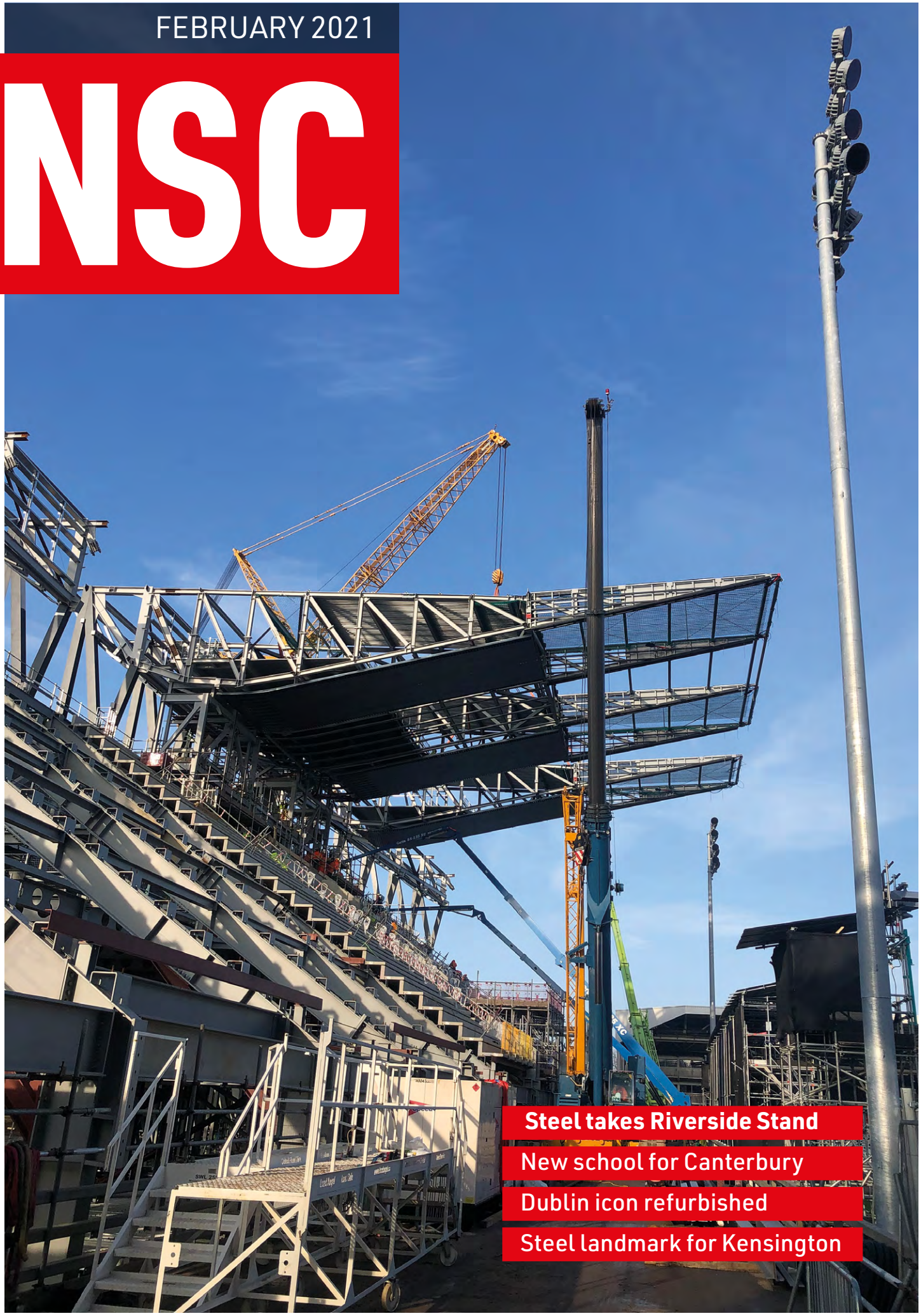
FEBRUARY 2021

NSC



Steel takes Riverside Stand

New school for Canterbury

Dublin icon refurbished

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FEBUARY 2021
Vol 29 No 2

NSC

Cover Image
Riverside Development, Craven Cottage, Fulham FC
Main client: Fulham FC
Architect: Populous
Main contractor: Buckingham Group
Structural engineer: WSP
Steelwork contractor: Severfield
Steel tonnage: 2,600t including all secondary steelwork and temporary fittings

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celebrating

excellence in steel

Call for entries for the 2021 Structural Steel Design Awards

The British Constructional Steelwork Association and Trimble Solutions (UK) Ltd have pleasure in inviting entries for the 2021 Structural Steel Design Awards.

Now in their 53rd year, the Awards celebrate the excellence of the United Kingdom and the Republic of Ireland in the field of steel construction, particularly demonstrating its potential in terms of sustainability, cost-effectiveness, aesthetics and innovation. The Awards are open to steel-based structures situated in the UK or overseas that have been built by UK or Irish steelwork contractors.

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

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

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

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

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

Closing date for entries: Friday 26th February 2021

BCSA

Trimble

Steel seizes record offices market share

Nick Barrett - Editor

Confidence and stability are the two key ingredients that underpin business investment on the scale that a modern industrial economy needs to keep ticking over. Last year will go down in history as a year when business confidence in the western world took more hits than at any time since World War II, and stability was threatened on a number of fronts including Brexit, the pandemic, and increasing talk of the danger of the UK itself breaking up.

It took brave senior managers and investors to commit to anything that they didn't have to, and construction suffered sorely from a multitude of decisions to kick projects into the long grass until the picture becomes clearer. Not many substantial projects were cancelled outright, but the knock on, or multiplier, effects of one project postponed causes more uncertainty elsewhere along supply chains.

Against that background it was little surprise then that most sectors of construction suffered falls in demand of over 20% in 2020, as confirmed in the 2020 Market Share Survey from Construction Markets (see News). Hopes are now high however, as we said last month, that with the COVID-19 vaccination programme off to an encouraging start and Brexit - for better or worse - behind us, 2021 will see an equally sharp rise in sentiment and therefore demand.

The Market Share Survey, produced by independent researchers since 1980, shows that steel fared relatively well against the weakened background in last year. The key sheds market for example fell by almost 24%, but steel increased its market share slightly, which bodes well for the future in a market segment that is expected to perform well in 2021.

Multi-storey buildings also fell by some 22%, and again steel showed a small rise in market share, to almost 65%. In multi-storey offices steel in fact reached an all-time high share of the market of almost 74%, compared to 72.5% a year earlier and 73% in the previous record year of 2006. Further gains were made in the health, retail, and leisure sectors. In residential, steel just about held its own in the high-rise market and managed to increase market share by over 3% in the low-rise sector.

This year government spending plans will focus attention on key sectors like education and healthcare that steel has excellent credentials in. Private sector investment in the burgeoning logistics sector relies on steel to provide the sheds it depends on, and once worries about the future of the office are overcome, the commercial market, where steel dominates the multi-storey sector, is widely expected to enjoy a resurgence in demand.

The focus on delivering value for money along with solutions that incorporate high sustainability performance will be undiminished as the recovery picks up, and will surely strengthen over time, which augers well for steel. The way that the constructional steelwork sector has developed, with almost all work being carried out offsite in line with the Modern Methods of Construction agenda, CNC production easily adapting to BIM, and close collaboration with the rest of the supply chain, means steel construction is in good shape to support its markets as the 2021 post-pandemic recovery gathers pace.

Steel performs well in constrained market

Structural steelwork increased its market share in key sectors during 2020, despite most areas of the construction industry severely contracting due to the COVID-19 pandemic.

According to the Market Share Survey, which has been produced by independent researchers Construction Markets since 1980, demand in most construction sectors fell by over 20% last year, but steelwork fared well in this weakened market.

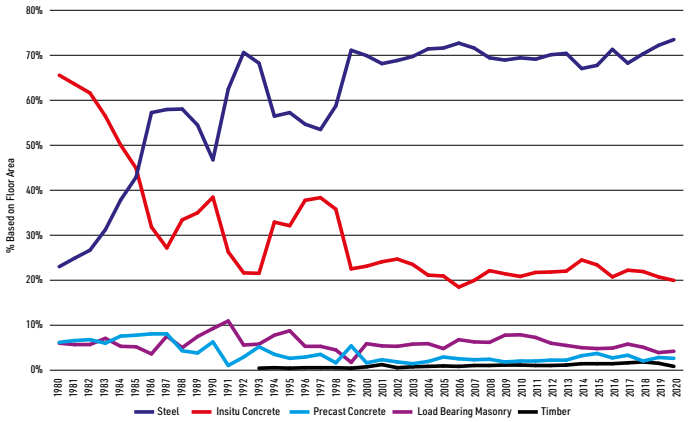
The key sheds market was down 23.7%, compared to 2019, with a total floor area of 9,113,000m². However, steelwork's market share rose from 92.2% in 2019 to 92.4% in 2020.

According to many developers, this sector is expected to perform well in 2021, due to the knock-on effect of the pandemic lockdown, which has seen the demand for distribution centres increase, partly because of the rise in online shopping.

