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NSC

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Cover Image
The Post Building, London
Main client: Brockton Capital and Oxford Properties
Architect: Allford Hall Monahagn Morris
Main contractor: Laing O'Rourke
Structural engineer: Arup
Steelwork contractor: BHC
Steel tonnage: 1,800t

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Survey casts vote for steel

Nick Barrett - Editor

The latest market research on the UK market for structural frames by independent researchers Construction Markets shows a healthy and continued market preference for using steel, as it has for each of the past 37 years (see News). This is clear recognition that steel is the best material to meet the needs of clients and to achieve the architect's and engineer's designs.

It is also of course a vote of confidence in steelwork contractors – mostly BCSA members - who consistently justify their international reputation for producing world-leading, often complex structures that allow the vision of architects and engineers to be fully realised and expressed. When this ability is allied to consistently providing the most economical framing solutions steel's dominance looks unshakeable; and that is before all its circular economy and sustainability benefits are factored in.

The 2017 survey shows steel dominating the multi-storey non-domestic market, which accounts for some 20% of the total frames market, with a share of over 66%, a touch above the previous year. No alternative material even managed as much as a third of this.

Steel's dominance in the single storey non-domestic market is even more marked, some 98% in the key market for sheds.

The survey showed growth in the overall market for structural frames of 4% compared to 2016, at over 43,000,000 m^2 of floor area, with 43% of this overall market captured by steel. The survey shows a mixture of ups and downs in the size of the various sub sectors; steel's market share was up in multi-storey health, education and leisure for example, and in single storey non-domestic buildings for the offices, retail, leisure and health sectors.

The latest 'crane survey' from Deloittes can also be read about in our News section this month, showing healthy growth in demand for commercial, and residential schemes in cities outside London, all markets served well by steel.

Steel is typically selected for major landmark schemes in urban areas like London, both the City and West End, and it is encouraging to report in News that steel is to be used to frame what will be Coventry's tallest residential building, a major student accommodation project comprising four interlinked towers of up to 22 storeys.

Evidence that the City aims to remain an international financial services leader can be seen in News where we report on start of work on a landmark 50-storey tower at Bishopsgate/Leadenhall Street. The distinctive design, with its array of 'stacked blocks', has been designed in steel.

News like this supports the survey's findings, confirms robust demand for structural steelwork, and reinforces confidence among clients and designers that they are making the right choice when they select steel solutions.

Steel maintains its dominance in key markets

Structural steelwork maintained its leading position in key sectors of the UK's structural frames market according to the 2017 Market Share survey by independent researchers Construction Markets.

The survey is the latest in a series that has been carried out annually since 1980. Based on interviews with 750 construction specifiers, the survey is the biggest of its kind in the UK.

The total market for structural frames in the UK last year was estimated to be just over 43 million square metres of floor area, up 4% on 2016. Once again, steel took the largest share with 43%, ahead of load bearing masonry at 37.6%, timber at 12.6% and concrete at 6.7%.

Overall, the single storey industrial buildings market contracted by 2.6% against 2016, but continued to be dominated by steel with the material accounting for 92.3% of the total market. In the key 'sheds' sector steel increased its market share by 0.1% to 97.9%.

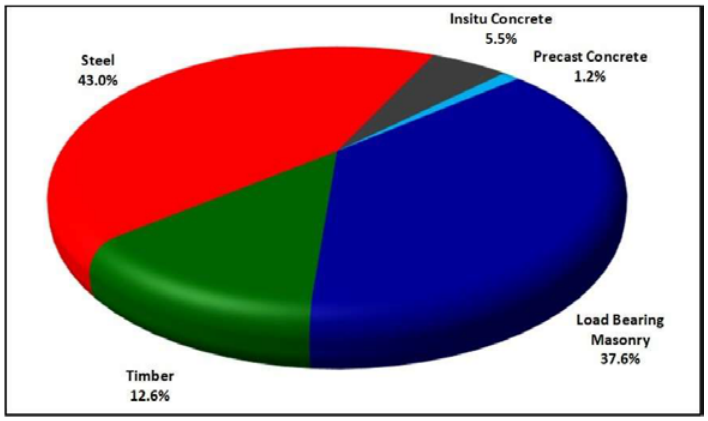
Steel also dominated the multi-storey non-domestic buildings sector, which accounts for 21% of the total market, with a share of 66.2%, up slightly from 66.1% in 2016. Within this sector steel recorded market share increases for health, education, and leisure buildings.

The total market for multi-storey leisure buildings grew significantly, up 21.7% over 2016, and steel increased its market share by 2.1% to 62.6%.

Steel also grew its market share in conventional single storey non-domestic buildings from 63.3% in 2016 to 63.5% overall, with increases in the offices, retail, leisure and health sectors.

BCSA Director General Sarah McCann Bartlett said: "The survey demonstrates that steel is the preferred framing choice across a broad range of both building types and sectors.

"The cost-effectiveness of steel, its flexibility, speed of construction and contribution to sustainability are all attributes valued by developers, contractors, designers and building users alike, so we are confident that future market share surveys will continue to show the dominance of steel frames."



The total 2017 market for structural frames

Steel to frame Coventry's tallest building

Working on behalf of main contractor Winvic Construction, Caunton Engineering has been awarded the steelwork contract for a major new student accommodation scheme in Coventry.

Said to include the tallest habitable building in the city, the scheme will comprise four steel-framed interlinked towers, ranging from six-storeys high to 22-storeys high.

The 22-storey block will be 76.2m-tall, just shy of the city's famous cathedral spire which is 90m high.

The towers will be able to house students in 1,192 self-contained bedrooms, which will feature secure CCTV and a fob entrance system, fully equipped kitchens including fridge/freezer, microwave and integrated oven and hob and deluxe designer shower rooms.

In addition to the student accommodation, there will be retail space on the ground and first floors.

Caunton is both designing and supplying 1,800t of steelwork for this major development.

Winvic Construction has been appointed by Jamie Lewis (Code) to build the scheme which is located on the corner of Fairfax Street and Cox Street in Coventry city centre.

UK steelwork contractor delivers Belize sports complex

Dorset-based REIDsteel has designed and fabricated the soon-to-open Belize Civic Center Sports Complex, said to be one of the largest public construction projects in the Central American country's history.

REIDsteel carried out the structural design, drawing and fabrication in Christchurch, Dorset, before containerising the finished steelwork for shipping to its destination.

The structural steel frame included hot rolled sections that were hot-dip galvanized for protection from the elements and for ease of maintenance, all designed for hurricane wind speeds of 160 miles per hour.

A total of 750t of steelwork was required for the 3,600m^2 complex, including a roofing system spanning 60m, together with terracing for approximately 4,500 seats.

The package also included all the suspended floors consisting of a galvanized composite metal decking system suitable for cast-in-situ concrete.

The glazing package, including curtain walling and aluminium-framed windows, was also packed for export and shipped to Belize.

The air-conditioned arena is suitable for both sports and entertainment events and includes international standard basketball and volleyball courts, practice courts, offices, media boxes and changing rooms. Outside there is parking and a deck area for boats to dock.

REIDsteel Project Engineer Pepe Oliva said: "There has been tremendous interest in Belize about the new national civic centre.

"Although we have designed, made and supplied many buildings in this part of the world, it is still incredibly rewarding to deliver a project of this magnitude on time and on budget to the client's satisfaction."

He added: "Like most of our buildings in Central America and the Caribbean, the Belize Civic Center has been designed to withstand hurricanes and other natural disasters.

"We hope it will serve the people of Belize, and be a source of civic pride, for many years to come."

Regional cities lead construction boom

According to the latest regional Deloitte Crane Surveys, cities such as Manchester and Birmingham are witnessing a construction boom with residential and commercial schemes accounting for the majority of project starts.

Deloitte's Manchester Survey shows significant growth for a second year in the city with 20 major residential projects and six major office schemes starting in 2017.

Sustained strong growth means Manchester is enjoying a 60% jump in residential and a 75% hike in office projects now under construction.

Deloitte also reported strong growth in Birmingham and Leeds where developers' confidence for city centre residential development remains strong.

Several significant Manchester schemes are likely to commence in 2018 including major residential developments as part of the St. John's master plan, residential blocks at Circle Square, further activity

No 1 Spinningfields is one of the prestigious commercial developments to have completed in Manchester last year

from Manchester Life Development Company in Ancoats and New Islington, and work on Angel Meadow which forms part of the Northern Gateway project.

Birmingham saw 24 major construction starts last year. This was again driven by the boom in city residential developments, up nearly a third to 13 schemes delivering 2,500 new units in 2018 alone.

In Leeds, residential construction across the city centre hit its highest level in a decade – 1,586 units across five development sites.

Leeds continues to deliver good volumes of new office space with three new construction starts in 2017, including another steel-framed office block at the Wellington Place development.

Expansion complete at Billington's processing facility

Following on from Billington Holdings acquisition of the Shafton Steel site in 2015, the facility has undergone a major expansion with the installation of new FICEP Endeavour and Gemini machines, as well as a new welding line.

Shafton's Sales Manager Mike Bawden says the ongoing plan is to further develop the site into one of the UK's premier steel processing companies.

"Our aim is to offer a fully comprehensive steel cutting and processing service from our site near Barnsley.

"The new FICEP Endeavour provides additional processing options from those previously offered. Capable of cutting, drilling, tapping, countersinking, milling, notching and scribe marking in structural sections up to 1,100mm-deep."

The machine is said to have a sophisticated combination of probing, clamping and laser devices that allows precise measuring of beam length and width, as well as flanges and web height.

The Endeavour operates on three direct drive independent drilling heads with maximum power on each spindle. The three high-tech spindles can operate simultaneously on both flanges and the web.

Capable of processing parent plates up to 12,000mm × 3,100mm, the FICEP Gemini machine has allowed the company to offer large area, fully processed components.

The Gemini has both oxy/gas cutting up to 80mm thick and hi-def plasma cutting up to 40mm to give complete flexibility in processing plates.

Steel up for North Wales water park

Working on behalf of main contractor ISG, EvadX has completed the steel erection for the Rhyl water park.

Housed within a double wedged-shaped structure, topped with a wave-like roof, the contract will deliver a 1,200m² leisure pool with flumes, slides and water play features, an adventure area containing a multi-level adventure area, a changing village and a café and bar area.

One large steel frame houses the entire facility with a line of columns and a partition wall running down the middle, separating the wet zone (aquatics area) from the dry area.

Each of these zones is housed within a large column-free hall topped with a wave-like roof, with each one sloping in the opposite direction to the other.

As well as being a nod to the water park's location, the wave-like roofs and, in particular, the wedge-shapes have been chosen for their efficiency.

According to the project architect, Space & Place, the two wedge shapes provide optimum volumetric arrangements offering better views through to the seafront, reducing the overall visual mass of the building and creating a more interesting architectural form.

Alliance Leisure Senior Business Development Manager Julia Goddard said: "The development in Rhyl will completely transform the town's leisure provision, creating a stand-out attraction which will draw an estimated 35,000 extra visitors to the area each year.

"Creating sustainable leisure facilities which inspire community engagement is always our ambition and this latest development project will certainly achieve this."

NEWS IN BRIEF

Severfield has announced that Chief Executive Ian Lawson is leaving the firm after standing down due to illness last year. Alan Dunsmore becomes Chief Executive Officer and Adam Semple Finance Director, both on a permanent basis, having held those roles on an interim basis since last March, while Ian Cochrane remains Chief Operating Officer.

BHC has been appointed by Laing O'Rourke as the structural steelwork contractor for its extensive redevelopment of the Edinburgh St James Centre. The company will be responsible for the supply, fabrication and erection of approximately 15,000t of structural steelwork over a period of two years.

Kloeckner Metals UK/Westok has upgraded its cellular beam design software package. Cellbeam version 10.3.1 is said to include enhanced calculation of the critical in-plane buckling load N_{cr}, a refined composite design to NEN-EN 1993/1994 as well as improved graphics and user interface.

The **Royal College of Art**'s (RCA) Battersea campus has been given the go-ahead for its Herzog & de Meuron designed £108M extension. The 15,800m² building for postgraduate students and 'entrepreneurs' at the RCA's Battersea South campus will replace the institution's sculpture building and moving-image studio at the corner of Howie Street and Elcho Street.

Developer **St Modwen** has announced that it will be increasing its commercial construction programme over the coming months as its focuses on work outside of London. The firm has published its annual results for the year ending November 2017, the highlight of which is a trading profit of £64M, up from £56M for the previous year.

Developer **Landsec** has secured a resolution to grant a revised planning permission for its proposed 52,300m² steel-framed development at 21 Moorfields, in the City of London. Last year, Landsec and Deutsche Bank exchanged a pre-let agreement for the bank's new London headquarters on a 25-year lease, conditional on achieving revised planning consent.

PRESIDENT'S COLUMN

I'm hearing a lot in the press about new methods of construction, with terms like 'offsite construction' and 'design for manufacture' coming up more and more.

However, many people forget that steel framing is the original offsite framing material and is already delivering a huge range of advantages to clients.

