resistance



Conclusion

For situations with uniform loading, or predominantly uniform loading, it can be concluded that straight bars with no extra provision for anchorage will be adequate. As with all composite elements, when the loading is heavily non-uniform, specific checks should be carried out using the principles given above. Resistance could be increased by using larger bars and/or increasing anchorage for example by forming the bar ends into hooks (if space allows).

Contact: SCI Advisory
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Email: advisory@steel-sci.com

View showing beginning of ramp section of floor slab and finished panels and framing

Steel work before final painting. The light vertical members are for panel fixings

This shows clearly how the floors are sloped thus avoiding separate ramps above the first level. Also can be seen the protective concrete bollards around the columns, the double beams and guard rails

Since the regulations affecting car parks have been revised, it has been possible to build them from unprotected steel. This effects a considerable saving in the price of the structure. The architect Maxwell New describes a recently completed car park at Croydon in which the very low cost of only £311 per car space was achieved.

This car park was designed for the owners, Goodliffe Garages, mainly to enable them to store cars for sale or repair. In this respect it differs from public car parks in the marking out and the space allocations, but in all other respects it is built to the same performance specifications. The design was begun soon after the new waiver procedure permitting exposed steel framework had been instituted for multi-storey car parks as Group 8 buildings in Regulation E2, Storage and General Buildings. Because there was a degree of unfamiliarity with the waivers in the early days, some difficulties were experienced which caused a considerable delay. At one time, the Ministry of Housing and Local Government and the Home Office were in opposition and it began to look as though a total impasse had been reached. Eventually, however, all design problems were resolved and work went ahead on this structure of unprotected steelwork. Even though costs were rising during the period of delay, the final figure of a little over £311 per car space for 355 cars is still much lower than that achieved in comparable structures in alternative materials.

Work began in July 1970 and the mandrill bored piling and oversite excavations were completed by the end of August. The steelwork and precast concrete floor slabs were erected in the next few weeks, so that it was possible to drive the full height of the car park by early December. Bad weather over the Christmas period caused some delay through difficulties with the screed and brickwork. The structure was handed over for parking by the end of January, since when the final finishes and the lift have been added. As can be seen, it was possible to store cars within five months of starting date and this may be considered very favourable compared with other methods of construction.

The structure, which makes use of the 'sloping slab' principal with the resultant saving in space, is of simple post and lintel type and

Detail of typical beam/column connection

close attention to detail has resulted in a good clean appearance, free from unsightly joints and mechanical fixings. The design approach was influenced by the need for speed of erection and the steelwork and concrete floors were in fact erected in six weeks. The cantilevers at the ends of the main frames were made by connecting universal beams in pairs to the flanges of the stanchions so that all members were continuous past the joint. This detail gave the following advantages:

(a) there was no need to provide large moment connections at the stanchions.
(b) the floor-to-floor heights were less than if single beams were used.
(c) compliance with the requirements of the 5th amendment to the Building Regulations was simply achieved.
(d) floor channels and down pipes for dealing with rain water were easily accommodated.

The wind shears were resisted at first deck level by brick walls and bracing panels, and the stanchions were designed, in all cases, as being pinned at their bases.

The steelwork has been painted with black bitumen while brickwork is fair faced externally and emulsion painted internally. The concrete is in natural finish except where a higher finish is required when cement paint has been used. Heavy steel channels have been used as bumper rails and there is a light timber handrail above. Overrunning of cars is prevented by a concrete kerb, while the handrail around the ramp core is of 1 in square steel hollow section. The steel columns are surrounded by concrete to a height of 2ft in order to minimize the damage to a car should it hit one of them. In order to obtain a waiver, car parks have to be largely open sided, amongst other requirements. At Croydon, this has been achieved by attaching fire-retardant fibre-glass panels to vertical steel frames running the full height of the car park.

The risk of a fire starting in an unattended car is very slight, but the building details have been designed to minimize the effects should one occur. Fire extinguishers have been positioned so as to be readily available in the event of fire breaking out when a car engine is started.

The car park was built under quite difficult conditions, as it is located in the centre of a busy motor-repair depot where parking space was severely limited. Apart from the great economy achieved through the use of exposed steel, the speed of erection it made possible was also an important factor leading to its selection. But even then, close co-operation at an early stage was necessary between the architect, the contractor and the client, and it was fortunate that this was given readily and willingly.