The multi-storey market was down 22.6% from 2019, but steelwork's overall share increased from 64.3% to 64.7% in 2020.

Steelwork managed to increase its share in most multi-storey sub-sectors, with a 1.4% market share rise in offices, to an all-time high of almost 74% in 2020. In the retail sector its share was up by 5.5%, in leisure up by 3.6% and in health up by 0.5%.

The residential market fell by 24.7% in 2020, but steelwork's share for low-rise apartments increased by 3.1% compared to the previous year to 12.5%, which equated to a floor area of 265,000m².



Market Shares, multi-storey office buildings market, 1980 to 2020

SCCS now UKAS accredited to offer UKCA certification

CE marking is now familiar to most construction professionals and continues for products placed on the EU market, which includes the Republic of Ireland.

However, now that the United Kingdom has left the EU a new system of UK Conformity Assessed marking (UKCA marking) has been introduced for Great Britain (comprising England, Scotland and Wales). The equivalent system in Northern Ireland is CE + UKNI marking.

The Steel Construction Certification Scheme (SCCS) has been automatically transferred from an EU Notified Body to a UK Approved Body and is now UKAS accredited to offer both UKCA and CE + UKNI certification in accordance with the Construction Products Regulation 2011 (retained EU law EUR 305/2011) as amended by the Construction Products (Amendment etc.) (EU Exit) Regulations 2019 and the Construction Products (Amendment etc.) (EU Exit) Regulations 2020.

"This extension of SCCS's offering ensures its clients are prepared and have the appropriate certification required from January 2021," said SCCS Director of Certification 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

Steel creating Leicester's Hotel Brooklyn

Approximately 750t of structural steelwork is being used to construct an hotel, which on completion will be linked to the adjacent Leicester Tigers Rugby Union Club's stadium.

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

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

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

The hotel structure is wedge-shaped, which aligns with the shape of the plot. From the tip of the V-shape, two wings of the structure splay outwards, creating the widest part of the hotel directly opposite the rugby ground. Above the ground floor car park much of the area between the two wings is taken up by a large, covered atrium.

The hotel is due to complete during the summer of 2022, and Caunton Engineering is the project's steelwork contractor.

Free guide to UKCA marking post-Brexit now available

A new free guide that highlights how the steel construction sector can easily meet the requirements of UKCA marking, as well as detailing the straightforward process for continuing to comply with the Construction Products Regulation, which is the legal basis for both UKCA and CE marking, has been published by the British Constructional Steelwork Association (BCSA) and Steel for Life.

Entitled *Steel Construction UKCA Marking*, the publication is available for free download at the steel construction sector website: www.steelconstruction.info

Major changes have been made to the system of conformity assessment for construction products following the UK's exit from the European Union and the ending of the transition period on 31 December 2020.

All construction professionals, main contractors, and clients need to be aware of the changes to what was the system for CE marking of construction products that had been in force since 2014.

CE marking continues for products placed on the EU market, which includes the Republic of Ireland. However, for products placed on the market in Great Britain (GB), comprising England, Scotland and Wales, a new system of UKCA marking has been introduced, although CE marking will continue to be recognised in GB until the end of 2021.

The free downloadable guide explains in detail what UKCA marking is, how it will work for the steel construction sector, and how you can ensure that you and your supply chain are compliant with the new legislation. It also covers the slightly different arrangements that apply in Northern Ireland.

"The steel construction sector successfully introduced CE marking six years ago, and we are confident that the sector will manage the change to UKCA marking just as effectively," said BCSA CEO David Moore.

Bridge installed for Port of Sheerness upgrade

Forming part of Peel Ports' master plan for its Port of Sheerness, a project which includes a 20-year strategy for growth, Nusteel Structures has fabricated and supplied a new vehicular bridge.

The bridge connects the port with the former Thamesteel site, which is being transformed into flexible storage and purpose-built logistics facilities, including 23-acres of car storage for the port's automotive clients.

Working on behalf of main contractor John Sisk & Son, Nusteel Structures fabricated four beams for the bridge. Each beam was 40m-long x 3.6m-deep and weighed 38t.

The beams were transported to site by Nusteel's own transport department using extendable trailers. Once on-site, the four beams were assembled into braced pairs before being lifted into position by a 1,000t-capacity crane.

The ongoing work will strengthen the north Kent port's position as a leading terminal for bulk timbers, automotive and other sectors.

Peel Ports' master plan at Sheerness will create up to 1,000 jobs, in addition to the 1,640 jobs the port already supports. Once completed, Peel Ports expects to have invested an estimated £50M in the region.

Bourne Parking reaches a century of car parks

Bourne Parking (part of the Bourne Group) is currently constructing its 100th car park since the turn of the century.

The Commons multi-storey car park in Hatfield town centre is a four-level structure containing 420 spaces.

Working as main contractor, undertaking all design aspects including steelwork design and erection on behalf of Welwyn Hatfield Borough Council, Bourne Parking required 400t of steel for the project.

Bourne Parking Managing Director Karl Butters said: "This is our landmark 100th car park constructed this century and it still amazes me and makes me feel immensely proud when I see the speed of erection of our bespoke steel and precast system build.

"The frame and floor erection commenced on 7 September 2020 and was completed on 5 November 2020. That's 420 spaces constructed in under two months!! A fantastic achievement on a very tight site surrounded by live vehicle and pedestrian routes."

NEWS IN BRIEF

Scotland-based steelwork contractor **AJ Engineering & Construction Services** is expanding its premises in a £2.5M investment over the next three years, which it said will allow it to more than double its production capabilities and employ more staff. The development will see its existing buildings in Forres being refurbished and a new automated fabrication facility being installed.

The **University of Reading** has entered into an agreement with affiliates of Commonwealth Real Estate LP, a film studios investor based in Los Angeles, for a long lease of land at the University's Thames Valley Science Park campus, Berkshire, which will see the development of a major film studios and creative media campus.

Recycling management firm **Binn Group** has announced that it has obtained planning consent from Perth & Kinross Council's Planning and Development Committee for a new energy-from-waste facility. The proposed facility will be located within the Binn Ecopark and is intended to process 84,900 tonnes of residual wastes per annum. It will operate using mass burn rolling grate incinerator technology.

A planning application has been submitted by **Muse Developments** and South Tyneside Council, to bring forward one of the first near net-zero buildings in the north-east region. The proposals are for a 4,600m² riverside five-storey office block at The Glassworks development in South Shields.

The **University of Plymouth** has been granted permission to create an iconic new facility that will inspire and educate the next generation of engineers and designers. The Babbage building, on the western edge of the University's main campus, will be enlarged and enhanced to provide an innovative and sustainable new home for the School of Engineering, Computing and Mathematics and additional space for the School of Art, Design and Architecture.

PRESIDENT'S COLUMN

It's public news that steel section prices have increased dramatically over the last six months, mainly on the back of commodity prices rising for both BOS and EAF manufacturing routes, and increased demand in China. Many mills have been trading in the red. Clearly, prices needed to rise, but the scale of the increases has been alarming and unfortunately every time steel prices go up it's front-page news. However, when other materials increase their prices by similar levels, it always seems to go under the radar. It's also worth remembering that there is a lot of steel in a concrete frame and rebar prices have rocketed too.

Although the raw material makes up a relatively small proportion of a steel-framed multi-storey building's overall cost, less than 5%, I'm sure a lot of cost plans are being revised as we speak. This could result in more delays of buildings being released for construction, further exacerbating the reduction in overall work, which we've been experiencing since Brexit and COVID-19 loomed large. The BCSA lobbied very hard for extensions to furlough for this period six months ago with BEIS, and many of us are using this facility. Economists are predicting inflation will increase over the next two years, possibly up to 4%, and that will cause further problems to the cost of buildings. It's important that unnecessary waste incurred in the process of building in the UK is reduced to offset some of these increases that are inevitable.

Over the last year there has been a tremendous growth in interest in 'carbon', with clients demanding comparison checks of the carbon footprint of a building made from differing materials. Steel has done well in the comparisons, but not as well it should. Unfortunately, when people have started to do comparisons they have concentrated on the 'cradle to grave' embodied carbon of the building, which does not take account of the recovery, re-use and more importantly the recycling of materials at end of life. The British Standards refer to this neglected part of the equation as 'Module D'. If the construction industry was taking into account Module D, in combination with the embodied carbon of manufacture, Modules A1-A3, the embodied carbon factor for BOS steelwork would be reduced in the order of 65%.

Other materials do not have as good a message for end of life recovery, re-use and recycling, so ignoring Module D makes the whole process of embodied carbon comparison of building materials flawed and grossly unfair to BOS manufacture. EAF manufacture benefits from steel recycling, but these figures are not expressed in their Module D value as they are already included in their embodied carbon factors for Modules A1-A3. The BCSA is lobbying hard for construction professionals to take Module D into account in such embodied carbon comparisons. The recycling and re-use of material is one of the cornerstones of sustainable thinking and the circular economy. Our industry has been recycling steel successfully for many years and the scale of it is astonishing, in the order of 95% to 99%. Simply put, not taking into account recycling and re-use in embodied carbon comparisons is like not taking gravity into account when designing an aeroplane!