Fabrication of individual steel pieces takes place offsite under controlled, highly regulated and safe factory conditions where the use of digital design and leading-edge fabrication systems deliver precision-engineered components with minimum waste.

Steel components are further pre-assembled or fabricated into modules either offsite or at the site at a low level. Structures are often prototyped or trial built offsite to ensure a perfect fit when the fabricated steel modules undergo final assembly on-site.

Already many steel structures have the M&E incorporated offsite – some examples include motorway gantries with the lighting and digital signage already fitted, transfer bridges for large manufacturing plants, and even the risers in high-rise buildings. This means that the majority of the value add for structural steel occurs offsite – in some cases up to 90%.

The benefits delivered by an offsite steel programme are those that the government is now looking to extend through the rest of the construction sector.

A faster on-site construction programme means government construction targets can be met more easily, the programme will be less affected by adverse weather, and a shorter on-site programme is more cost-effective.

Fewer people are required on-site which helps to mitigate issues around skills shortages, and improves on-site safety. The need to work at height is reduced due to the majority of the work taking place offsite, also providing a skills and safety benefit.

Offsite steel manufacturing occurs in a controlled environment with factory production control and the adoption of automation ensuring consistency and reliable quality, and creating scalability.

Digital design for manufacture and assembly, including full Level 2 BIM, has created new skills in the sector. And the stable long-term nature of jobs in a steel fabrication factory assists in the training of a specialist workforce.

So what's next? The structural steelwork sector is not standing still and continues to invest in modern automated plant and equipment. With the sector having adopted Level 2 BIM and able to undertake digital design for manufacturing, it is now looking at implementing digitisation throughout the complete supply chain.

But for the sector to continue to move forward, clients and main contractors need to adopt new procurement models to drive earlier supply chain engagement. This will create further efficiencies for offsite manufacture, in particular, opportunities for further offsite integration between sub-trades.

Tim Outteridge
BCSA President & Sales Director Cleveland Bridge

SCCS now certifying to ISO 3834

The Steel Construction Certification Scheme (SCCS) can now offer certification to BS EN ISO 3834:2005 – Quality management in the field of welding.

"This is a significant addition to the service that SCCS offers its clients and further develops our strategic objective of offering a one-stop shop for certification," said SCCS Certification Scheme Manager Stephen Blackman.

The SCCS is a wholly-owned subsidiary of the British Constructional Steelwork Association. It was established in the early 1980s to provide quality management certification for steelwork contracting organisations.

SCCS now offers a wide range of certification and monitoring services for the structural steelwork sector, including integrated or separate UKAS accredited Quality management systems, Environmental and Health & Safety management systems, Factory Production Control systems and selected National Highways Sector Schemes.

For more information about SCCS go to *www.steelcertification.co.uk*

Boxpark gets Wembley pitch approval

Plans for London's largest Boxpark in Wembley have been approved by the London Borough of Brent.

Similar to its steel-framed predecessor in Croydon, Boxpark Wembley will feature a selection of independent and established food traders from across London and around the world, as well as a major 2,000 capacity arena space for large scale events, and a BoxBar, stocked with a top selection of craft beers, fine wines and spirits, for more intimate events.

Boxpark's Creator and CEO Roger Wade said: "I'm delighted to announce the opening of the third Boxpark site. Boxpark Wembley is located in an iconic location, on Olympic Way in Wembley Park. We look forward to working closely with Quintain, Brent Council and the other venue operators on the site, to develop a world-class food, drink and entertainment destination, and possibly the best fan park in the world!"

Quintain Chief Executive Angus Dodd said: "We are working hard to ensure that Wembley Park is an exciting place to rent and live in London and this brand-new space is another way in which we are demonstrating that.

"Boxpark Wembley will open up Wembley Park to a whole new audience and we are looking forward to welcoming them, along with those that live and work here already, as we work closely with Boxpark to deliver this new exciting venue for London."

Boxpark Wembley will be created by BDP, the team behind the award-winning design of Boxpark Croydon. BDP's Chairman, Gavin Elliott, is keen to get started on the new project:

"Following on from the award-winning success of Boxpark Croydon, it's great to 'get the band back together', to design another Boxpark with Roger and his team."

Boxpark Wembley is scheduled to open its doors towards the end of 2018.

Charity auction raises funds for Manchester Arena victims

L-R: Phil Thompson, Paul Merson and former West Ham striker Tony Cottee

Barrett Steel has announced that its charity dinner and auction raised over £10,000 for its chosen charities, the We Love Manchester Emergency Fund, the charity set up to help those left bereaved or seriously injured by last year's Manchester Arena attack, and the Mind Charity Leeds.

Hosting nearly 400 people, the event brought together suppliers, customers, staff, friends and family of Barrett Steel's nationwide branches.

The guests were joined by Sky Sports' presenters and former England footballers Tony Cottee, Paul Merson, and Phil Thompson.

The charity auction featured a Newcastle United football shirt signed by footballing legend, Alan Shearer, sold out U2 concert tickets with a full hospitality package and a signed Anthony Joshua boxing glove.

Chief Executive of Manchester Council, Joanne Roney OBE said: "As trustees of the Emergency Fund, we remain hugely grateful for the outpouring of support and solidarity we've had from around the world for those affected by the tragedy at Manchester Arena.

"The money raised by this dinner will go a long way to helping those who have been affected and we are touched that donors are still thinking of us and still want to help support us."

Work starts on City's 50-storey tower

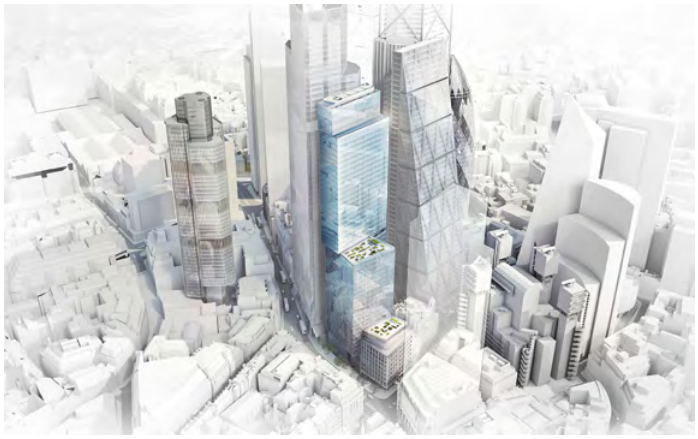
Foundation and piling work has started on the 50-storey tower at 6-8 Bishopsgate/150 Leadenhall Street in the City of London.

Approval for the steel-framed office tower was only secured last summer. The development will encompass distinctive 'stacked blocks' with retail units on the ground floor and a viewing gallery at its summit. The scheme will provide over 52,900m² of space to let.

Developers for the scheme are Mitsubishi Estate London and Stanhope.

Mitsubishi Estate London Managing Director and CEO Yuichiro Shioda said: "As part of the eastern cluster, this new tower will provide the modern business space required to keep the City of London at the forefront of international commerce."

Stanhope Chief Executive David Camp said: "We are delighted to be continuing our partnership with Mitsubishi Estates on this striking landmark building for London that will further enhance its global appeal and its ability to attract high quality international businesses to locate in the City."



Steel connections get CE Marking

Lindapter has gained CE Mark approvals for its latest range of steel connection systems, which it said further demonstrates its commitment to high quality manufacturing and transparency of product performance.

In addition to the longstanding CE Mark approvals for Lindapter's Girder Clamp, Hollo-Bolt and LindiBolt, the following products are now CE Marked: High Slip Resistant Clamps (Types AF and AAF); Adjustable Clamps (Types CF, D2, F9, LR, LS, & Flush Clamp); and Floor Fixings (Grate-Fast, FloorFast & Type 1055).

This latest announcement follows multiple CE accreditations achieved by Lindapter since 2011 and is said to offer engineers an extensive range of options for designing CE approved steelwork connections to Eurocode 3.

The company claims that almost every conceivable steel connection can be quickly accomplished without on-site drilling or welding by using Lindapter's clamping systems.

CE Marking provides specifiers and contractors with the assurance that the product will perform as declared in the published Declaration of Performance (DoP).

Work to start imminently on £80M Rochdale regeneration scheme

Willmott Dixon has won the contract from Genr8 Developments to build a new £80M steel-framed retail and leisure scheme in Rochdale.

Construction work is expected to start on Rochdale Riverside by the end of this month.

Delivered by a joint venture between Genr8 and Kajima in partnership with Rochdale Borough Council, the development will contain 18,500m² of retail and leisure accommodation in the centre of the town.

Willmott Dixon said contracts for work packages connected to the build, including groundwork, steelwork, roofing and cladding will be awarded in the coming months.

Genr8 Developments Partner Mike Smith said: "We are very pleased to announce Willmott Dixon as lead contractor and look forward to seeing work commence on-site later this month.

"The scheme is now over 60% let and with works commencing on-site we expect to be able to announce further lettings soon."

It is estimated that 250 construction operatives could be working on the site at peak times, while around 80 different companies are likely to be subcontracted to help deliver the scheme.

Willmott Dixon Managing Director in the North West Anthony Dillon, said: "As a locally-based company, we are delighted to have been appointed for this flagship project which will be a fantastic new addition for the town as well as a catalyst to encourage new inward investment.

"We'll also support the local economy by using businesses from the area whenever possible during the build programme; we want to leave a lasting legacy that all can be proud of."

Diary

For SCI events contact Jane Burrell, tel: 01344 636500 email: *education@steel-sci.com*
For Institution of Structural Engineers events email: *training@istructe.org* or telephone 0207 201 9118

Tuesday 13 & Wednesday 14 March 2018
Design of Portal Frame Elements (Part 2) Webinar This 1 hour webinar follows the principles established in Part 1.

Thursday 22 March 2018
Steel Connection Design Course
This 1 day course is for designers and technicians wanting practical tutition in steel connection design.
Nottingham

Tuesday 10 & Wednesday 11 April 2018
Composite Design Webinar
This 1 hour webinar will cover the principles of design of composite beams and slabs, as well as codified design rules.

ArcelorMittal has developed 10 sustainability outcomes which are explained below

ArcelorMittal zeroes in on waste

Sustainability tops the agenda at ArcelorMittal as the company acts to help create a more sustainable future for the steel industry and the environment. Achieving zero waste within the company is a key target.

As part of its group-wide sustainability focus ArcelorMittal has adopted 10 sustainability development outcomes, all of which contribute to ensuring that the production of steel, the use of resources, new product development, and the support of its people and their communities is achieved in the most sustainable way.

These outcomes are at the core of its new sustainable development framework that motivates action by its people from site to corporate level.

"Our 10 sustainable development outcomes were designed to ensure we manage to stay ahead of expectations, and also demonstrate our understanding that long-term success lies not only in creating shareholder value but also in actively contributing to society's needs," says ArcelorMittal Chairman and Chief Executive Lakshmi N Mittal.

The 10 outcomes are seen in the company as a strategic way to represent the material, social and environmental aspects of the business. They form the basis of an approach designed to also help avoid damaging disruptions to operations and create substantial value, both for stakeholders and shareholders.

The 10 outcomes are:

1. **People:** The company says that it makes sure the workforce is safe and healthy, committed to its success, and operates with integrity. Diversity is valued and every individual is respected and their potential developed.
2. **Products:** Commercial designers and manufacturers, as well as end-users choose steel for products that need strength and durability. They make that choice because they understand steel contributes to more sustainable lifestyles.
3. **Infrastructure:** Steel is the first-choice material for the governments and public bodies that commission and approve building and infrastructure projects, and the firms that design and construct them. They know steel is part of the answer, not part of the problem.
4. **Resources:** ArcelorMittal is a leader in building a more resource-efficient economy, and says it understands the technical, logistical and commercial challenges this represents.
5. **Air, land and water:** The company's local communities and stakeholders trust it to share the vital resources of air, land and water, because ArcelorMittal operates responsibly and transparently, and has clearly improved its impacts.
6. **Energy and carbon:** ArcelorMittal develops innovative products that help other industries to reduce carbon emissions and drive carbon and energy improvements in steel production.
7. **Supply chains:** Suppliers are expected to live up to ArcelorMittal's high standards because the company is committed to managing its supply chain responsibly, and is trusted to do so by its customers and stakeholders.
8. **Community:** ArcelorMittal says it is welcomed as a good neighbour because it actively engages at a local level, and makes a positive contribution to more resilient and thriving communities through its day-to-day operations as well as through thoughtful well-targeted investments.
9. **Scientists and engineers:** A healthy pipeline of well-trained and talented engineers, scientists and technicians, both for our own future, and for society as a whole are available.
10. **Impact measurement:** Finally, ArcelorMittal says it can show the value of its contribution to society, and its stakeholders understand and appreciate it.

Further highlighting ArcelorMittal's sustainability credentials, the world's most prestigious award programme for the circular economy, The Circulars, has recently highly commended the company for demonstrating leadership and innovation by applying circular economy principles to its business models.