Architects
Maxwell New & Haile Associates
Engineers
G. C. Manders & Partners
Steelwork
Modern Engineering
Main Contractor
William Cowlin & Son
Client
Goodliffe Garages (Croydon) Ltd
(a company in the *Office Cleaning Services* group)

New and revised codes and standards

From BSI Updates April 2021

BS EN PUBLICATIONS

BS EN ISO 11127-1:2021
Preparation of steel substrates before application of paints and related products. Test methods for non-metallic blast-cleaning abrasives. Sampling
supersedes BS EN ISO 11127-1:2011

BS EN ISO 11127-2:2021
Preparation of steel substrates before application of paints and related products – Test methods for non-metallic blast-cleaning abrasives. Determination of particle size distribution
supersedes BS EN ISO 11127-2:2011

BS EN ISO 11127-3:2021
Preparation of steel substrates before application of paints and related products. Test methods for non-metallic blast-cleaning abrasives. Determination of apparent density
supersedes BS EN ISO 11127-3:2011

BS EN ISO 11127-5:2021
Preparation of steel substrates before application of paints and related products. Test methods for non-metallic blast-cleaning abrasives. Determination of moisture
supersedes BS EN ISO 11127-5:2011

CORRIGENDA TO BRITISH STANDARDS

BS EN ISO 10225:2021
Gas welding equipment. Marking for equipment used for gas welding, cutting and allied processes
Corrigendum, March 2021

BS EN ISO 22826:2021
Destructive tests on welds in metallic materials. Hardness testing of narrow joints welded by laser and electron beam (Vickers and Knoop hardness tests)
Corrigendum, March 2021

UPDATED BRITISH STANDARDS

BS EN 1993-1-4:2006+A2:2020
Eurocode 3. Design of steel structures. General rules. Supplementary rules for stainless steels
Amendment, February 2021;
Amendment, December 2015

BRITISH STANDARDS REVIEWED AND CONFIRMED

BS EN ISO 14171:2016
Welding consumables. Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non-alloy and fine grain steels. Classification

BS EN ISO 15792-3:2011
Welding consumables. Test methods. Classification testing of positional capacity and root penetration of welding consumables in a fillet weld

NEW WORK STARTED

EN ISO 11127-7
Preparation of steel substrates before application of paints and related products. Test methods for non-metallic blast-cleaning abrasives. Determination of water-soluble chlorides
will supersede BS EN ISO 11127-7:2011

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – ADOPTIONS

21/30404447 DC
BS EN ISO 10675-1 Non-destructive testing of welds. Acceptance levels for radiographic testing. Steel, nickel, titanium and their alloys
Comments for the above document were required by 6 April, 2021

21/30426853 DC
BS EN ISO 5173 Destructive tests on welds in metallic materials. Bend tests
Comments for the above document were required by 11 April, 2021

Steelwork contractors for buildings

Membership of BCSA is open to any Steelwork Contractor who has a fabrication facility within the United Kingdom or Republic of Ireland. Details of BCSA membership and services can be obtained from
Lorraine MacKinder, Marketing and Membership Administrator,
The British Constructional Steelwork Association Limited, Unit 4 Hayfield Business Park, Field Lane, Auckley, Doncaster DN9 3FL
Tel: 020 7747 8121 Email: *lorraine.mackinder@steelconstruction.org*

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

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

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

BIM BIM Level 2 assessed

QM Quality management certification to ISO 9001

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

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3		●	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*
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
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2	✔	●	Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●			●	✔	4		●	Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £1,400,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		4			Up to £3,000,000
Bourne Group Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●		●	●	●	✔	4			Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●						●	✔	4		●	Up to £6,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●		●	●	●	●	●		●	●	●	✔	3		●	Up to £6,000,000
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 £400,000
Duggan Steel	00 353 29 70072	●	●	●	●	●	●	●	●		●				●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	4		●	Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	●	Up to £6,000,000
EvadX Ltd	01745 336413		●	●	●	●	●	●		●	●	●			●	✔	3		●	Up to £4,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●		●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●			●		●	●	●	●	●		●	●	●	✔	3		●	Up to £2,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●		●	●				●		2			Up to £2,000,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	2			Up to £1,400,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
G.R. Carr (Essex) Ltd	01286 535501	●		●	●			●			●			●	●	✔	4			Up to £800,000
H Young Structures Ltd	01953 601881			●	●	●	●	●						●	●	✔	4	✔	🟢	Up to £3,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Harry Peers Steelwork Ltd	01204 528393	●		●	●	●	●	●	●		●					✔	4			Above £6,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Hillcrest Structural Steel Ltd	023 8064 1373			●	●	●	●	●		●	●			●	●	✔	3		🟣	Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●	●	●			●	●	●	✔	3			Up to £3,000,000
J & A Plant Ltd	01942 713511				●	●									●		4			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●		●			4			Up to £6,000,000*
Kiernan Structural Steel Ltd	00 353 43 334 1445	●		●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	🟣	Above £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4		🟣	Up to £6,000,000
LA Metalworks Ltd	01707 256290				●	●				●	●			●	●	✔	2			Up to £2,000,000
Leach Structural Steelwork Ltd	01995 642000			●	●	●	●	●			●					✔	2		🟣	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
Littleton Steel Ltd	01275 333431				●					●	●			●	●	✔	3			Up to £1,400,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●			●	●	✔	4		🟢	Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £2,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £1,400,000
Maldon Marine Ltd	01621 859000				●	●			●	●	●				●	✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						3			Up to £3,000,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £1,400,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●			●	●				✔	4		🟣	Up to £2,000,000
North Lincs Structures	01724 855512			●	●					●	●				●		2			Up to £800,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		🟤	Up to £6,000,000
Painter Brothers Ltd	01432 374400	●			●				●	●	●				●	✔	3			Up to £6,000,000*
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £1,400,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
REIDsteel	01202 483333			●	●	●	●	●	●	●	●	●	●		●	✔	4		🟤	Up to £6,000,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●				●	✔	3			Up to £2,000,000
S H Structures Ltd	01977 681931	●		●	●	●	●	●	●	●	●	●	●		●	✔	4	✔	🟤	Up to £3,000,000
SAH Luton Ltd	01582 805741			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	🟤	Above £6,000,000
SGC Steel Fabrication	01704 531286				●					●				●	●	✔	2			Up to £200,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●		●			●				●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £2,000,000
South Durham Structures Ltd	01388 777350			●	●	●				●					●		2			Up to £800,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £1,400,000
Steel & Roofing Systems	00 353 56 444 1855	●		●	●	●	●				●	●		●	●	✔	4			Up to £4,000,000
Taunton Fabrications Ltd	01823 324266				●					●	●				●	✔	2		🟣	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 £6,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	🟤	Above £6,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**FPC**	**BIM**	**SCM**	Guide Contract Value (1)