Mark Denham
BCSA President

New Steel Construction Technical Digest now available online

New Steel Construction's (NSC) fifth Technical Digest, which brings together a year's worth of technical guidance, is now available for download at: www.steelconstruction.info

Helping to keep engineers and architects up-to-date with the latest steel construction related guidance, NSC's Digest compiles all the magazine's Technical Articles and Advisory Desk Notes from 2020, which can be downloaded as a pdf or viewed online.

Advisory Desk Notes reflect recent developments in technical standards or new knowledge that designers need to be made aware of. Some of them arise because a question is being frequently asked of the steel sector's technical advisers. They have always been recognised as essential reading for all involved in the design of constructional steelwork.

The longer Technical Articles cover more detailed insights into what designers need to know, often the result of legislative changes or changes to codes and standards.

Sometimes it is simply felt that it would be helpful if a lot of relatively minor changes, perhaps made over a period of time, were brought together in one place, so a technical update is needed.

Some of the topics covered in last year's Technical Articles include in-plane stability and restraints for portal frames, shelf angle floor beams in fire, joint stiffness calculation and the design of splice connections.

Science block rises with steel

Working on behalf of Morgan Sindall, Elland Steel Structures is erecting 1,100t of structural steelwork for The University of Salford's Science, Engineering and Environmental Building (SEE).

The four-storey, 15,550m² SEE Building will be occupied by the University's departments of Robotics, Built Environment, Civil, Aeronautical and Mechanical Engineering, Computer Science and Networking, Human and Natural Science and The Morson Maker Space (an additive and digital manufacturing hub).

The new structure is a braced frame, using a composite solution of steel beams supporting metal decking and a concrete topping to form the floors. Typically, columns are hot rolled UC sections, except at the entrance where feature CHS columns are utilised.

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

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

Plans revealed for flagship Middlesbrough office scheme

Chinese contractor and developer BCEGI has submitted a planning application for an office scheme in Middlesbrough.

Known as Boho X, the seven-storey structure will offer 5,500m² of Grade A office space, primarily for the digital and creative sector. It will also include a swimming pool and gym, café, lecture theatre and a rooftop bar/event space.

According to BCEGI, the building's state-of-the-art spacious, modern working environments will act as a further catalyst for social, economic and environmental change across the Tees Valley and the wider region.

Lead Director of BCEGI Dongwen Yu said: "We are delighted to be working alongside Middlesbrough Council to deliver this iconic digital hub.

"Our vision is to deliver a thriving, successful and attractive heart to Middlesbrough, which will serve the needs of local people and businesses for decades to come. This is an ambitious and carefully crafted proposal that expresses the confidence in Middlesbrough."

Work is due to start in August, with a completion date in December 2022.

Developer constructing 90,000m² of logistics and distribution space as demand soars

GLP has announced that it has begun developing more than 90,000m² of logistics and distribution space across four sites in Bedfordshire, Northamptonshire and Milton Keynes.

The developments are said to be part of the largest programme of speculative logistics real estate development currently underway in the UK.

The company said the development programme has been launched to satisfy the significant demand in an increasingly supply-constrained logistics real estate market in the UK.

Demand for larger warehouses has significantly expanded in recent years, particularly among e-commerce occupiers in need of more storage space. According to Savills, online sales in December 2020 were 51% higher year-on-year, with this growth trajectory expected to continue.

The developments consist of three units at G-Park Bedford Wixams, a unit at G-Park Northampton, two units at G-Park Milton Keynes and a further unit at GLP's flagship logistics park Magna Park Milton Keynes.

Bruce Topley, Managing Director, GLP UK, said: "The growth of e-commerce in the UK has been accelerated by the COVID-19 pandemic given the increased importance of home deliveries.

"As a result, we have seen a surge in demand for logistics real estate in the right locations. Customers are also seeking to reinforce their supply chains and increasingly require higher specification buildings and cutting-edge sustainability credentials. In response to this, we are excited to be bringing high-quality logistics space to the market."

Redevelopment of Granada TV studios underway

Once the home of Granada Television (later ITV Granada), Manchester's famous TV studios are being redeveloped into a new mixed-use scheme and steelwork is nearing completion on one of the first new offices blocks.

Working on behalf of Bowmer + Kirkland, EvadX is erecting 550t of steel for a 10-storey commercial block on the site of the former annex building, which used to accommodate dressing rooms and the make-up department.

The steel-framed structure measures 50m-long x 11m-wide, and it will accommodate around 6,000m² of office space, along with retail units at ground and lower ground floor.

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

The office block is due to complete in October.

Steel signal gantry installed at Bristol

During a Christmas period rail possession a 33m-long signal gantry structure, fabricated by Adey Steel, was installed at Bristol East Junction.

The steel gantry forms part of the ongoing remodelling works at Bristol Temple Meads. The structure was fabricated at Adey Steel's Loughborough production facility, before being painted and part-assembled prior to installation.

Working with AMCO Giffen and Network Rail, the gantry was lifted into place using a rail-mounted crane.

The signal gantry will be put into service this summer along with further remodelling works to the area. The plan to transform the junction will improve capacity, flexibility and reliability, making more efficient use of platforms at the station, while reducing delays for passengers.

An extra line is also being introduced to support additional suburban services being planned for the future.

Diary

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

Tue 2 & 9 February 2021
STROBE
Online course
The third and fourth webinars in a series of four that will inform engineers how to design high strength steels (HSS) in accordance with the current European practice as well as cover brand new developments in design guidance arising from the STROBE project.

Tue 16 February 2021
Eurocode Load Combinations
Member webinar
Eurocode load combinations can cause some confusion amongst building designers. This webinar has been prepared to explain which combinations are appropriate, in which circumstances.

Tue 23, Thu 25 February and Tue 2 March 2021
Light Gauge Steel Design
Online course
This online course is delivered in 3 sessions and introduces the uses and applications of light gauge steel in construction, before explaining in detail the methods employed by Eurocode 3 for designing light gauge steel members in bending and compression and the calculation of section properties.

Wed 3 March 2021
Designing in Stainless Steel
Member webinar
This webinar gives an introduction to the use of stainless steel in structural applications. Topics covered include grade selection and design of members and connections in accordance with Eurocode 3.

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

Steel passes school exams

Steelwork provided the necessary speed of construction.

Structural steelwork has proven to be the right choice for the construction of a new school in the cathedral city of Canterbury.

FACT FILE
Barton Manor School, Canterbury
Main client: **Kent County Council**
Architect: **Noviun Architects**
Main contractor: **Kier**
Structural engineer: **Malachy Walsh and Partners**
Steelwork contractor: **H Young Structures**
Steel tonnage: **600t**

Strategically placed bracing provides the stability.

A partnership between Kent County Council, the Department for Education and Barton Court Academy Trust is constructing a new school in Canterbury.

Being built on the site of the former Chaucer Technology School, Barton Manor School is due to open in September 2022, and will provide teaching space for 1,050 pupils aged between 11 and 18.

In order to meet the scheduled school opening date, it was important to choose construction materials that could form the architectural design economically and swiftly.

"Speed of construction is always important and building with a steel-framed solution is quicker than other methods, especially during the inclement winter months," says Kier Project Manager Jamie Hawkins.

"We also have some 18.5m-long spans in the sports hall, and these would have been difficult to form in anything other than steel."

Malachy Walsh and Partners' Associate Director Tim Moynihan agrees and adds: "Steel provides security of quality and speed, unlike concrete there is little or no risk of a member not reaching the required quality and having to be recast as sometimes occurs with concrete elements."

The new school will feature 7,200m² of teaching space, with both traditional teaching spaces and modern vocational training studios in a steel-framed three-storey building. Vocational subjects to be taught will include catering, resistant materials, hair and beauty therapy, performing arts, information and communications technology, business and health and social care.