By collaborating with internal experts, leading academics and its customers, ArcelorMittal is finding ways to make transformational changes in the way it does business, as it seeks to achieve its ambition of becoming a zero-waste company.

ArcelorMittal General Manager, Head of Corporate Responsibility and Sustainable Development Alan Knight says: "Being highly commended by The Circulars 2018 is a fantastic achievement and highlights how far we have come as a steel company to change not only the way we do things, but also the way we are perceived as a corporate citizen.

"We have long talked about the value steel brings to people's lives and its unparalleled recyclability, but now we are finding ways to take those ideas further and become a zero-waste company by integrating circular economy principles into everything we do."

Steelwork is also playing an important role in building a sustainable future. ArcelorMittal's high-strength S460 and Histar® grades help reduce steel weight while maintaining excellent weldability.

These characteristics satisfy the needs of the construction industry for light and economical structures that meet both safety and sustainability criteria.

Histar® steels also reduce carbon dioxide (CO_2) emissions.

Substituting Histar® for regular steel achieves a CO_2 reduction of around 30% in steel columns and around 20% in steel beams. The 50,000t of Histar® the company produces each year represents a saving of 14,000t of CO_2, which is the same as the annual emissions of around 4,000 cars.

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STEEL for life

New High-Rise Design Publication

ArcelorMittal recently published its new High-Rise buildings guidance. Produced with the assistance and guidance of the Council on Tall Buildings and Urban Habitat (CTBUH) the guide highlights how structural steel can be used effectively in tall buildings, and includes various effective structural options, use of S460 and Histar®, stiffness considerations such as outrigger design, recommendations for seismic design, life cycle assessment and composite megacolumns.

The publication can be downloaded from: *http://sections.arcelormittal.com/library/technical-brochures.html*

Large Angles

Developed principally to increase the capacity of powerline pylons, renewable wind energy towers, antenna and other structural applications such as trusses, bracings, industrial halls, mezzanines and racking systems, ArcelorMittal produces hot rolled equal angles with a leg length of up to 300mm and material thickness from 18mm to 35mm.

Available in grade S355 to EN 10025-4: 2004 the 300 × 300 angle range now appears in EN 10056-1 :2017.

Capacities are given in ArcelorMittal's Orange Book where it is shown that a 300 × 300 × 35 in S355 with a 3m system length has a flexural capacity of 4600 kN and a torsional capacity of 5530 kN.

See: *http://orangebook.arcelormittal.com/*

ArcelorMittal Sections supports revised SCI EC3 guidance

The SCI has published revised versions of its popular Eurocode design guides P361 Introduction to the Eurocodes, P362 Concise Eurocodes and P364 Worked Examples – Open Sections.

These revised editions reflect amendments to the codes since 2009 and include more detailed explanations to aid a designer in selecting rules most commonly needed for orthodox steel-framed buildings.

P364 now includes a full design in Histar® 460 for an intermediate level corner column in simple construction. Also, where appropriate, for full design examples using S355, alternative ArcelorMittal Orange Book designs in S460 are given for comparison.

SCI Associate Director David Brown considers the concise guide and the worked examples to be particularly valuable. "Instead of referring to multiple documents, and their respective National Annexes, the Concise Eurocodes guide brings all the important information together in one place, making the design process much easier.

"The worked examples are really helpful as they show the full calculation process, but in addition each example is completed using the Blue Book and Orange Book resources, demonstrating the practical way steel members are designed."

Copies of these guides can be obtained from the SCI Book Shop at: *https://portal.steel-sci.com/shop.html*

All about stockholding

NSC highlights the services steel stockholders provide, the benefits they offer and some of the standards and requirements applicable to this sector.

Picture courtesy of National Tube Stockholders

Steel stockholders play a vital part in the steel construction supply chain, ensuring the market is supplied with what it needs when it is needed. From an extensive national network of depots, steel stockholders serve all parts of the UK industry.

What range of products do they stock?

As well as heavy structural sections they supply plates, hollow sections, light sections, cladding materials, flats and angles – all the elements needed to create a steel structure.

What other services do they offer?

Like the rest of the steel construction supply chain, stockholders have invested heavily in recent years in productivity and service enhancing equipment and computer-controlled stock control and distribution processes. Some have invested in the latest laser cutting, sawing, shotblasting and priming equipment.

"Today's steel stockholders play a much bigger role in the supply chain, offering more than just stock materials from the mill. Processing services such as sawing, painting and drilling are being demanded more and more by steelwork contractors. Most look to tap into the large investments made in plant and machinery that give flexibility to match their workloads, storage space, shorter lead-times and availability of labour; while keeping control of their output," says AJN Steelstock Sales Executive Phil Cleaver.

What is the relationship between the steel stockholder and steelwork contractor?

Some steelwork contractors of course buy direct from the mill, usually for specific projects involving large quantities of steel sections. The factors that influence what percentage of a steelwork contractor's steel is sourced from a stockholder or direct from the mill will vary over time and with the size and nature of each project. There will also be a lot of variation between steelwork contractors.

Benefits of using a steel stockholder

Stockpiling

Stockpiling ensures continuity of supply when production is interrupted and avoids disruption to customers. Stockholders also have a bulk breaking role.

One of the major benefits to steelwork contractors of the stockholders is not having to hold expensive stocks of steel themselves, tying up capital with no guarantee that the steel stocked will be needed for the next project. Stockholders can do this much more economically as, having a lot of steelwork contractors to supply, they can turn their stock over much more quickly.

"As tubular specialists, National Tube Stockholders (NTS) offers the market a wide product portfolio of sizes and grades to suit many applications. Our service is second to none, with a highly professional and knowledgeable team we aim to make life a little bit easier for our customers," says NTS Group Marketing Manager Danni Hadley.

Requirements and Certification

Most stockholders are now accredited to ISO9001 - Quality Management. Other certifications stockholders might hold include;

- BS EN 1090-1 – Factory Production Control
- BS EN ISO14001 – Environmental Management
- BS OHSAS 18001 – Health & Safety Management.

A new requirement for stockholders who are involved in stocking structural steel products for highways work is National Highways Sector Scheme 3B – Stocking and distribution activities for structural steel products.

From 15 September 2018, NHSS3B will be a mandatory requirement for all companies involved in the stocking and distribution of structural steel products for all Highways England projects, as well as other public bodies adopting the Highways England Series 1800 specification for structural steelwork.

Furthermore, for projects that start before 15 September 2018 and finish after this date it is highly likely that NHSS3B will be a requirement.

NHSS3B does not apply to manufacturing activities, only to stocking and distribution activities.

"As steel stockholders, we continue to play a key role in ensuring steelwork contractors are met with just-in-time supply. We believe that established local supply networks and continued investment in advanced processing technology are imperative to maintaining the UK's world-class steel fabrication standards."
Barrett Steel Group Managing Director James Barrett.

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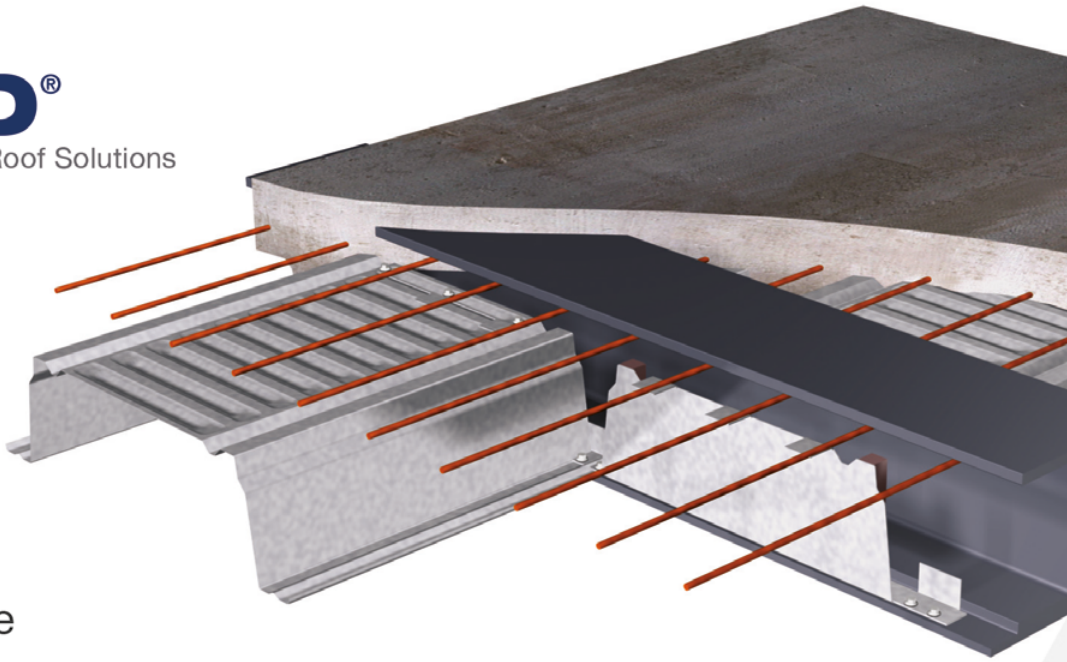

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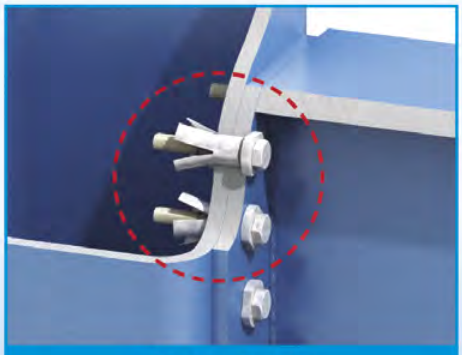

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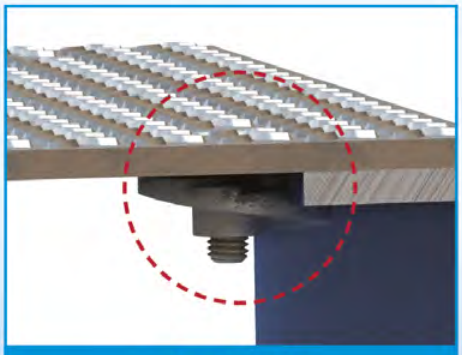

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One of the two main sloping elevations

School spearheads new town

Structural steelwork has answered all the questions correctly on a school project in Perth. Martin Cooper reports.

FACT FILE
Bertha Park High School, Perth
Main client: Perth & Kinross Council
Architect: NORR
Main contractor: Robertson
Structural engineer: Goodsons Associates
Steelwork contractor: Walter Watson
Steel tonnage: 720t

A school for the new 800-acre village known as Bertha Park is starting to take shape on the outskirts of Perth.

Spearheaded by Springfield Properties, which secured planning consent for its master plan in 2016, the construction of the site's proposed 3,000 homes will continue for the next 30 years.

It is estimated Bertha Park, featuring 60 acres of commercial land accommodating shops, offices and restaurants, will generate work for 2,000 people.

One of the initial parts of the village to be built is the £31M Bertha Park High School, a facility that will cater for up to 1,100 secondary pupils. It is hoped that by building the school in the early stages of the development, it will encourage families to move to the new village.

"The project is unique in the current Scottish schools programme as it isn't a replacement for an existing school, rather it is an entirely new building to serve the growing population of Perth," explains Robertson Operations Manager Robbie Kerr.

Having a blank canvas with no old school to replicate in any way, as well as building on a greenfield site, has allowed the design team to produce a highly distinctive school building.

The school is accommodated within one large wedge-shaped structure that measures 70m-long and is 40m-wide at the northern end. Both of the main elevations taper inwards and so the southern end is slightly narrower at 20m-wide.

Topping the building is a sloping roof with a five degree pitch, which slopes downwards from the north facing main façade. This means the structure has three floors with a large enclosed plant deck above at one end, sloping down to only two floors at the southern elevation. The uppermost third floor consequently only extends over five bays at the north end.

This 40m-wide north façade contains the school's main entrance and, similar to the slightly narrower southern elevation, will feature large glazed areas in contrast to the two side elevations of the school that will be clad with brick.

"It's a very efficient shape, suited to a steel-framed design," explains NORR Director Kevin Cooper. "The teaching spaces are located around the exterior of the structure with a large column-free centrally positioned amphitheatre acting as the school's main focal point."

The steel frame is based around a nominally standard grid for its classrooms of 7.5m × 7.5m, although there are some slightly larger teaching spaces with a grid of 7.5m × 9m.

Steelwork supports metal decking

Efficiency was the main driver for the building's shape and the reason for choosing steel

throughout creating a composite design. Stability for the steelwork is derived entirely from braced bays, located throughout the structure, but mostly in partition walls.

The ground floor of the project contains the aforementioned classrooms around much of the perimeter, with the western elevation also accommodating a sports hall, a smaller games hall and a gym. The sports hall is a double-height braced box with spans of 20m.

The middle of the ground floor features the amphitheatre, breakout spaces and dining areas, all of which form the central open-plan spine of the school. These zones are spanned by bridges, giving access across the void, and are topped with a roof featuring rooflights allowing plenty of natural daylight to penetrate the building's interior.