Steelwork contractors for bridgeworks

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

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

FB Footbridges
CF Complex footbridges
SG Sign gantries
PG Bridges made principally from plate girders
TW Bridges made principally from trusswork
BA Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
CM Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
MB Moving bridges
SRF Site-based bridge refurbishment
FRF Factory-based bridge refurbishment
AS Ancilliary structures in steel associated with bridges, footbridges or sign gantries (eg grillages, purpose-made temporary works)
QM Quality management certification to ISO 9001
FPC Factory Production Control certification to BS EN 1090-1
1 – Execution Class 1 2 – Execution Class 2
3 – Execution Class 3 4 – Execution Class 4
BIM BIM Level 2 compliant
SCM Steel Construction Sustainability Charter
(● = Gold, ● = Silver, ● = 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 £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
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	●	✓	4			✓		Up to £400,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	●	✓	3			✓	●	Up to £1,400,000
ECS Engineering Services Ltd	01773 860001	●			●	●	●		●			●	✓	4				●	Up to £3,000,000
Four-Tees Engineers Ltd	01489 885899	●		●	●	●	●		●	●	●	●	✓	3			✓	●	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●			●	●				●	●	●	✓	4	✓		✓	●	Above £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓	●	Up to £1,400,000
Millar Callaghan Engineering Services Ltd	01294 217711	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●	●	●	●	●	●					●	✓	4			✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £6,000,000
REIDsteel	01202 483333	●				●	●	●				●	✓	4				●	Up to £6,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	●	Up to £3,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499											●	✓	3					Up to £800,000
Taziker Industrial Ltd	01204 468080	●		●	●	●	●	●	●		●	●	✓	3		✓	✓		Above £6,000,000
Underhill Engineering Ltd	01752 752483	●	●	●	●	●				●	●	●	✓	4	✓		✓		Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●		●	✓	4	✓	✓	✓	●	Above £6,000,000
Non-BCSA member																			
Allerton Steel Ltd	01609 774471	●		●	●	●	●	●			●	●	✓	4	✓		✓	●	Up to £3,000,000
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
Eiffage Metal	00 33 388 946 856	●	●		●		●	●	●			●	✓	4					Above £6,000,000
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 £200,000
In-Spec Manufacturing Ltd	01642 210716									●	●	●	✓	4			✓		Up to £800,000
Kelly's Welders & Blacksmiths Ltd	01383 512 517											●	✓	2			✓		Up to £200,000
Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £3,000,000
Lundy Projects Ltd	0161 476 2996	●		●	●	●	●			●	●	●		4			✓		Up to £4,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●				●	●	●	✓	3			✓		Up to £3,000,000
Universal Sealants UK Ltd	0114 261 1126	●				●			●	●	●	●	✓	2					Up to £400,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000

Corporate Members

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

Company name	Tel
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	0300 123 5000
Inspire Insurance Services	02476 998924

Company name	Tel
Keiths Welding Limited	07791 432 078
Paul Hulme Engineering Ltd	07801 216858
QHSE-Interspect Ltd	07438 413849
Sandberg LLP	020 7565 7000

Company name	Tel
Structural & Weld Testing Services Ltd	01795 420264
SUM Ltd	0113 242 7380

Industry Members

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

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

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

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

SfL
Steel for Life Sponsor

Structural components

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

Computer software

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

Steel producers

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

Manufacturing equipment

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

Membership services

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

Protective systems

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

Safety systems

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

Steel stockholders

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

Structural fasteners

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

Welding equipment and consumables

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

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