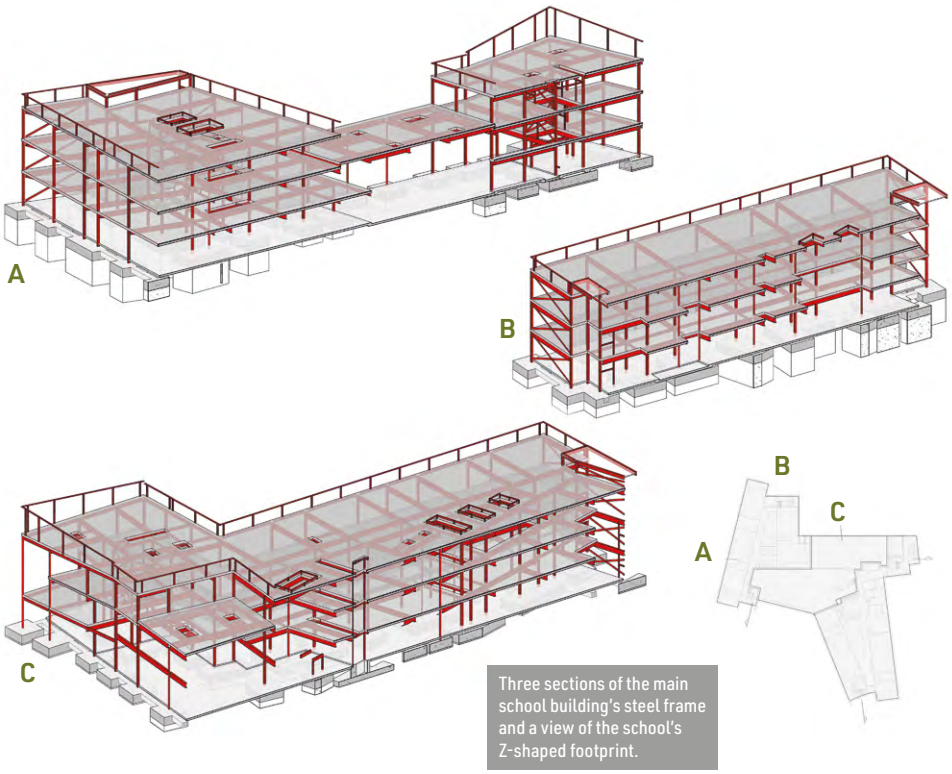
Adjacent to the teaching block, the school will also have a steel-framed sports hall, that will also include a two-storey element that will accommodate a first-floor dance studio as well as changing rooms on the ground floor.

Work on this project began in November 2019, with the demolition of the previous school buildings and then a thorough site remediation programme, which was required as asbestos was found in the ground.

A major sewer previously ran beneath the site and under the proposed footprint of the main school building. During the remediation programme, the sewer was diverted to run around the perimeter of the site.

Kier then installed pad foundations and ground beams in readiness for the steelwork erection programme to begin. However, to give the steel a helping hand and make it easier to achieve the required fast construction programme, the ground floor slab for the teaching block was also installed during the groundworks phase.

"Speed of construction is always important and building with a steel-framed solution is quicker than other methods, especially during the inclement winter months."



Three sections of the main school building's steel frame and a view of the school's Z-shaped footprint.

"This gave the steel erectors a flat, clean and dry surface to run their MEWPs along during their programme, which helped to ensure they completed the work on schedule," adds Mr Hawkins.

The main school building is a sort of Z-shaped structure with a full-height atrium, containing the dining room and a sixth form social area, at its centre.

Next to the dining area there is an activities hall, which is a double height space and represents the only part of the main school building that is two-storeys high. Forming this area's column-free space, is a series of 12m-long UB roof rafters.

The classrooms generally radiate outwards, on all three floors, from the main atrium and tend to have regular widths, although some are longer than others.

As the plan shape of the school is not very regular, some of the steel connections are not at 90 degrees to each other.

"This is where our BIM project collaboration was useful, as it allowed these details to be inspected closely," explains Mr Moynihan.

Adding architectural interest to the lower parts of the main school building, some columns are circular hollow sections that will remain exposed in the completed scheme. On the upper floor, these members will not be on view and consequently they change to standard UC sections.

Within the building there are several stair cores and a lift core. The stair cores are steel-framed with precast stairs, while the lift core also has a steel frame for construction continuity. It has block infill walls to facilitate the installation of fixings for the lift equipment.

The cores, however, do not provide the structure with its stability, this is predominantly provided by bracing, which was required during the construction phase as well as in the completed form.

The cross bracings are located within the classroom partition walls, while roof bracing is placed within the ceiling voids. However, due to the high number of windows, bracing has not been viable in many locations and so some moment resisting continuous frames have been installed.

The main school building and the two-storey part of the sports hall have both used a precast flooring solution supported by steel beams.

"The precast floors work well with steel in terms of quality control and speed. Metal decking with concrete was considered, but tends to be too thin for the multitude of uses we required," says Mr Moynihan.

Visualisation of the completed school.

The installation of the precast flooring planks required a lot of coordination between steelwork contractor H Young Structures and the project's precast concrete installer.

The steelwork was generally erected to the full height of the structure, with the roof elements left off to allow the planks to be lifted into place. Once the flooring was installed, H Young Structures' team followed on behind to complete the steel frame.

Summing up, Ms Cardus, Executive Headteacher of Barton Court Academy Trust says: "The school is a truly exciting project for Barton Court Academy Trust and the local community. It has been an amazing opportunity to design a school from inception which can deliver our vision for excellence, collaborative learning and creativity.

"The Trust has named the new school Barton Manor School and it will provide Canterbury and the local area with much needed secondary school places." ■

The project's first steel elements are lifted into place.

Steel serves up store refurbishment

A famous department store in Dublin is being refurbished with structural steelwork to form the centrepiece of a new mixed-use development.

New steel-framed floors are being added to the existing structure.

The completed Clerys Scheme will create a new landmark destination for the north side of Dublin's Liffey River.

"We needed a lightweight efficient method to form the new floors, which would not require us to have to install new foundations in the confined existing basement."

Originally opened in 1853, Clerys department store was for many years a Dublin landmark, so much so that the pavement below its grand two-faced clock that hangs above the main O'Connell Street entrance became a famous rendezvous point, and not just for shoppers.

Unfortunately, the famous store permanently closed its doors in 2015, and now after laying idle for a few years a major refurbishment is in full swing that will bring the building back to life as the centrepiece of a new mixed-use development known as the Clerys Quarter.

Overall, the scheme comprises three main elements, the refurbishment and vertical extension of the historic store, and two new buildings to the rear, a 176-bedroom hotel and a new five-storey office block.

In the main redevelopment of the Clerys Building, as much of the original 1920s (the store was rebuilt after a devastating fire in 1916) building will be retained, although later internal interventions which occurred in the 1940s and 1970s, such as the existing atrium infill and roof extension have been carefully demolished. The hotel and new office block are being built on areas previously occupied by two of these 1970's extensions.

'Clerys is a unique and iconic building, which was one of the world's first purpose-built retail department stores," says Waterman Moylan Associate Anthony Byrne. "Much of the work revolves around retaining the impressive Portland stone facade, while stripping back the partial third floor which holds it in position, and then adding new atrium infills, façade structures, three new long spanning steel-framed floors to the entire building, and a new long span feature curved roof."

In the completed scheme, the retained ground, first and second floors will once again be used for retail, while the new upper steel-framed levels will accommodate offices. The new steel-framed structure is supported independently from the original concrete frame on new columns placed sympathetically within the existing atrium and

FACT FILE
Clerys Quarter, Dublin
Main client: **Oakmount**
Architect: **Henry J Lyons**
Main contractor: **Glenbrier Construction**
Structural engineer: **Waterman Moylan**
Steelwork contractor: **Kiernan Structural Steel**
Steel tonnage: **1,800t**

around the building's perimeter to minimise the impact on the new and existing floorplates.

The new steelwork has had to follow the original structural grid around the perimeter, which revolved around a 6m and 7m column spacing. However, internally the new office floors have fewer columns and Westok cellular beams, up to 14m long, have been used to provide modern flexible office spaces.

Kloeckner Metals UK Westok Design Team Manager John Callanan comments: "The opportunity to help develop the built environment of O'Connell Street really is a once in a lifetime opportunity, and we're absolutely delighted to see the fruits of our design collaboration with Waterman Moylan and Kiernan Structural Steel take shape."

The ability to create the column-free spaces were one of the reasons for choosing a steel-framed solution with long span beams for the new levels, as was the material's lightweight attributes.

"We needed a lightweight efficient method to form the new floors, which would not require us to have to install new foundations in the confined existing basement," explains Mr Byrne. "We utilised a particular system of micro-piles and raft foundations to support the new steel-framed and concrete structures. These rafts were minimised to maintain a formation level above the existing ground water depth below the existing basement, mitigating the need for dewatering in gravel deposits under the adjacent structures."

As well as maintaining some continuity within the retained structure, it was important that the new steel columns and frame remained independent and did not connect to or touch the existing frame. This was required to eliminate the possibility of differential settlement, or any additional loading of the historic structure.

To overcome this challenge, the steel columns are intricately detailed to bridge the existing floor beams via a series of bespoke stiffened splice plates at each floor level.

Kiernan Structural Steel Engineer Mirivano Carrig explains: "The design for these elements took a considerable amount of time from both ourselves and Waterman Moylan to get a solution that was both structurally sound and could easily be installed on site.

"The detail transfers the forces from the column (above) down onto the column (below) all the while allowing the existing concrete beams to pass freely through the column's cross section."

The design of these bespoke pieces also had to take into account how they could be erected within the existing concrete frame.

To this end, the design team agreed that not only would the column be split between the different floor levels, but that the web of the column (from above) would be removed, thereby allowing the steelwork erectors to slot the column over the existing beam.

The plates consist of 70mm × 480mm × 2700mm sections on both flanges, with two 20mm × 200mm × 270mm stiffeners (fins) used on both plates in order to increase the stiffness so they could carry the loads without buckling.