The northern end of the amphitheatre features an audience terrace, formed by steel rakers supporting precast planks. Behind the terracing the school's three-storey part extends for five bays.

According to the design team, the intention is that the school provides well-designed spaces, both internally and externally, that produce and encourage opportunities for positive social interaction for all age groups, both within the formal school setting and in the public environment.

The design addresses the access needs of disabled children and adults, pupils, staff, and visitors. The new school is said to be a 'barrier-free' environment, providing full access for the integration of students and other users who have special needs.

This requirement goes beyond simply providing access and toilets for wheelchair users, but will address for example, the needs of the hearing and visually impaired, and the provision of accommodation for teaching areas appropriately sized to accommodate students with special mobility and equipment needs.

Some typical winter weather did not slow down the steel erection programme

Steelwork contractor Walter Watson completed the steel frame erection in January, but remained on-site for a few further weeks to complete the other parts of its package. These included the installation of precast elements – stairs and terracing – and the installation of metal decking.

Using a variety of mobile cranes, the steel programme was completed ahead of schedule despite some typically inclement winter weather.

"There were a number of factors as to why this job was always going to be a steel project; speed of construction was one but also the location was important. We are located on a greenfield site with little or no paved access roads as yet, but steel has been transported to site in erectable loads. We would have struggled with any other material," explains Mr Kerr.

"The long 16m spans over the amphitheatre and the 20m spans over the sports hall would also have been difficult to form in any other framing solution."

Prior to the steel erection programme kicking off, Robertson had been on-site since August 2017. Early works included some earthmoving to level the previously sloping land and the installation of pad foundations.

As well as the main school building, the project also includes the construction of a steel-framed energy centre, which features a five degree slope as a nod to the school structure, car parking, and sports pitches including a 3G all-weather pitch.

Bertha Park High School is due to open for the Autumn term in 2019.

The project will provide a new city landmark for Coventry

Steel makes a splash

Coventry's city centre Water Park project has overcome a number of obstacles including a confined site and a challenging steelwork design.

FACT FILE
Coventry Water Park & Leisure Pool
Main client: Coventry City Council
Architect: FaulknerBrowns Architects
Main contractor: Buckingham Group
Structural engineer: engenuiti
Steelwork contractor: Billington Structures
Steel tonnage: 1,200t

Located adjacent to the 70m-high medieval Christchurch spire, one of the city's historical landmarks, the Coventry Water Park and Leisure Pool facility will provide a high-quality destination that is accessible to everyone and will act as a catalyst for further regeneration.

The £36M project will house a water park with a range of slides, a lazy river, wave pool, day spa, 25m-long swimming pool, 120 station gym, dance studio and squash courts.

The building will be dramatically lit at night and sits next to Coventry's ambitious City Centre South project which will transform the retail offering during the coming years.

With the exception of the area adjacent to the spire, the project footprint is almost entirely bounded by busy roads and consequently the facility has been designed to fully occupy the constrained city centre site, which has resulted in the building's distinctive shape. The upper parts of the centre are housed in a circular drum-shaped structure, while lower down the ground and first floors are accommodated within a more rectangular shaped plinth.

With very little room for materials storage or plant equipment, the site is served by two entrances and a roadside laydown area. With no on-site tower crane, all lifting duties are being performed by a variety of mobile cranes, brought to site individually when needed.

Billington Structures used mobile cranes up to and including a 250t-capacity unit for the steel erection. With so little room to manoeuvre, the company erected the entire frame by working in a circular manner, infilling wedges and ending up putting in the last steelwork adjacent to where it had begun.

Overall the structure houses the main 25m swimming pool, squash courts, plant areas and spa within its ground floor, while above the first floor accommodates the gym, changing rooms, further plant areas and a kid's splash pool.

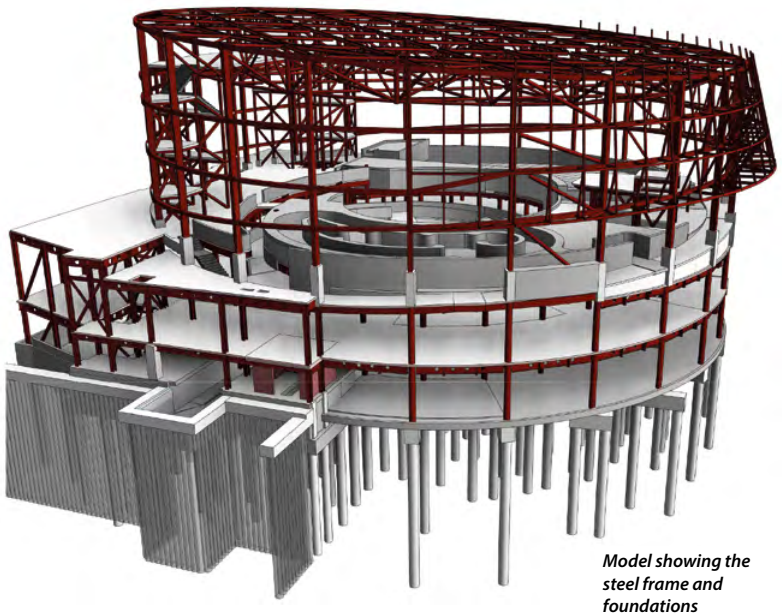
Moving up the structure into the cylindrical part, the second storey is in fact two floors with one lower level providing the base for the wave pool, lazy river and associated balance tanks. The main level two is then the pool surround where many of the rides culminate, and from where visitors ascend twin staircases leading upwards to the top of the steel-framed ride tower, which is where the six rides begin.

Apart from a facetted curved perimeter, the lower floor levels are formed with a steel frame containing exposed bespoke plate girder beams with cellular holes. The deep cellular beams provide the necessary stiffness to support pool tanks and control the dynamic response of the gym, while the holes have been principally designed to accommodate the many services required for the building.

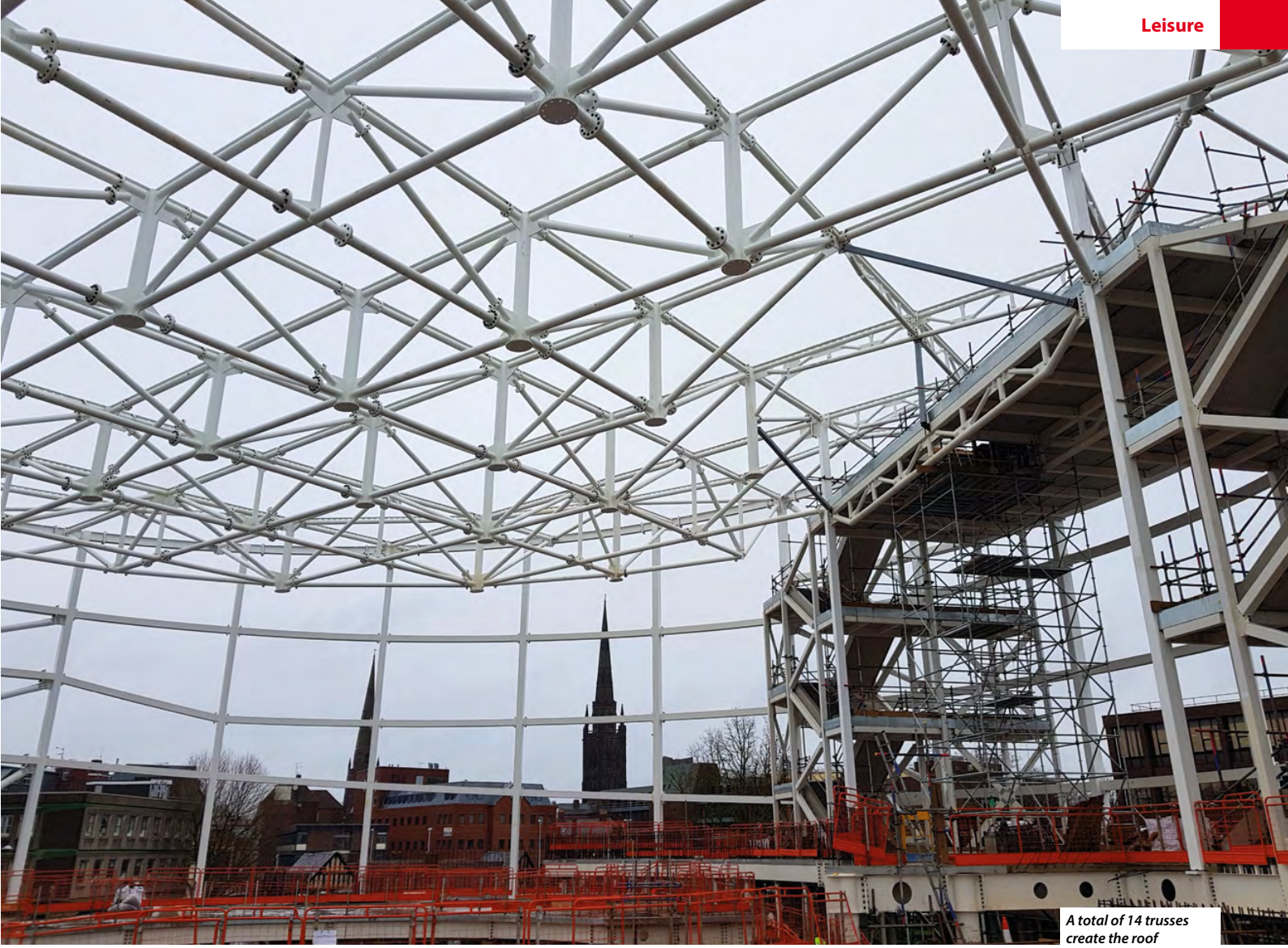
"The connection nodes to the steel frame beneath the pool hall are working particularly hard as they support the high vertical load from the pools, and are also designed as stiff moment connections in two directions to control deflection and prevent cracking of the pool tanks," says engenuiti Associate Ian Hamilton.

The cylindrical drum rises to a height of 19m to give the building its overall 28m height. This upper part houses a large column-free zone, with a massive span of 52m formed by a rooftop diagrid of inclined steel tubular trusses.

This open area will house the slides, with the largest standing 14.6m high and the other measuring in the region of 11.5m. All of these water slides will be hung from the roof trusses, meaning the steelwork is not just spanning a large area it is also picking



Model showing the steel frame and foundations



A total of 14 trusses create the roof

up considerable extra loadings.

"When designing the roof steelwork, we had to take into account the ride's self-weight, water loadings as well as dynamic loads from riders. The rides are hung from downstand columns located at the diagrid nodes. These forces are generally resolved by a push/pull action in both directions of the diagrid," adds Mr Hamilton.

Adding some extra complexity into the design, the roof of the drum is not flat, as it slopes downwards towards Christchurch spire. The trusses consequently taper from a maximum depth of 4m.

To form the rooftop diagrid Billington Structures has installed a total of 14 trusses, seven spanning in one direction and the others spanning at an adjusted angle of 90 degrees.

In order to erect the diagrid most of the trusses were installed piece small along with the main supporting steelwork. The supporting columns consist of 24 × 18m-high 500mm × 300mm RHS columns that are spaced regularly around the drum perimeter. A compression truss that runs around the rooftop perimeter of the drum then connects the columns to the diagrid members.

Only when there were enough supporting columns in place could a truss be installed, and so they were erected progressively as the erection team worked its way around the drum circle.

None of the sections spanning the central part of drum were erected as complete trusses as they would have been too long, consequently these trusses were brought to site in erectable pieces, with the longest section measuring 28.5m-long.

A small amount of temporary steel was also utilised to support the diagrid until it was complete and fully self-supporting.

Connection design has also been a challenging aspect of the steelwork package. Some parts of the diagrid require nodes that have to accept up to five bolted beam connections and, at a later date, the rides themselves.

"Building the facility in the middle of Coventry city centre has required very careful and sympathetic logistics planning. The footprint of the facility encompasses nearly the entire footprint of the site which drove the need for Buckingham Group to develop and implement a just-in-time delivery strategy.

"For this to be successful we have had to obtain full support from all relevant sub-contractors and suppliers. The daily briefings and workshops between Buckingham Group and our supply chain partners creates a working environment where priority is given to the necessary orders, with all parties supporting the importance of maintaining this strategy and understanding how it benefits everyone," sums up Buckingham Group Project Director Colin Roddy.

Coventry Water Park is due to open in 2019.

The steel erection programme progressed in a circular manner around the site

In the post

A former Royal Mail sorting office is being reconfigured into a new mixed-use development with large areas of the original steel structure being retained. Martin Cooper reports.

FACT FILE
The Post Building, London
Main Client: Brockton Capital and Oxford Properties
Architect: Allford Hall Monaghan Morris
Main contractor: Laing O'Rourke
Structural engineer: Arup
Steelwork contractor: BHC
Steel tonnage: 1,800t

Having stood as a derelict structure for more than 20 years, the former Royal Mail sorting office on London's New Oxford Street is being brought back to life as a new mixed-use development containing commercial, retail and residential elements.