Each splice contained around 50 M42 bolts with a further four M36 positioning bolts, which were used in vertically slotted holes to ensure that the (above) column flanges remained vertical during installation - thereby ensuring that the flanges were in contact. Each splice plate (per flange) weighs almost 900kg and like much of the steelwork, they will remain exposed in the completed project as architectural features.

No standard UC section could satisfy both the structural requirements and the space needed around the existing concrete beams and so the project's design incorporates plated column sections throughout, which had to cater for different sized existing beams on each retained level.

Consequently, there three different types of plated columns used on this project – the largest being 505mm-deep × 400mm-wide, with 40mm flanges.

Stability for the steel-framed floors and the retained portions of the existing structure is derived from three new concrete cores, all located within the new steel-framed atrium infill on ground, first and second floor level. These tie into the existing structure and support the new floors via a series of bespoke steel cast-in plates.

The atrium is centrally located within the development and its completed design features a glazed roof. The atrium is much larger than it previously was in the 1990s, as it has been stripped back to its 1920s version with all of the subsequent additions demolished as part of the early works.

The site's tower crane is also positioned in the atrium and this is providing some of the lifting capacity for the steelwork erection.

Working in conjunction with the tower crane are a number of MEWPs and selecting the correct machines was crucial on this scheme.

"Selecting the correct access equipment proved challenging due to the minimal permissible loadings on the existing slabs," says Mr Carrig.

"Spreader plates were used to distribute the weight of the MEWP's on the existing slab at level two, while one of the lightest self-propelled cherry pickers on the market was selected for use on the newly-poured slabs from level three up."

Summing up this unique project, Kieran Fay of Glenbrier Construction says: "Clerys, is a listed building from the 1920s, providing many challenges for Glenbrier and the team, but with a cohesive approach, design and construction work has progressed well on the project.

"The modern state-of-the-art design will undoubtedly enhance the mix of old and new within the building, while enhancing its atmosphere for the user and O'Connell Street itself, bringing character to Dublin's central quarter."

Clerys Quarter is due to complete in the third quarter of 2021. ■

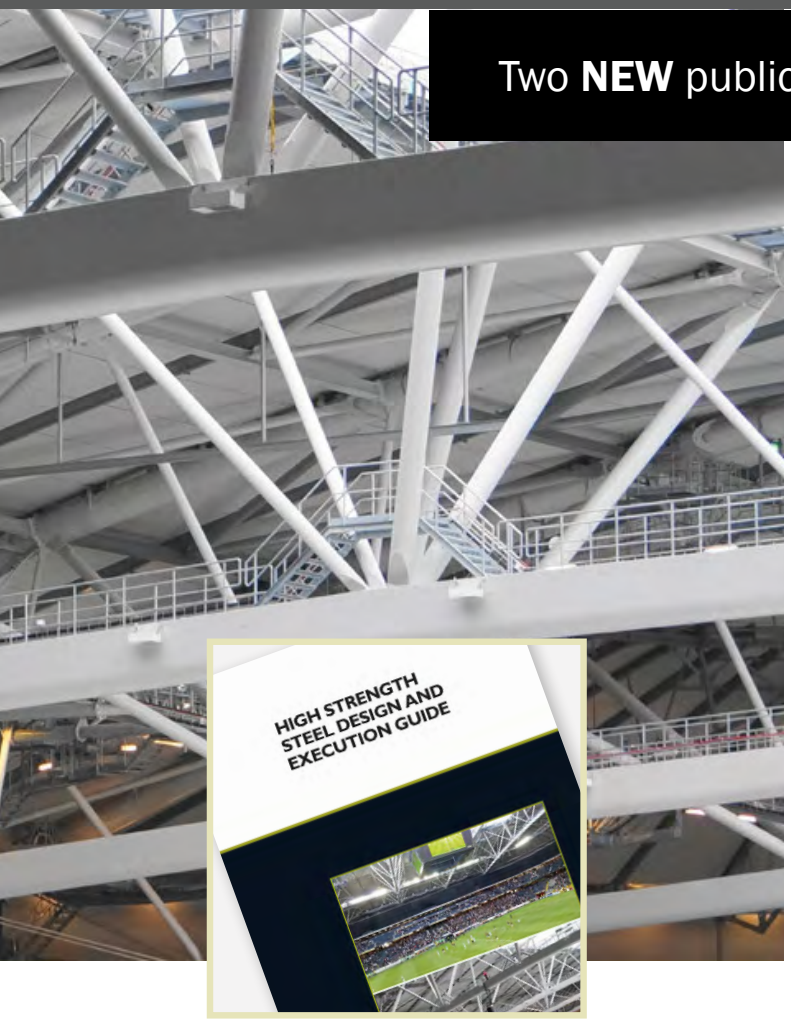
The new steel roof structure takes shape.

Bespoke stiffened splice plates allow new steel columns to bypass the existing floor beams.

Steel was chosen as it offered a lightweight solution that required minimal foundation work.

Cellular beams have been used for service integration.

Two **NEW** publications from **SCI**



High Strength Steel Design and Execution Guide (P432)

High strength steel can enable substantial savings in structural weight and material costs and is increasingly being used in a range of applications in the construction industry, particularly for heavy columns, transfer beams, trusses and bridge girders.

This new guidance provides advice for designers, fabricators, product manufacturers and clients on the selection, design and execution of high strength steel structures. It provides comprehensive guidance on when and how the benefits of steels with yield strengths from 420 to 700 MPa can be exploited in practical design situations in the construction industry. Information on product availability, execution and welding is also given.

Fire Resistance of Steel Sections Galvanized to EN ISO 1461 (P429)

Galvanized steel has been shown to have a lower surface emissivity than non-galvanized steel at temperatures below approximately 500 °C. The temperature of a galvanized steel section will therefore increase at a slower rate than that of an equivalent non-galvanized section, leading to increased fire resistance for fire exposure periods of up to around 30 minutes.

This new design guide provides tables to calculate fire resistances and maximum fire exposure periods for galvanized steel beams, composite beams, columns, and plates in tension, according to the Eurocodes and the UK and Irish National Annexes. Design tables in accordance with BS 5950 are also provided.

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FACT FILE
127 Kensington High Street, London
Main client: **AshbyCapital**
Architect: **Pilbow & Partners**
Main contractor: **ISG**
Structural engineer: **WSP**
Steelwork contractor: **Bourne Steel**
Steel tonnage: **425t**

The new steel frame extends the building to its new five-storey height.

Hybrid design creates landmark structure

A new steel frame, combined with retained concrete elements, both of which reuse existing foundations, is helping to create an economically-designed commercial and retail scheme in central London.

Erection work was challenging as the steel frame abuts the adjacent London Underground lines.

A £50M project to create a high-quality commercial and retail space is currently underway on one of London's most prestigious shopping thoroughfares.

Occupying the site of the former Pontings Department store which, along with Barkers and Derry & Toms, was one of the three renowned emporiums that once thrived in the vicinity, 127 Kensington High Street, which also fronts Wrights Lane, is a project that involves both new and old structures being combined to create a modern building.

"The original Pontings store was demolished and replaced with two newer structures in the 1970s and 80s. We have retained approximately 30% of these buildings and infilled and extended areas with a new steel frame, while also constructing two additional floors to the footprint," explains ISG Project Director Raymond Faulks.

Overall, the new steel frame represents around 40% of the new scheme, with the remaining 60% split between retained and new reinforced concrete elements. The new steel frame extends part of the new building to its new five-storey design, while the retained three-storey concrete parts have been extended to the same height with an additional new concrete frame.

Targeting a BREEAM 'Excellent' rating, the scheme will accommodate commercial space on all floors, but the ground level is split with retail space taking up the majority of the floorspace. An arcade splits the new building in half, with the north side of the ground floor accommodating a Boots store – which also occupies the basement - and the south side having six smaller retail units. The arcade will

"The reuse of the foundations was possible as a steel frame with composite metal deck offers a relatively light and economic construction solution, compared to other framing methods."

As well as creating a new Grade A commercial scheme with retail elements, the project will also provide a new entrance to High Street Kensington underground station.

also provide an access point from Wrights Lane to the adjacent High Street Kensington underground station.

Also positioned on Wrights Lane, the main entrance to the offices features a large 9m-high cruciform steel column that creates a 12m-span lobby. Although this part of the scheme is predominantly concrete-framed, a steel column was chosen because it was easier to install and for its aesthetic qualities, as like much of the steelwork, soffits and concrete elements, it will be left exposed within the completed structure.

Prior to construction work beginning on site, a thorough survey and examination of the site and the existing concrete-framed structure was undertaken. From this it was deduced that the existing foundations could be reused, with only minor enhancements if a steel frame was inserted into the areas that would need to be demolished in order to create the architectural design for the modern structure.

"The reuse of the foundations was possible as a steel frame with composite metal deck offers a relatively light and economic construction solution, compared to other framing methods," says WSP Engineer Dan Hagan.

Further explaining the rationale behind the project team's chosen methodology, Mr Faulks adds: "The decision to retain, reconfigure and extend, rather than demolish the existing building, has significantly reduced the project programme and showcases the benefits of close collaboration between all project stakeholders to innovate and seek the best possible outcomes."