Occupying a prominent West End site, the scheme will not only reinvigorate the plot, it will also create a desirable building close to many amenities and public transport links.

Main contractor Laing O'Rourke [LOR] started work on site in late 2016, initially undertaking a large-scale demolition programme. Unlike many other city centre schemes, this demolition project also included retaining a large portion of the original 1960s-built steel-framed building.

Therefore, a horseshoe-shaped zone in the middle of the site containing ground, first and second floor levels was left in place. These floors were originally used for mail sorting duties, while the building's upper four floors, now demolished, accommodated administrative offices and a plant level.

"It's all about gaining planning permission and getting the most efficient use of the existing structure," explains LOR Project Manager Andrew Veness.

"The retained element has high floor-to-ceiling heights and so we've been able to insert three mezzanines and consequently add more office space."

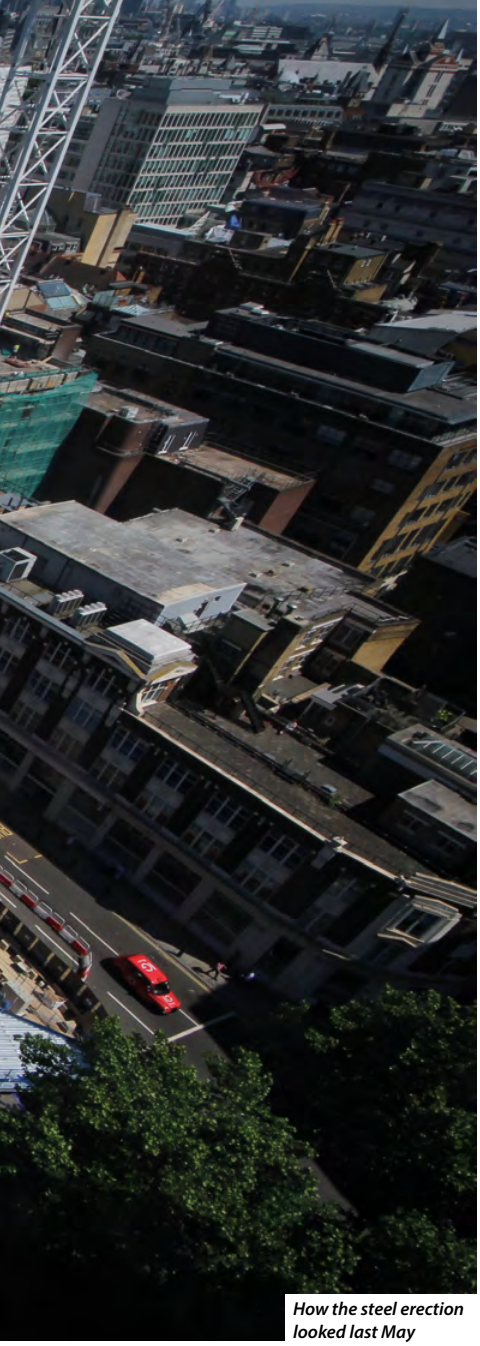
Keeping some of the original steel frame also fitted into the overall design aesthetic, which will ultimately see the new building have exposed steel beams and columns creating a modern 'white collar factory' office building.

Retaining a large steel frame required steelwork contractor BHC to use more than 200t of temporary steel propping and bracing, as the frame's original stability system had been demolished. The stability system was completely remodelled to remove the existing cores from the key corner floor areas and create a new one in the central part of the site.

Careful consideration of the sequence of work and load transfer was required. Temporary works were also needed to permit the construction of the new frame over existing live network substations, which could not be moved prior to erection commencing.

"Once the temporary props were in place we then set about constructing a new central core that sits within the open end of the retained structure's horseshoe shape," says BHC Project Manager Bobby McCormick.

Once the steel core was erected, the retained steelwork was connected to this new stability-giving element and this then allowed the temporary props and bracing to be dismantled.



How the steel erection looked last May

The completed building's New Oxford Street façade

A number of factors came into play when the design team chose a steel core instead of a concrete one. The site's basement and raft foundations have both been reused and a lighter steel option helped avoid the need for new piles.

"As well as the steel option being lighter, it was also deemed to be in keeping with the desired overall design aesthetic of exposed steelwork throughout the building," explains Arup Project Engineer Tim Bennett.

"The former post office underground railway runs directly beneath the site and so it was also important not to add unnecessary loads."

Having stabilised the retained steelwork BHC then set about reconfiguring the large steel beams in readiness for the insertion of new steel mezzanine levels.

The original grid pattern for the Post Building's ground floors was 12m × 20m to suit post office vehicle movements. Consequently, a series of deep transfer beams was originally installed to support these spans. These transfer beams had the effect of concentrating the original building loads into heavily-loaded, widely-spaced points on the raft foundation.

As the ground floor is no longer subject to vehicle movements, the very long spans over this area are no longer necessary. As such, by providing new columns to cut down the long spans, the increased overall building mass can be spread more evenly on the existing foundations.

By removing the transfer beams' concentrating effects, the widely-spaced high point loads are replaced by more frequent, lower point loads. This helps limit punching shear and bending forces within the raft, such that the increased building size can be carried.

The now redundant transfer beams have been slimmed down from 1.8m-deep to 500mm-deep members. This involved a large amount of site modifications to the existing plate girders, with a large team of welders on-site.

Where mezzanine floors have been inserted, the existing steel beams have been trimmed to maximize available headroom within the existing floor-to-floor heights.

An entirely new steel frame has been erected around the retained portion completing the lower three floors and filling up the entire site's footprint. At the south east corner of the site a new residential zone has been created and integrated within the overall structural footprint.

Elements of the retained building were integrated at levels one, two and three, and this dictates the floor-to-floor height of these storeys. Above this, new construction is provided following the original grid at levels four and five.

These floors step-in at levels five and eight, where transfer beams have been installed to support the column location changes. Substantial transfer structures were included at level five to permit the upper floors to follow a more attractive spatial planning grid

Level eight also has a slightly higher floor-to-ceiling height than the other new floors and includes another mezzanine. The roof profile has been stepped back to minimise visual intrusion, and trusses spanning along the step lines have been used to reduce the number of internal columns, maximising clear internal floor space.

"This is a very challenging project and site, with lots of trades working simultaneously, all of which has required a good deal of coordination," sums up Mr Veness.

"Retaining and altering the old steelwork was an engineering feat requiring the frame to be surveyed throughout the works. We also found the old steel to be in good condition, in some ways due to it being coated in lead

▶20

The project's upper floors nearing completion

▶19

paint, all of which had to be carefully removed."

In total, the mixed-use development creates 44,000m² of floorspace, with eight floors of offices and seven floors of adjacent residential (including 100% of the required affordable housing provision on-site) above two floors and a basement containing a variety of public uses including shops, cafés, galleries, and a GP surgery for the local community.

The development also makes a significant contribution to the public realm by creating a new public space on Museum Street, reactivating the historic route of Dunn's Passage, and providing a public roof terrace.

The Post Building is scheduled to complete by December 2018.

Modifying existing frames

Significant modifications to the existing steel frame are a key feature of the work to reconfigure the Post Building. David Brown of the SCI discusses some of the issues with refurbishment projects.

The first concern is always to discover details of the existing structure, which will often demand site investigation – it is very uncommon to find sufficient drawings to describe the structure, and even less likely that design calculations are available. Comprehensive surveys are needed, recognising that modifications through the years may have been undertaken with no records at all. Assessment of the existing structure must follow, acknowledging the design Standards and material quality of the time.

At the Post Building, significant site fabrication and welding was undertaken to reduce the depth of the existing transfer beams. For any form of welding, procedures must be developed and followed to minimise the risk of defects, which in turn demands that the composition of the original material be known. Site welding sometimes carries with it the idea of slightly shoddy work, but this should not be the case. Site welding should be completed to the same demanding standards of shop welding, involving weld procedures, qualified welders and post weld inspection.

Another feature of the refurbishment of the Post Building is the change in loading regime for many members. Design forces have been modified, in phases, and the resistance of the member must be carefully considered at each stage. Additional steel reinforcement to increase member resistance will not carry the stress from the existing loads, unless some form of jacking is undertaken to temporarily relieve the member. Unless the existing load is relieved, the stress in the original member must be considered in the verification of any site-fabricated compound members.

The Post Building is also notable for the complete remodelling of the building's stability system and the careful thought required to transfer the loads and to develop the temporary works requirements. Stability is of fundamental importance to the structure, addressed under the CDM regulations and the National Structural Steelwork Specification.

One of the existing transfer beams that was reduced in depth from 1.8m to 500mm

The NSSS calls for an outline of the method of erection envisaged by the structural designer, together with information on the assumed temporary works and the erection stage when the temporary works are no longer necessary.

Designers undertaking refurbishment or adapting existing structures will find the first reference particularly helpful, as it provides guidance on historic steelwork, but also on the principles to be followed when working on the modification of structures of any age.

Appraisal of existing iron and steel structures, P138, SCI
Appraisal of steel structures, SN41, Steelbiz
Guide to site welding, P161, SCI
National Structural Steelwork Specification, 6th edition, BCSA

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How Eastbourne's redeveloped town centre will look

Shoppers' beacon

A nautical themed shopping centre extension is set to reinvigorate Eastbourne town centre. Martin Cooper reports.

FACT FILE
The Beacon, Eastbourne
Main client: Legal & General
Architect: tp Bennett
Main contractor: Kier
Structural engineer: Clarke Bond
Steelwork contractor: Caunton Engineering
Steel tonnage: 2,000t

A new name, new shops, new restaurants and a new cinema, it is all change for Eastbourne town centre's leading shopping destination.

An £85M extension to the existing Arndale shopping mall is currently under construction and it will provide 22 new retail units, seven restaurants and an eight-screen cinema. Once complete, the new enlarged centre will be renamed The Beacon, a name that conjures up images of the town's coastal history and the nearby Beachy Head Lighthouse.

Andrew Rice, Fund Manager for the centre owners Legal & General says it is never easy to find a new name for a shopping centre with a 38-year history.

"After discussions and explorations, including meetings with key opinion formers in Eastbourne, we agreed unanimously that The Beacon was a great new name."

According to tp Bennett Project Architect Julie Heron, the nautical idea from the name has been carried over into the design of the extension.

"We have long, curved bulkheads that run either side of the mall, while the elevation opposite the railway station culminates into a ship's nose feature element that accommodates an entrance to one of the anchor stores."

Aside from these unique design features, the entire 16,200m² extension is being constructed as a steel frame, which is partially divided in two by a covered L-shaped pedestrianised street. Officially described as an outdoor space, the street will however offer some weather protection as it will be topped with a glazed undulating roof, supported by the main steel frame.

Cutting across the site, approximately at the point where the L-shaped street cranks, a movement joint splits the steel frame into two separate parts via a row of double columns.

To stabilise the large steel frame, a hybrid stability solution has been used throughout the scheme, according to Caunton Engineering Project Designer Gavin Christie,

"The client wanted the flexibility so that tenants could knock down partition walls in the future if stores needed to be enlarged, and so this meant cross bracing could not be located within internal walls.

"Instead we developed a hybrid stability system consisting of full-height shop front moment frames, working alongside bracing, which is positioned in staircases and back-of-house areas."

Overall the extension consists of two lower levels, with retail units located at ground floor and restaurants accommodated at first floor. Towards the centre of the extension there are two further upper floors, a second floor housing the cinema's eight screens, and a third floor accommodating the projection rooms.

The cinema levels straddle the street, with two second floor footbridges spanning the pedestrian thoroughfare.

The project's two anchors stores, Next and H&M, differ from the other retail units as they have two trading floors with their upper levels accessed via internal staircases and elevators.

"Designing a retail mall with a cinema above means there is very little repetition within the frame's structural grid, as many of the retail units and all of the cinema screens are different sizes," says Mr Christie.

With numerous locations having column

The main retail element of the scheme takes shape

grid changes, the project has a fair amount of large plate girders acting as transfer structures. One notable area that needed transfer structures is a suspended service yard, built above some ground floor retail units.

In order to support the yard and take into account the loadings that delivery trucks will exert on this slab, a series of large transfer girders has been installed.

Value engineering plays an important role in most projects' design and this scheme is no exception. Having initially been designed by project consultants Clarke Bond, Caunton were employed to take on the project at RIBA Stage 4.

"We increased the profile and gauge of the metal decking to allow it to span further, which then meant we required fewer beams to support it. The beams we did install were larger members but, even with a slightly higher steel tonnage, the project saved money as the fire protection requirement was reduced," explains Caunton's Engineering Manager Matthew Shimwell.

Planning and logistics have also played an important role on this scheme as the development is taking place adjacent to a 'live' shopping centre and in the middle of the busy town.

Along one elevation, which will eventually accommodate the link between the old shopping centre and the extension, the new build abuts the old with columns only 100mm apart.

New foundations could not be installed close to the existing centre and so one grid line of new columns is supported on cantilevering footings.