The new building creates 12,081m² of Grade A commercial office space, much of which is accommodated within the new steel-framed portion of the scheme. The steel frame starts at basement level and is located to the east of the site, connecting to a retaining wall that separates the project from the London Underground lines that serve the adjacent High Street Kensington station.

The close proximity of Transport for London's assets was another reason for choosing a steel solution for this part of the scheme. Installing new piles for a heavier concrete frame, next to the underground lines, would have been problematic.

Prior to the new ground floor being installed, a series of temporary raking steel beams had to be positioned at basement level to support the site's retaining wall. Once the steel frame had advanced upwards and beyond the ground floor level, and support and stability for the retaining wall was achieved, the rakers were removed.

"This was quite a challenging procedure as the temporary steel needed to be installed in advance of the demolition being undertaken. The existing structure required the temporary works to be installed in locations that were within 50mm of the new structure in numerous areas.

"Many of the temporary beams and rakers were over 15m-long and needed delivering and removing through a very small lifting point. Early engagement and design with our specialist supply chain was key to this element being so successful," says Mr Faulks.

The new steel frame is mostly erected around a regular 7.2m column grid pattern, which follows the column spacing in the retained portion of the scheme. The steelwork supports metal decking to form a composite flooring solution.

The uppermost steel level (fifth floor) is set back from the remainder of the structure to form a large terrace. This uppermost roof level has been designed as a portal-framed pavilion, which connects to the frame below.

A new steel core has been erected within this area of the building. It provides stability not only to the steelwork, but also to the retained and new concrete elements of the scheme.

The nature of the project's hybrid design, means that throughout the building there are numerous interfaces between steel and concrete frames.

One large area with a number of such interfaces is a mezzanine floor, which is being installed within the double-height ground floor retail zone within the retained structure. This new floor level will be predominantly used as a back-of-house area.

"As the majority of the steelwork will be exposed in the final condition, appearance is vital, so a significant amount of time was spent at the design stage making sure that the frame not only performed from a structural perspective but also satisfied the architectural requirements," says Bourne Special Projects Deputy Divisional Director Craig Galway.

"This is further complicated as much of the steelwork needs to be erected in areas often inaccessible for the tower crane, so it has to be moved into position and erected using a variety of plant and techniques."

As well as creating new floors, steelwork is also being used to restore the historic street line along both the Kensington High Street and Wrights Lane elevations. The previous buildings were set-back from the basement walls, creating wider pavements. This unnecessary feature is being rectified with the addition of new steelwork to the retained portions of the structure. A new façade, 1.5-wide, is being added to the building.

ISG will also complete this new elevation using a handmade light grey brick along with Moleanos stone to provide a contemporary and architecturally sympathetic addition to this important London thoroughfare.

127 Kensington High Street is due to complete in late 2021. ■


A steel column is erected prior to being encased in concrete.

Stand up for Fulham

One of London's most famous football grounds is undergoing a significant redevelopment with the construction of a new Riverside Stand.

Situated on the banks of the River Thames, Fulham FC have played at Craven Cottage since 1896, making it one of the oldest continuously used stadiums in English football.

Renowned for its intimate atmosphere, as the fans are close to the pitch, the stadium has seen a number of changes over the years.

Of particular note was the opening in 1905 of the first stand designed by the celebrated stadium architect Archibald Leitch, which is still in use today as the Johnny Haynes Stand. Mr Leitch also designed the famous Cottage, a corner pavilion that was common at Scottish football grounds, and is one of the last remaining examples in English football.

The other sides of the ground have all seen changes over the years, most notably the construction of seated stands that replaced the standing terraces behind both goals.

Currently, the club is redeveloping the side of the ground opposite its famous Johnny Haynes Stand, the Riverside Stand, which as the name suggests backs on to the adjacent River Thames.

A new two-tiered stand will accommodate restaurants overlooking the river, events spaces, a health club complete with roof-top pool, a boutique hotel and a roof terrace. It will of course address the Club's operational and sporting requirements during the football season, but importantly also provide a new destination for local residents and visitors to the area on non-match days, providing new revenue streams for the client and reaffirming the stadium's position at the heart of the community.

Designed by architect Populous and engineered by WSP, the development is not just a sports structure, it also includes a transformation of the riverside walkway into a world class leisure destination; a pathway that will allow an uninterrupted walk along the banks of the River Thames between Hammersmith and Putney Bridges and a choice of amenities for visitors to enjoy throughout the year.

The project's main contractor Buckingham Group started on site during the summer of 2019, with the demolition of the old stand. This was followed by an extensive groundworks programme that included the installation of a new river wall that will facilitate the pathway.

A basement was excavated, work which saw approximately 45,000m³ of material leave the site by river, and then the plot was sheet piled and waterproofed.

Steelwork for the stand starts at basement level, and this area, along with a central core (there are

FACT FILE
Riverside Development, Craven Cottage, Fulham FC
Main client: **Fulham FC**
Architect: **Populous**
Main contractor: **Buckingham Group**
Structural engineer: **WSP**
Steelwork contractor: **Severfield**
Steel tonnage: **2,600t including all secondary steelwork and temporary fittings**

Roof trusses arrive by river transport and are lifted into place by a 400t-capacity crane positioned on a jack-up barge.

four stability-giving steel cores in total) were the initial parts to be erected. Once this stability-giving element was completed, steelwork contractor Severfield worked outwards in two directions from this central point to erect the majority of the structure.

According to Buckingham Group Project Manager Andrew Mackintosh, the reason for using this sequence of steel erection was because the central core risers provide a main distribution route to/from the plant deck enclosed within the roof envelope and getting this erected early has allowed the installation of this important equipment to commence early.

Overall, the steel-framed Riverside Stand is 113m-long × 30m-wide and 30m-high. It contains six internal levels, including the basement, and the steel design is mostly based around a regular 7.4m x 9m column grid. However, the extremely tight constraints imposed by the river and the field of play has meant that irregular column layouts have invariably been required to maximise the space within the building, which is also planned around hospitality, health club and hotel uses.

▸20

Roof stability

Photo: Andy Heffer, WSP Structures

The roof structure is formed by 16 main cantilever trusses that feature tapered plate girders towards the front edge. Out-of-plane forces acting longitudinally along the roof are resisted through bending in each of the triangulated roof column sets that cantilever from the superstructure below and support the root of the trusses.

Having no lateral cross-bracing was a key architectural driver. So, the in-plane overturning effect from the cantilever roof as well as transverse wind loads are resolved through axial loads in the same column sets that are propped at level five by the raking beams that support the seating tier.

A portion of the overturning moment is also resisted by columns forming a Vierendeel frame that runs from the top of the roof down to ground floor. Horizontal components of the axial forces within the raker beams are brought into the floor diaphragms through tie beams at each level with vertical loads taken through the building columns.

Much of the overturning moment is reduced at level two where the Vierendeel frame forms a knee joint before combining into a V-column arrangement at ground level. This feature, which developed from a desire to keep intrusion on the river walk to minimum, serves to reduce the lateral forces by using the buildings own dead weight to counteract the overturning moment in the roof.

Visualisation of the completed Riverside Stand.

The new stand will enhance supporters' match day experience with a host of facilities.

▸19 Consequently, at either end of the stand the column spacings take on a far more irregular configuration as this part of the structure accommodates the hotel, swimming pool, gym and conference rooms. Like many stadiums, the tiers are formed with steel rakers that support precast terracing units.

WSP Associate Director Andy Heffer says a number of material options were initially investigated for the scheme, but steel is the traditional choice for large cantilever roof structures, which the stand has, while steelwork was chosen for the main structure and tiers because of the unique logistical constraints of the site.

"In order to improve the programme many previously concrete designed elements, such as the cores, were changed to steel and this has allowed the project to be constructed in a partly top-down sequence with steel columns springing directly from basement pile caps. This then allowed the steel frame to get underway with the concrete basement slab and buried drainage works undertaken after the frame was erected."

The form of the building is said to have been designed to echo the gentle curve of the river. Its glass façade will allow natural light into the interiors, providing stunning views from every level, while the roof structure is supported by steelwork to create the striking visual effect of the roof floating in the air, high above the seating tier.

The construction of the Riverside Stand's roof, involves the installation of a series of 35m-long steel trusses, which taper down from a maximum depth of 5m (see box, previous page).

"In order to improve the programme many previously concrete designed elements, such as the cores, were changed to steel."

Because the site is extremely confined with little or no room for materials to be stored, the trusses have been assembled at a satellite site in Tilbury Docks.

"The roof trusses were assembled at the Docks into seven pairs that included all secondary steelwork. They were also fire protected and partially clad, before being floated upriver by barge," explains Severfield Senior Project Manager Gary Dooley.

The journey upriver from Tilbury to Fulham had to be meticulously planned and arranged around low tide. The River Thames, all the way up to Fulham and beyond, is subject to tidal movements and during high tide the trusses would have been too high to navigate under some of the river's bridges.

Once the trusses had arrived at the construction site, they were lifted into place using a 400t-capacity crane positioned on a jack-up barge moored in the river.

Each pair of trusses weighed approximately 50t and the gaps between each pair were infilled as the erection sequence progressed.

In order to achieve the project's elegantly designed roof, there are supporting columns set-back at each end. To cover the extreme ends of the seating, additional gable trusses, which cantilever 4m beyond the final main truss have been added. These were lifted into place attached to a pair of trusses, creating two slightly heavier pre-assembled triple elements.

In conclusion, Mr Mackintosh says: "During this difficult time, our project team has successfully and rapidly adapted to new remote working practices for design coordination and collaboration in order to keep this scheme on schedule.

"Buckingham Group, alongside WSP and Severfield have made use of model sharing, via MS Teams, Navisworks and other online services, highlighting how everyone has embraced the new working 'normal'." ■

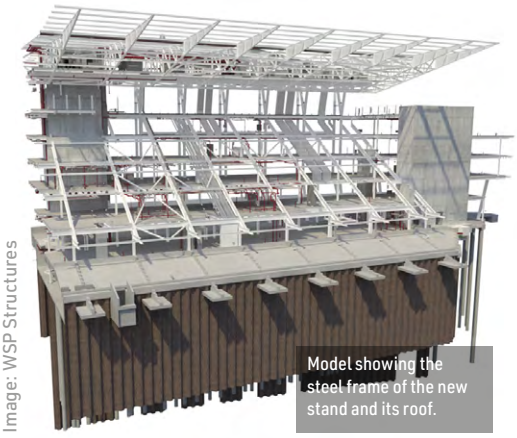

Model showing the steel frame of the new stand and its roof.

Image: WSP Structures


Due to onsite constraints, roof trusses are assembled at Tilbury Docks before being transported to site by barge.


Feature columns adorn the river side of the new structure.

Photo: WSP Structures

Fulham Stadium

The vertical Vierendeel trusses help to manage the overturning from the cantilevering roof trusses. Richard Henderson of the SCI discusses some features of the behaviour.

Vertical Loads

Between the stability cores, the cantilevering roof trusses apply a bending moment to the top of the vertical Vierendeel trusses spanning between levels 2 and 5. Arranged in storey-height rectangular panels, the spaces along the façade are uninterrupted by bracing. A more usual arrangement of a vertical cantilever truss, used for stability bracing for example, would involve the columns continuing to the ground with a tension and compression applied to the foundations when resisting overturning. In this case, at level 2, the columns rake under the cantilever roof and come together at a common node closer to the line of action of the roof load, thus increasing the reaction at this point. The floor loads applied to the Vierendeel columns provide a restoring moment.

The inclined beam supporting the seats props the Vierendeel truss at level 5. The horizontal prop force in the inclined beam is carried in shear by the vertical truss and is resolved at level 1. This simplified description of the behaviour ignores any effect of propping from the intermediate floors, the magnitude of which is determined by the relative in-plane stiffness of the diaphragms and the bending stiffness of the truss.

Lateral Loads

The prevailing south westerly wind loads on the stand add to the overturning effect of the roof trusses. When the wind is north-easterly, the overturning from the weight of the roof is countered as the wind will tend to apply an uplift to the projecting structure. The horizontal loads due to wind are transferred through the floors by diaphragm action to the stability cores and do not add to the shear force carried by the Vierendeel trusses.

Effect of Vierendeel Action

The absence of diagonal bracing in the vertical trusses means that half the prop force is carried in each column in shear. At the floor levels, the

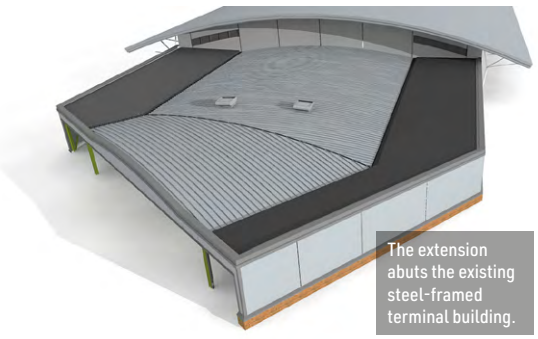
column to beam joints are rigid and carry a significant bending moment as well as the axial load. The effect of the combined bending and axial load means the column elements are substantial. The magnitude of the prop force and therefore the column bending moment can be controlled by adjusting the rake of the columns from level 2 to the common node at the ground floor.

Extension cleared for take-off

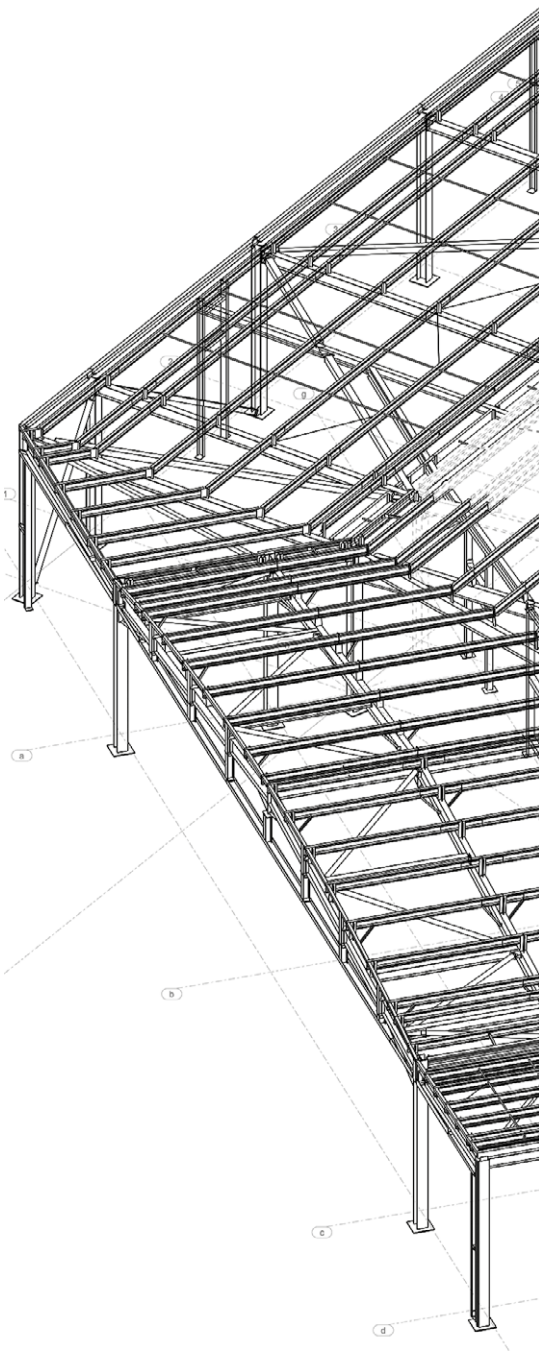
London Southend Airport is forging ahead with its expansion plans that include an extension to the terminal building's baggage area.

As well as erecting the main frame, Border Steelwork Structures also installed the wall and roof cladding.

Due to the shape of the structure, column spacings vary accordingly.



The extension abuts the existing steel-framed terminal building.



Prior to the aviation downturn caused by the ongoing COVID-19 pandemic, London Southend Airport was reported to be the UK's fastest growing airport and in 2017 there was a 29% increase in passenger numbers taking the figure to more than one million.

It is said that the Essex airport has capacity to comfortably handle five million passengers in the near future and take up the slack over the next decade before a prospective third runway opens at Heathrow.

As part of a multi-million-pound ongoing masterplan, the airport owner Stobart Group has lengthened the runway to enable larger aircraft to use London Southend Airport, as well as carrying a number of alterations and expansions to its main terminal building.

The steel-framed terminal building was constructed nine years ago, as the Airport geared itself up as a convenient gateway for the London 2012 Olympic Games (see NSC March 2011).

One of the important elements of the Airport's plans for its terminal building is an extension to its haul baggage shed (HBS).

"The extension is required in order to comply with Department for Transport regulations to screen luggage using Standard 3," explains XYZ Rail & Civils Senior Project Manager Roy Hill.

"As the Airport grows it needs to have the latest Standard 3 security X-ray equipment in the HBS, so we are building an extension that wraps around the existing area on three sides to house these new machines as well as an extension to the conveyor system."

The existing terminal building is a steel portal frame structure, and so is the extension, which consists of moment connection portal frames constructed from 254 UCs and 406 UB main rafters.

The extension structure abuts the existing terminal building, but there is no connection between the two steel frames, which are both structurally independent.

"Once the cladding has been installed the two will blend and look like one complete building," adds Mr Hill.

Before the steelwork erection for the extension could begin, a groundworks programme had to be completed. The work included the installation of approximately 50 piles, up to 15m in depth, and the casting of ground beams and the main concrete slab.