Summing up, Kier Senior Project Manager Alan Quigley says: "Ordinarily we would have erected the steel frame and built our way out of the site from the service yard and then finished up nearest the site entrance.

"However, the two anchor flagship stores have to open on time and need to be handed-over first for their fit-out. They have dictated our programme and this has meant a lot of on-site planning, as we had to erect them first. The direction we had to take with the steel erection means we will effectively box ourselves in at the end, which means we'll have to use smaller cranes as there will be very little room for equipment manoeuvring."

Parking solution

As well as constructing the shopping centre's extension, Kier is also undertaking a number of other phases of work for this scheme. Initially the company built a new west entrance to the mall and completed the remodelling and refurbishment of the management suite. In addition, it has also recently commenced the remodelling of the east entrance, which is said to be particularly challenging as it remains open to the public throughout the works.

However, possibility the most challenging part of its work consists of enlarging the mall's existing multi-storey car park. Although this work is being done only a stone's throw from the extension, it is a separate site with its own access and delivery points.

The original six-storey concrete-framed car park is having two extra levels added to its top. In order to minimise the weight on the existing foundations, a steel-framed solution supporting metal decking is being used.

All of the 90-plus existing concrete columns have been strengthened to allow the new steel columns to be landed on top to form a replica grid pattern for the new upper floors.

Working on behalf of Caunton Engineering, Composite Profiles has been engaged to detail, supply and install over 9,000m^2 of composite metal floor decking for the new floors.

Composite Profiles Senior Operations Manager Mark Harley says: "Tata Steel's ComFlor 80 profile was the obvious choice with its long-spanning capability. The profile is also available with Tata Steel's unique Colorcoat FD170 pre-finished coating to the underside.

"This provides a light and airy feel which many car parks find difficult to achieve."

Steel frame accommodates innovation

A flat soffit and exposed steelwork will all work towards creating a suitable industrial-looking environment for a university's engineering and research building.

FACT FILE
University of Central Lancashire [UCLan] Engineering Innovation Centre, Preston
Main client: UCLan
Architect: Reiach and Hall Architects, Simpson Haugh
Main contractor: BAM Construction
Structural engineer: BDP
Steelwork contractor: Elland Steel Structures
Steel tonnage: 700t

Forming one of the initial elements of the University of Central Lancashire's (UCLan) ambitious £230M campus master plan, the Engineering Innovation Centre (EIC) will bring a unique facility into the heart of Preston.

The idea behind the £30M EIC is to create an environment that inspires teaching, research and knowledge exchange, establishing the University as a leader in engineering innovation.

The EIC will capitalise on the location of the University at the centre of one of the most intensive engineering and manufacturing areas in the UK to create an internationally competitive facility that will bring together the region's expertise from within academia and industry.

The EIC will be equipped to the highest standard with technology demonstration areas and specialist work areas to create an integrated space for teaching, research and knowledge exchange.

Staff, students and local companies will have access to state-of-the-art equipment, including flight simulators, Formula Student cars and specialist electronics laboratories, which will also allow users to work on a variety of projects.

UCLan says its vision over the next 10 years is to create a unified, sustainable and welcoming campus which will enhance the experience for all those visiting the University. The new campus will integrate seamlessly with the rest of the city, benefitting current and future generations of students, staff, visitors and the wider community.

The site prepares for the steel erection to start by installing the cores

Work on the site, which had previously been used as a car park, started last summer. Prior to the structure's steel frame being erected, main contractor BAM Construction had to install piled foundations along with a retaining wall along three of the elevations.

Recycled stone was brought in to form a solid base for the piling rig to work from, and a total of 230 bored piles were installed to a depth of 25m.

Preliminary work then included erecting the building's two precast concrete cores, which are positioned at either end of the structure. Once these were up, the steelwork programme was able to commence, as the cores provide the frame's overall stability.

The two cores are made up of 12 precast elements each, with some sections weighing up to 30t. A 250t-capacity crawler crane was needed to lift these heavy precast elements into place, and once this work was completed it remained on-site to erect the steel frame.

"Having made solid and dry ground for the site helped both the steel and precast erections," explains BAM Construction Project Manager Simon Atkinson. "It meant the steelwork had a dry and solid area to be temporarily stored on, while the cranes and MEWPs had good ground to work from."

The six-storey steel frame is approximately 70m-long x 20m-wide and 30m-high. It has been designed around a regular grid which incorporates two spans, one of 13.5m and another at 6.5m. The longer span accommodates the building's workshops and teaching spaces, while the shorter span houses circulation routes, a main staircase and some smaller ancillary classrooms.

Within the frame a series of steel box sections supports 450mm-deep precast flooring planks within their depth via a welded plate on the bottom flange. These sections work in conjunction with T-section members spanning in the opposite direction, which also sit within the plank depth to create the flat soffit.

"This framing solution was chosen as it creates a flat soffit from which the services will be suspended," explains BDP Project Engineer Chris Goodwin.

"The client has an aspiration for a clean soffit as it helps – along with the building's exposed steelwork – to create an industrial-feel to the structure."

According to project architect Simpson Haugh, a key concept from early inception was the expression of the building structure 'as the engineering of the building becomes the architecture.'

By having an exposed structural frame behind glazed cladding, the building is promoting itself as engineering educational tool.

A steel solution was chosen for its flexibility

The building's long column-free spaces have provided the university with plenty of flexibility.

In the upper floors, this flexibility provides the ability to move partitions between classrooms to suit future use requirements and also means any services for new equipment will be unrestricted. On the ground floor, it provides open-plan workshop spaces for positioning machinery.

Stability is provided by the precast cores and precast planks acting as a floor diaphragm. As part of the floor, a lightweight T-section allowed for a flat soffit, but during construction, temporary bracing was required before the planks were installed.

The steel bracing, erected by the steelwork contractor Elland Steel Structures, allowed the entirety of the steelwork to be erected at once, removing the requirement of waiting for the planks to achieve diaphragm action and so shortened the construction programme.

Columns were brought to site in 15m-long sections, meaning the structure's 30m-high frame has one splice just above third floor. The internal, and heaviest, columns are 305 UC sections.

According to Elland's Site Manager Curtis Lewis, the steel erection programme progressed from one end of the building to the other, with each bay built up to the structure's full height.

The heaviest steel member was only 6t, however the large 250t-capacity crawler crane had to be utilised. With only one location available for any crane on the site, and very little room for it to manoeuvre, the crane had to be able to lift some columns and beams over the entire frame.

"The capacity and reach was also needed for the precast plank installation which we also undertook," explains Mr Lewis. "We installed the flooring once the steelwork was complete and so the planks had to be lifted up over the frame and then down through the roof which was left off until the flooring was complete."

The UCLan EIC is due to open in 2019.

Visualisation of the completed building

Stability comes from two cores and steel bracing

Members subject to combined bending and compression

David Brown of the SCI reviews the options and available resources that can be used to simplify the design checks and determine the required resistance data.

Expressions 6.61 and 6.62

These two expressions are well-known in the Eurocode steel design world. They bring together a number of intermediate calculations in a final crescendo of complexity, not helped by an unfamiliar presentation of familiar terms. In fact, the expressions are conceptually similar to the "more exact" approaches found in BS 5950, containing an axial term, a major axis moment term and a minor axis moment term. The denominators in the three terms are the flexural buckling resistance, the lateral torsional buckling resistance and the minor axis cross sectional resistances respectively. The second two terms are modified by factors that allow for the interaction between the different modes of buckling.

If Class 4 sections are excluded the ΔM terms due to a shift in the neutral axis can be removed, and if the denominators are presented in more familiar terms, the two expressions become:

$$\frac{N_{Ed}}{N_{b,y,Rd}} + k_{yy}\frac{M_{y,Ed}}{M_{b,Rd}} + k_{yz}\frac{M_{z,Ed}}{M_{c,z,Rd}} \le 1 \quad (6.61)$$

$$\frac{N_{Ed}}{N_{b,z,Rd}} + k_{zy}\frac{M_{y,Ed}}{M_{b,Rd}} + k_{zz}\frac{M_{z,Ed}}{M_{c,z,Rd}} \le 1 \quad (6.62)$$

The main ratios are each $\frac{\text{applied}}{\text{resistance}}$. Purists should note that the denominator in the final term is really $\frac{W_z f_y}{\gamma_{M1}}$, but this is equal to the cross sectional resistance $M_{c,z,Rd}$ since $\gamma_{M1} = \gamma_{M0} = 1.0$

The first task in using these expressions is to determine the member resistances.

Member resistances from the Blue Book

The calculation of member resistances always starts from section classification. The easy way to classify a section under combined bending and axial load is to use the "*n*" limit given in the *axial force and bending* tables of the Blue Book.

Section Designation and Axial Force Resistance $N_{pl,Rd}$ (kN)	n Limit Class 3 **Class 2**
457x152x82 $N_{pl,Rd}$ = 3620	0.839 **0.263**

Figure 1:"n" limit from the Blue Book

An extract from the tables is shown in Figure 1.

The Class 2 limit is the axial load ratio (compared to $N_{pl,Rd}$) when a member changes from Class 2 to Class 3. The Class 3 limit is the axial load ratio when a section becomes Class 4 (and the designer may prefer to choose a different section!).

The limitations are so defined because, as shown in Table 1, the different Classes demand different properties to be used in the calculation of member resistance.

Class	Axial resistance	Bending resistance
1	A_g	W_{pl}
2	A_g	W_{pl}
3	A_g	W_{el}
4	A_{eff}	W_{eff}

Table 1: Member class and resistance calculations

For the resistance calculations, it does not matter if the member is Class 1 or 2; both use the same member properties. Thus all that is needed is to know that the member is "at least Class 2", and hence why a Class 1 limit is not needed.

For the beam data shown in Figure 1, the member becomes Class 3 when the axial load exceeds 0.263 × 3620 = 952 kN. The member becomes Class 4 when the axial load exceeds 0.839 × 3620 = 3037 kN.

These limits are simply a rearrangement of the conditions found in Table 5.2 of BS EN 1993-1-1.

Flexural buckling resistances can be obtained directly from the *axial force and bending* tables for the appropriate buckling length. There can be an advantage in taking resistances from the *axial force and bending* tables, as the resistances are limited to Class 3. In the pure *compression* tables, under uniform compression, the section may become Class 4 and the resistance penalised.

Lateral torsional buckling resistances are best taken from the resistance table for bending alone. This is because the tables dedicated to bending alone allow designers to select a resistance appropriate to the shape of bending moment diagram, based on the C_1 value. The bending resistances in the axial force and bending tables are for a value of $C_1 = 1.0$, so can be very conservative.

There is however an immediate problem if the section is Class 3. The *axial force and bending* tables provide a LTB resistance for Class 3 sections, but for $C_1 = 1.0$. All UB in bending alone are Class 1, so the *bending* tables do not cover Class 3 sections. If a section becomes Class 3 due to the axial compression, but has a non-uniform bending moment diagram, use of the values in the *axial force and bending* tables will be conservative. For a precise value, manual calculations would require the calculation of the LTB resistance using the elastic modulus.

The interaction factors

The interaction factors are given in both Annex A and Annex B of BS EN 1993-1-1. Annex B is recommended, because it is simpler, and because the Annex A method is to be relegated when the revised Eurocode is published.

A typical term from Annex B is shown in Figure 2, (over).

▶28

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The *C* factor deals with the shape of the bending moment
▶26 diagram, and is taken from Table B3 of the Standard.

$$k_{yy} = C_{my}\left(1 + (\bar{\lambda}_y - 0.2)\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}}\right) \le C_{my}\left(1 + 0.8\frac{N_{Ed}}{\chi_y N_{Rk}/\gamma_{M1}}\right)$$

Figure 2: Typical interaction factor

Again, the presentation of these terms is not very attractive. In particular, the term $\chi_y N_{Rk}/\gamma_{M1}$ is unhelpful, as it is simply the flexural resistance (in this case in the major axis), or $N_{b,y,Rd}$. The expressions might more helpfully be presented in the form in Figure 3.

$$k_{yy} = C_{my}\left(1 + (\bar{\lambda}_y - 0.2)\frac{N_{Ed}}{N_{b,y,Rd}}\right) \le C_{my}\left(1 + 0.8\frac{N_{Ed}}{N_{b,y,Rd}}\right)$$

Figure 3: Typical interaction factor, revised presentation

The Blue Book cannot help here, as the expression demands an intermediate value, $\bar{\lambda}_y$ used as part of the calculation process, but not given in the tables.

Two options are available for the designer wanting to follow the full process – calculate the intermediate values needed, or use the graphical presentation of these interaction factors given in SCI Publication P362[1].

Bringing it all together

Designers have options to use simplified versions of these two expressions, with differing degrees of conservatism. An example of each follows, and then finally a comparison with the full expression. The comparisons are illustrated with a numerical example, verifying a 457 × 152 × 82 UB in S355. The beam is 4 m long has an axial load of 800 kN, a major axis bending moment of 60 kNm (diminishing to zero) and a minor axis bending moment of 15 kNm (diminishing to zero), all as indicated in Figure 4.

From the Blue Book (Figure 1, p26), the Class 2 limit is 952 kN, so the member is at least Class 2.

From the *axial force and bending* table, $N_{b,y,Rd}$ = 3560 kN and $N_{b,z,Rd}$ = 1200 kN

Because the major axis bending moment is triangular in shape, C_1 = 1.77 and from the *bending* table, (used because the member

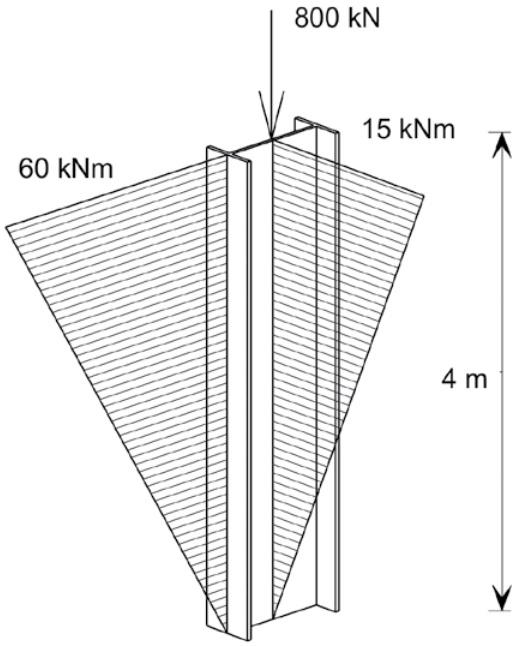

Figure 4: Example member

is at least Class 2), $M_{b,Rd}$ = 518 kNm (contrast with 347 kNm from the *axial force and bending* table, for C_1 = 1.0). From the same table, $M_{c,z,Rd}$ = 82.8 kNm

The main terms required have now been determined.

A very simple version

In the Institution of Structural Engineers Handbook[2], expression 6.61 and 6.62 have been combined into a single expression:

$$\frac{N_{Ed}}{N_{b,z,Rd}} + \frac{M_{y,Ed}}{M_{b,Rd}} + C_{mz}\frac{M_{z,Ed}}{M_{z,Rd}} \le 0.78$$

This definitely is a simplified version. The *k* interaction factors have disappeared, and the C_{mz} factor applied to the third term is readily determined from Table B3.

From Table B3, $C_{mz} = 0.6 + 0.4\psi$ but ≥ 0.4

$\psi = 0/60 = 0$, so $C_{mz} = 0.6$

Substituting the known values in the above expression:

$$\frac{800}{1200}+\frac{60}{518}+0.6\,\frac{15}{82.8}=0.89>0.78$$

In this instance, the simple expression shows that the member is not satisfactory.

A *reasonably* simple version

Mike Banfi of Arup proposed a pair of simplified expressions in a technical note published in 2008[3]. For Class 1 or 2 sections, the simplified expressions are:

$$\frac{N_{Ed}}{N_{b,y,Rd}}+C_{my}\frac{M_{y,Ed}}{M_{b,Rd}}+C_{mz}\frac{M_{z,Ed}}{M_{c,z,Rd}}\le 0.85 \text{ and}$$

$$\frac{N_{Ed}}{N_{b,z,Rd}}+0.78\frac{M_{y,Ed}}{M_{b,Rd}}+C_{mz}\frac{M_{z,Ed}}{M_{c,z,Rd}}\le 0.78$$

Referring to Table B3, $C_{my}=C_{mz}=0.6$. Substituting the known values:

$$\frac{800}{3560}+0.6\,\frac{60}{518}+0.6\,\frac{15}{82.8}=0.40\le 0.85, \text{OK}$$

$$\frac{800}{1200}+0.78\frac{60}{518}+0.6\,\frac{15}{82.8}=0.87>0.78. \text{ U/S}$$

This second version also indicates that the member is unsatisfactory.

The full version

Using the expressions in the Standard demands the intermediate values of non-dimensional slenderness for flexural buckling in both axes, which are shown in Table 2.

	$N_{cr}=\frac{\pi^2 EI}{L^2}$	$\bar{\lambda}=\sqrt{\frac{Af_y}{N_{cr}}}$
Major axis	47396	0.276
Minor axis	1534	1.536

Table 2: Flexural buckling data

The interaction factors follow:

$$k_{yy}=0.6\left(1+(0.276-0.2)\frac{800}{3560}\right)\le 0.6\left(1+0.8\,\frac{800}{3560}\right)=0.61$$

$$k_{zz}=0.6\left(1+(2\times 1.536-0.6)\frac{800}{1200}\right)\le 0.6\left(1+1.4\,\frac{800}{1200}\right)=1.16$$

$$k_{zy}=0.6\left(1-\frac{0.1\times 1.536}{(0.6-0.25)}\,\frac{800}{1200}\right)\ge\left(1-\frac{0.1}{(0.6-0.25)}\,\frac{800}{1200}\right)=0.81$$

$$k_{yz}=0.6k_{zz}=0.6\times 1.16=0.70$$

Then the full interaction expression becomes

$$\frac{800}{3560}+0.61\,\frac{60}{518}+0.70\,\frac{15}{82.8}=0.42\le 1, \text{OK}$$

$$\frac{800}{1200}+0.81\,\frac{60}{518}+1.16\,\frac{15}{82.8}=0.97\le 1, \text{OK}$$

Using the full expression demonstrates the member is (just) satisfactory. There are plenty of opportunities to make a mistake along the way, so careful attention to detail is important. Software will of course make the job easier. For manual calculations, the simplified versions of the expressions proposed by Mike Banfi are recommended, although it may be noted that there is not much more effort to complete the comprehensive expressions given in the Eurocode. A tool to verify members in combined bending and compression is available on *steelconstruction.info*, which may be used to confirm the results presented in the example.

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SCI, 2017

2 Manual for the design of steelwork building structures to Eurocode 3
The Institution of Structural Engineers, 2010

3 Banfi, M
Simplified expressions for compression and bending
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BUILDING WITH STEEL
Reprinted from Volume 5 No. 1
February1968

'Back-to-Back' Cantilever Hangar

Aeroplanes get larger and larger, consequently hangars to house them must grow at a similar rate – and this inevitably means greater cost.

The Lockheed company has such a problem with the housing of its latest transport aeroplane, the largest transport yet built: one should say 'had' the problem because it has been solved by an ingenious patented gigantic steel framed double cantilever hangar large enough to house simultaneously four aircraft each of which is 246 ft long, 65 ft high and measures 223 ft wing tip to wing tip: and yet show savings in cost!

The design of the hangar envisages two back-to-back cantilevered canopies, one for static and fatigue ground testing, the other to house aircraft undergoing actual flight tests. The two areas are completely column-free and provide a clear span height of 78 ft throughout. Offices, laboratories and workshops are contained in the central core of the hangar occupying five storeys and a total area of 240,000 sq ft. This central core is the supporting structure for the two massive cantilevered roofs: one roof extends 261 ft, the other 271 ft.

The outstanding structural feature of the hangar is a superstructure extending above the roof of the central core and holding the cantilevered roofs in position. This superstructure is supported by one hundred 14-in columns which extend from the foundations up through the centre core. To achieve the full height of the superstructure – 142 ft from the ground – these main columns which are 87 ft long below the roof, are spliced above the roof to the centre core.

Two exposed main tension and compression members – 24-in wide flange beams with 19-in channel caps – extend down at an angle from the top of the columns and connect to the trusses forming a triangular structural system.

The object of the superstructure – in addition to holding the cantilevered trusses in shape – is to provide resistance against uplift in abnormal wind conditions. This means that the ends of the trusses will move up and down a few inches and no more, under maximum wind or live load conditions.

It is estimated by the designers that the advantage in saving of steel with this hangar over a conventional cantilever design, lacking the superstructure, can be as high as 32 per cent with a maximum saving in cost of 24 per cent – very substantial indeed.

The designers draw special attention to the fact that each cantilever canopy supports a full coverage, bridge crane system of 10 ton capacity.

The hangar illustrated in the article is equipped with enormous structural steel sliding doors on each end of the two 480 ft hangar ends: these doors are 70 ft high and 80 ft wide but it is emphasised that experiments are now being carried out with doors of up to 100 ft clear height.

Five thousand tons of steel are being used in this structure which becomes fully operational this month (February 1968).

Complete dimensions of the hangar – 630 ft by 480 ft with a height of 142 ft.

AD 416:
Artificially reducing the effective width of slab to satisfy shear connection requirements

In composite construction, the effective width of slab to be used in composite beam design, as calculated from BS EN 1994-1-1 (clause 5.4.1.2) and the former BS 5950-3.1+A1, is based on results from experimental and analytical studies. In the past, designers would sometimes use a smaller effective width in their design in an attempt to satisfy the minimum degree of shear connection requirements (BS EN 1994-1-1, 6.6.1.2). This method has been a matter of controversy as it could lead to situations where the actual number of studs provided is not adequate.

The minimum degree of shear connection requirement is a complex problem which is associated with the overall behaviour of the composite beam, and the stiffness and ductility (slip capacity) of the shear connectors. Therefore, due to the various unknowns and nonlinearities present, it is difficult to justify a relaxation to the codified requirements for a minimum degree of shear connection without proper analysis. For example, a number of parameters have been known to have an effect on shear connection demands such as the span, any asymmetry in the steel flange areas, the steel grade, the construction method (propped vs unpropped) and the utilisation of the beam in bending. As one can imagine, simplified methods such as the one in question cannot possibly account for all these in a quantifiable manner.

The most recent guidance in SCI P405 was developed based on the results from tests and extensive numerical analyses that accounted for the effects of the above mentioned parameters. A set of alternative shear connection rules that cover different practical cases is provided to complement the rules in BS EN 1994-1-1.

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BS EN PUBLICATIONS

BS EN ISO 544:2017
Welding consumables. Technical delivery conditions for filler materials and fluxes. Type of product, dimensions, tolerances and markings
Supersedes BS EN ISO 544:2011

BS IMPLENTATIONS

BS ISO 20805:2017
Hot-rolled steel sheet in coils of higher yield strength with improved formability and heavy thickness for cold forming
Supersedes BS ISO 20805:2011

UPDATED BRITISH STANDARDS

BS 5427:2016+A1:2017
Code of practice for the use of profiled sheet for roof and wall cladding on buildings
AMENDMENT 1

BS EN 1993-1-6:2007+A1:2017
Eurocode 3. Design of steel structures. Strength and Stability of Shell Structures
AMENDMENT 1

BS EN 1993-4-1:2007+A1:2017
Eurocode 3. Design of steel structures. Silos
AMENDMENT 1

BRITISH STANDARDS WITHDRAWN

BS EN ISO 544:2011
Welding consumables. Technical delivery conditions for filler materials and fluxes. Type of product, dimensions, tolerances and markings
Superseded by BS EN ISO 544.2017

BS ISO 20805:2011
Hot-rolled steel sheet in coils of higher yield strength with improved formability and heavy thickness for cold forming
Superseded by BS ISO 20805:2017

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT - ADOPTIONS

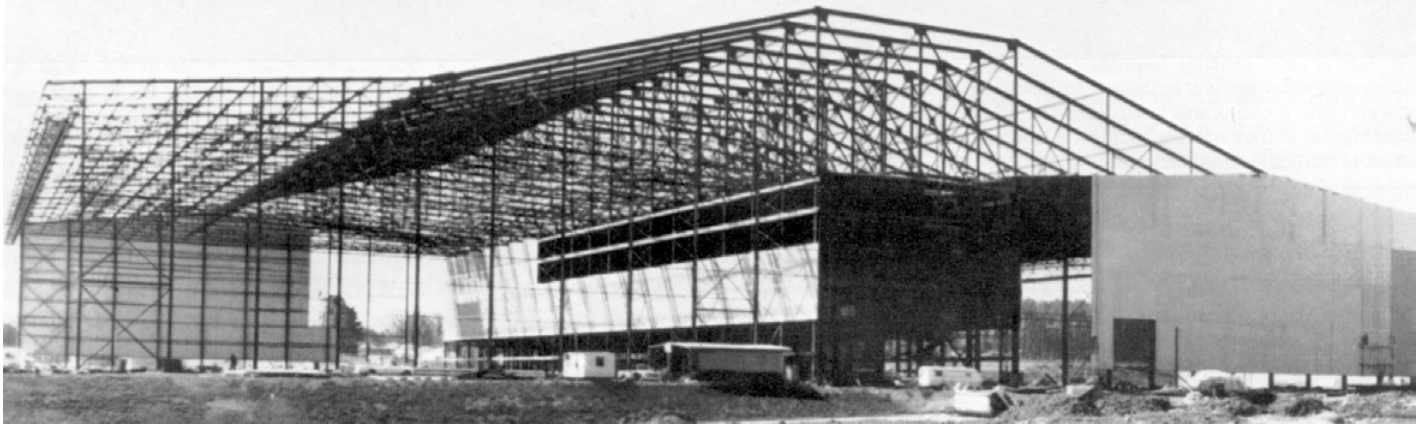
18/30361473 DC

BS EN ISO 8504-3 Preparation of steel substrates before application of paints and related products. Surface preparation methods. Part 3. Hand- and power-tool cleaning
Comments for the above document were required by 13 February, 2018

ISO PUBLICATIONS

ISO 9017:2017
Destructive tests on welds in metallic materials. Fracture test
Will be implemented as an identical British Standard

ISO 26304:2017
Welding consumables. Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of high strength steels. Classification
Will be implemented as an identical British Standard



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
Gillian Mitchell MBE, Deputy Director General, BCSA, 4 Whitehall Court, London SW1A 2ES
Tel: 020 7747 8121 Email: *gillian.mitchell@steelconstruction.org*

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

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

FPC Factory Production Control certification to BS EN 1090-1
1 – Execution Class 1 **2** – Execution Class 2
3 – Execution Class 3 **4** – Execution Class 4
BIM BIM Level 2 assessed
QM Quality management certification to ISO 9001
SCM Steel Construction Sustainability Charter
(● = Gold, ● = Silver, ● = Member)

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A & J Stead Ltd	01653 693742			●	●					●	●			●	●		3			Up to £400,000
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
A&J Fabtech Ltd	01924 439614	●					●		●	●	●		●	●		✔	3			Up to £400,000
Access Design & Engineering	01642 245151					●				●	●			●	●	✔	2			Up to £4,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3	✔	●	Up to £4,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●									✔	2	✔	●	Up to £3,000,000
Advanced Fabrications Poyle Ltd	01753 653617				●	●	●	●		●	●			●	●	✔	2			Up to £800,000
AJ Engineering & Construction Services Ltd	01309 671919			●	●					●	●			●	●	✔	4			Up to £3,000,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4			Up to £1,400,000*
Apex Steel Structures Ltd	01268 660828					●	●			●	●			●	●		2			Up to £2,000,000
Arc Fabrication Services Ltd	01709 557654			●	●	●	●	●	●	●	●			●	●	✔	3			Up to £200,000
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2			Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●		●	●		2			Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●	✔	4			Up to £800,000
ASME Engineering Ltd	020 8966 7150				●	●	●	●		●	●			●	●	✔	4		●	Up to £4,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●			●	●			●	●	✔	2			Up to £1,400,000
Austin-Divall Fabrications Ltd	01903 721950			●	●		●	●		●	●			●	●	✔	2			Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2		●	Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✔	4			Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £1,400,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●		●	●	✔	4		●	Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		4			Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●			●	●	✔	4			Up to £6,000,000
Builders Beams Ltd	01227 863770			●	●	●	●			●	●			●	●	✔	3	✔		Up to £3,000,000*
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●				●	●	✔	4		●	Up to £3,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●			●			●		●		●	✔	3		●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●		✔	4		●	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✔	4			Up to £6,000,000
Cook Fabrications Ltd	01303 893011			●	●		●			●	●			●	●		2			Up to £1,400,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●	✔	4			Up to £1,400,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £40,000
D Hughes Welding & Fabrication Ltd	01248 421104				●	●	●	●		●	●		●	●	●	✔	4			Up to £800,000
Duggan Steel	00 353 29 70072		●	●	●	●	●	●	●	●	●	●			●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	3			Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✔	4	✔	●	Up to £6,000,000
ESL (GB) Ltd	01482 787986	●					●	●	●	●	●	●	●	●	●	✔	4			Up to £400,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✔	3		●	Up to £3,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●		●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●											●	●	●	✔	3		●	Up to £2,000,000
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)
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
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●		●		✔	3			Up to £3,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●		●	●			●	●	✔	2		●	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✔	4		●	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●			●	●				●	✔	2			Up to £1,400,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●		●			●	●	●	✔	3			Up to £2,000,000
J & A Plant Ltd	01942 713511				●	●									●		4			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●		●			4			Up to £6,000,000*
John Reid & Sons (Strucsteel) Ltd	01202 483333		●	●	●	●	●	●	●	●	●	●		●	●	✔	4		●	Up to £6,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✔	4		●	Up to £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4			Up to £6,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		●	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
Luxtrade Ltd	01902 353182									●	●				●	✔	2			Up to £800,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	4			Up to £2,000,000
M J Patch Structures Ltd	01275 333431				●					●	●				●	✔	2			Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £1,400,000
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
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		●	Up to £4,000,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		2			Up to £400,000
Painter Brothers Ltd	01432 374400								●		●			●	●	✔	3			Up to £6,000,000*
Pencro Structural Engineering Ltd	028 9335 2886			●	●	●	●	●	●		●			●	●	✔	2			Up to £2,000,000
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £800,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
Rippin Ltd	01383 518610			●	●	●	●	●						●	●		2			Up to £1,400,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●			●	●	✔	3			Up to £3,000,000
S H Structures Ltd	01977 681931	●			●		●	●	●	●	●	●			●	✔	4	✔	●	Up to £2,000,000
SAH Engineering Ltd	01582 584220			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Sean Brady Construction Engineering Ltd	00 353 49 436 4144			●	●	●	●			●	●			●	●		2			Up to £800,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4		●	Above £6,000,000
SGC Steel Fabrication	01704 531286				●					●				●	●	✔	2			Up to £800,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●		●			●	●			●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		2			Up to £1,400,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £800,000
Steel & Roofing Systems	00 353 56 444 1855			●	●	●	●					●		●	●	✔	4			Up to £3,000,000
Taziker Industrial Ltd	01204 468080									●				●	●	✔	3			Above £6,000,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●			●	●	✔	2			Up to £400,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●			●	●	✔	3	✔	●	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●	●			●			●			2	✔		Up to £2,000,000
Underhill Engineering Ltd	01752 752483				●		●	●	●	●	●			●	●	✔	4			Up to £3,000,000
W I G Engineering Ltd	01869 320515				●					●					●	✔	2			Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	4			Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●		●	●	●	●	●	●	●	●				●	✔	4		●	Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●	●				●					✔	4		●	Up to £4,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**FPC**	**BIM**	**SCM**	**Guide Contract Value (1)**

Steelwork contractors for bridgeworks

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

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

- **FB** Footbridges
- **CF** Complex footbridges
- **SG** Sign gantries
- **PG** Bridges made principally from plate girders
- **TW** Bridges made principally from trusswork
- **BA** Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
- **CM** Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
- **MB** Moving bridges
- **RF** 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	RF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
A&J Fabtech Ltd	01924 439614	●			●	●	●				●	✓	3					Up to £400,000
AJ Engineering & Construction Services Ltd	01309 671919	●			●	●	●	●	●	●	●	✓	4					Up to £3,000,000
Bourne Construction Engineering 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 £3,000,000
Cementation Fabrications	0300 105 0135	●			●						●	✓	3			✓	●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	✓	4			✓		Up to £800,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	✓	3			✓	●	Up to £1,400,000
ECS Engineering Ltd	01773 860001	●			●	●	●		●		●	✓	3					Up to £3,000,000
ESL (GB) Ltd	01428 787986									●	●	✓	4			✓		Up to £400,000
Four-Tees Engineers Ltd	01489 885899	●			●	●	●		●	●	●	✓	3			✓	●	Up to £2,000,000
Had Fab Ltd	01875 611711									●	●	✓	4					Up to £3,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●				●				●	●	✓	4			✓	●	Up to £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●			●	✓	4					Up to £2,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●						●		●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●			●	●	●				●	✓	4			✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●		●	●	✓	4		✓	✓	●	Up to £4,000,000
S H Structures Ltd	01977 681931	●	●		●	●	●	●	●		●	✓	4	✓		✓	●	Up to £2,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499									●	●	✓	3			✓		Up to £800,000
Taziker Industrial Ltd	01204 468080	●			●	●	●			●	●	✓	3		✓	✓		Above £6,000,000
Underhill Engineering Ltd	01752 752483	●			●	●	●			●	●	✓	4			✓		Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	●	Above £6,000,000
Non-BCSA member																		
Allerton Steel Ltd	01609 774471	●		●	●	●	●			●	●	✓	4			✓	●	Up to £4,000,000
Centregreat Engineering Ltd	029 2046 5683	●		●	●	●	●	●	●	●	●	✓	4					Up to £1,400,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●		●	●	●	●	●		●	✓	4			✓	●	Up to £800,000
Francis & Lewis International Ltd	01452 722200									●	●	✓	4			✓	●	Up to £2,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●	●	●		●	●	✓	3					Up to £2,000,000
Hollandia Infra BV	00 31 180 540 540	●	●	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000*
IHC Engineering (UK) Ltd	01773 861734	●									●	✓	3			✓		Up to £400,000
Interserve Construction Ltd	020 8311 5500									●		✓	N/A					Above £6,000,000*
Lanarkshire Welding Company Ltd	01698 264271	●		●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £2,000,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●								●	●	✓	N/A					Up to £3,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●				●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000

Corporate Members

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

Company name	Tel
Control Energy Costs Ltd	01737 556631
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	08457 504030

Company name	Tel
Kier Construction Ltd	01767 640111
McGee Group (Holdings) Ltd	020 8998 1101
PTS (TQM) Ltd	01785 250706
Sandberg LLP	020 7565 7000

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

Industry Members

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

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

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM	BIM
AJN Steelstock Ltd	01638 555500								●		M		
Albion Sections Ltd	0121 553 1877	●									M		
Arcelor Mittal Distribution - Scunthorpe	01724 810810								●		D/I		
AVEVA Solutions Ltd	01223 556655		●								N/A		
Ayrshire Metals Ltd	01327 300990	●									M		✓
BAPP Group Ltd	01226 383824									●	M		
Barrett Steel Services Limited	01274 682281								●		M		
Behringer Ltd	01296 668259					●					N/A		
British Steel Ltd	01724 404040				●						M		
BW Industries Ltd	01262 400088	●									M		
Cellbeam Ltd	01937 840600	●									M		
Cleveland Steel & Tubes Ltd	01845 577789								●		M		
Composite Metal Flooring Ltd	01495 761080	●									M		
Composite Profiles UK Ltd	01202 659237	●									D/I		
Cooper & Turner Ltd	0114 256 0057									●	M		
Cutmaster Machines (UK) Ltd	01226 707865					●					N/A		
Daver Steels Ltd	0114 261 1999	●									M		
Daver Steels (Bar & Cable Systems) Ltd	01709 880550	●									M		
Dent Steel Services (Yorkshire) Ltd	01274 607070								●		M		
Duggan Profiles & Steel Service Centre Ltd	00353 56 7722485	●							●		M		
easi-edge Ltd	01777 870901							●			N/A	●	
Fabsec Ltd	01937 840641	●									N/A		
Ficep (UK) Ltd	01924 223530					●					N/A		
FLI Structures	01452 722200	●									M	●	
Forward Protective Coatings Ltd	01623 748323						●				N/A		
Hadley Industries Plc	0121 555 1342	●									M	●	
Hempel UK Ltd	01633 874024						●				N/A		
Highland Metals Ltd	01343 548855						●				N/A		
Hi-Span Ltd	01953 603081	●									M	●	
International Paint Ltd	0191 469 6111						●				N/A	●	

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM	BIM
Jack Tighe Ltd	01302 880360						●				N/A		
Jamestown Manufacturing Ltd	00 353 45 434288	●									M		
John Parker & Son Ltd	01227 783200								●	●	D/I		
Joseph Ash Galvanizing	01246 854650						●				N/A		
Jotun Paints (Europe) Ltd	01724 400000						●				N/A		
Kaltenbach Ltd	01234 213201					●					N/A		
Kingspan Structural Products	01944 712000	●									M	●	
Kloeckner Metals UK	0113 254 0711								●		D/I		
Lincoln Electric (UK) Ltd	0114 287 2401					●					N/A		
Lindapter International	01274 521444									●	M		
MSW UK Ltd	0115 946 2316	●									D/I		
Murray Plate Group Ltd	0161 866 0266								●		D/I		
National Tube Stockholders Ltd	01845 577440								●		D/I		
Peddinghaus Corporation UK Ltd	01952 200377					●					N/A		
Pipe and Piling Supplies Ltd	01592 770312	●									M		
PPG Architectural Coatings UK & Ireland	01924 354233						●				N/A		
Prodeck-Fixing Ltd	01278 780586	●									D/I		
Rainham Steel Co Ltd	01708 522311								●		D/I		
Sherwin-Williams Protective & Marine Coatings	01204 521771						●				N/A	●	
Structural Metal Decks Ltd	01202 718898	●									M	●	
StruMIS Ltd	01332 545800		●								N/A		
Stud-Deck Services Ltd	01335 390069	●									D/I		
Tata Steel – Tubes	01536 402121				●						M		
Tata Steel – ComFlor	01244 892199	●									M		
Tension Control Bolts Ltd	01948 667700						●			●	M		
Trimble Solutions (UK) Ltd	0113 887 9790		●								N/A		
voestalpine Metsec plc	0121 601 6000	●									M	●	
Wedge Group Galvanizing Ltd	01909 486384						●				N/A		
Yamazaki Mazak UK Ltd	01905 755755					●					N/A		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