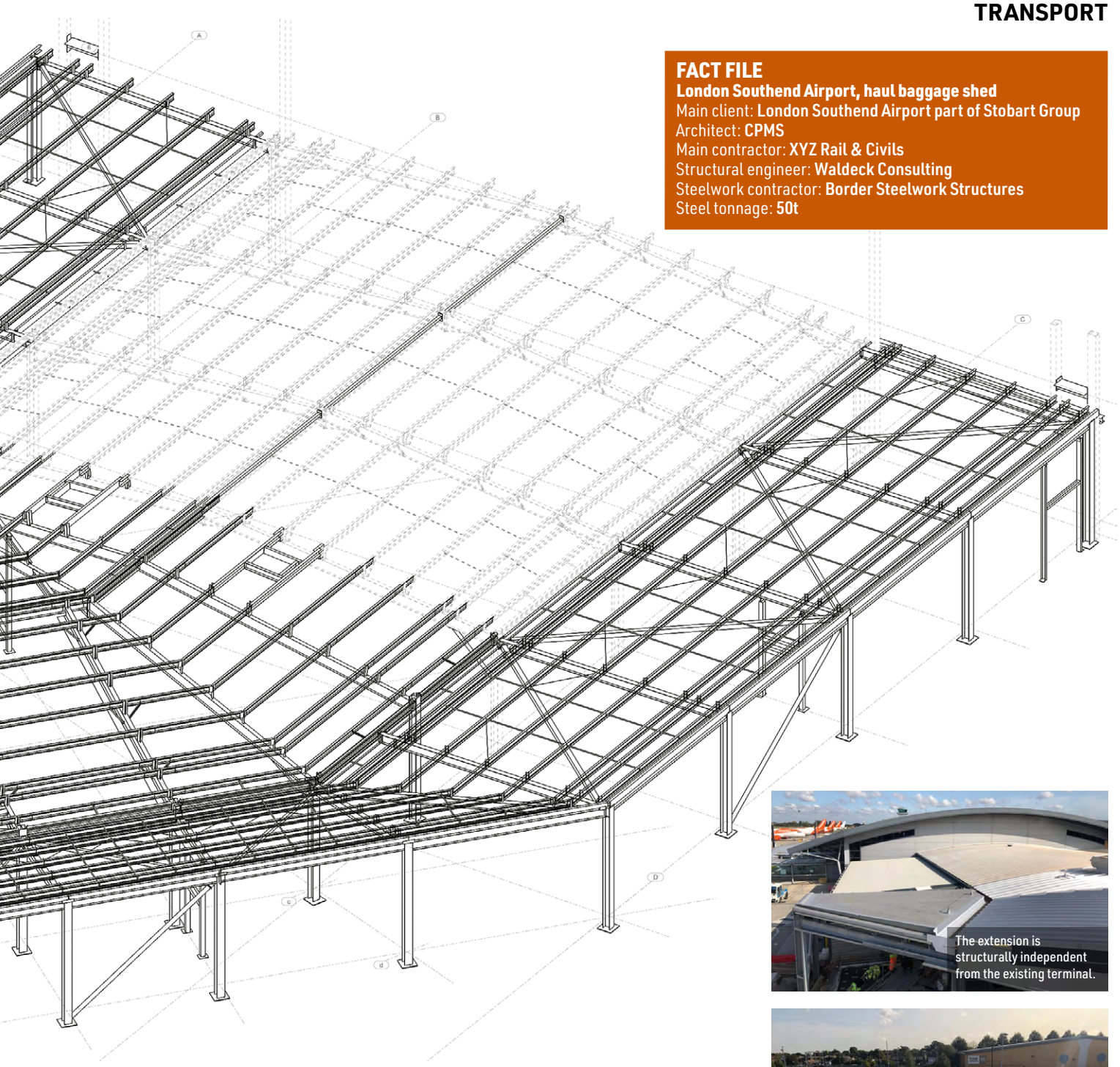
The subsequent steelwork programme was divided into two phases, with the first, which accounted for around four fifths of the overall total, erected prior to the first COVID-19 lockdown in March 2020. The project's steelwork contractor, Border Steelwork Structures (BSS), also installed the extension's cladding, 80% of which was also complete before the lockdown.

With easing of restrictions, the phase one cladding was completed in August.

The phasing of the steelwork and cladding installation was necessary as the Airport had to maintain its baggage capacity throughout the works. A temporary baggage carousel, installed to boost capacity before the extension comes online, had to be removed prior to the phase two works beginning.

The HBS wrap-around extension measures

FACT FILE
London Southend Airport, haul baggage shed
Main client: **London Southend Airport part of Stobart Group**
Architect: **CPMS**
Main contractor: **XYZ Rail & Civils**
Structural engineer: **Waldeck Consulting**
Steelwork contractor: **Border Steelwork Structures**
Steel tonnage: **50t**



The extension is structurally independent from the existing terminal.

Steelwork has delivered the project's required speed of construction.

Construction work is being carried out around the activities of a live airport.

approximately 47m-long × 39m-wide with a maximum height of 5.2m. Although it is independent of the main structure, it does connect to the existing baggage handling structure's canopy.

The main portal span is 22m-long, while column bay spacings vary due to the shape of the structure, but they are mainly 6.85m.

One side of the frame has a large opening for baggage vehicles. This part of the extension will have exposed columns, which need to be protected against vehicular impact load.

Explaining the stability system for the standalone extension, BSS Technical Manager Ian Elliott says: "The lateral load induced by the wind will be transferred to the columns via the external cladding and then down to the piled foundations situated in the bearing strata.

"Lateral stability is provided in-plane by the moment resisting connections of the portal frame structure. Out of plane lateral stability is provided by vertical bracing located on two sides of the extension structure."

The installation of the steelwork and the cladding was done using the site's tower crane and one mobile crane.

Because of the proximity of the functioning airport, the cranes had to be positioned so they did not over-slew any areas outside of the construction site, while a maximum height of any lifting operations was also enforced.

"We are continually liaising with the Airport authorities, to iron out any potential problems," says Mr Hill. "We have a security fence around our site which effectively seals us off from the airfield and the 'live' environment, keeping all of our operations landside."

Phase two of the steelwork and cladding was completed during December, and construction work on the extension is due to complete in March.

A fit-out programme is then due to begin in June, with the new and enlarged HBS coming into full operation later this summer (2021). ■

New Guidance on fire resistance of galvanized steel sections

By Dr Francisco Meza, Principal Engineer, SCI

Introduction

Galvanizing to EN ISO 1461[1] is commonly used to provide protection against corrosion for a wide variety of steel components, ranging in size from nuts and bolts to large structural sections. The process involves dipping steel components into molten zinc (which is usually around 450°C) for a few minutes. Unlike a paint coating, the metallurgical bond that is formed through galvanizing becomes part of the steel itself and is not merely a chemical or mechanical bond. As a result, galvanized steel not only provides corrosion protection but also has a high resistance to mechanical damage during handling, storage, transport and erection.

The zinc protective layer also provides a reduced surface emissivity of the steel component, which influences the rate at which the temperature of a steel section increases when exposed to a source of heat. Laboratory and full-scale testing[2,3], have demonstrated that below approximately 500°C, the galvanized coating remains stable, and its surface emissivity is around half of that for non-galvanized steel. A galvanized steel section will therefore heat up at a slower rate than an equivalent non-galvanized section which means an increased duration of fire resistance or increased load bearing resistance for a given fire exposure period.

Temperature increase of a steel member under fire conditions

Heat transfer to a steel member is predominantly by two mechanisms — radiation and convection. EN 1993-1-2[4], clause 4.2.5.1 gives a simple heat transfer model, which is used to determine the increase in temperature of a steel member $\Delta\theta_{a,t}$ over a small time interval Δt of no larger than 5 seconds. This simple heat transfer model is given by equation (1).

$$\Delta\theta_{a,t} = k_{sh}\frac{A_m/V}{c_a\rho_a}\dot{h}_{net}\Delta t \ [K] \qquad \text{Eq. (1)}$$

where:

$\dot{h}_{net}$ is the design value of net heat flux per unit area [W/m²]

c_a is the specific heat of steel [J/kgK]

ρ_a is the density of steel [kg/m³]

$\frac{A_m}{V}$ is the section factor of the member, per unit length [m⁻¹]

k_{sh} is a correction factor, commonly attributed to the shadow effect of flanges

Equation (1) has to be solved following an iterative procedure because the specific heat c_a and the net heat flux $\dot{h}_{net}$ are both temperature dependent. The temperature reached by a steel member at a given time in a fire can then be determined by summing the small increments in temperature $\Delta\theta_{a,t}$ over the total time of fire exposure.

The net heat flux $\dot{h}_{net}$ to the surface of a steel member is given in EN 1991-1-2, clause 3.1 as the sum of the heat transfers by convection $\dot{h}_{net,c}$ and by radiation $\dot{h}_{net,r}$, expressed as:

$$\dot{h}_{net} = \dot{h}_{net,c} + \dot{h}_{net,r} \qquad [W/m^2] \qquad \text{Eq. (2)}$$

The convective heat flux is calculated as:

$$\dot{h}_{net,c} = \alpha_c(\theta_g + \theta_a) \qquad [W/m^2] \qquad \text{Eq. (3)}$$

where:

Galvanized steel carpark at Sky Headquarters (London). Photo: Philip Durrant

α_c is the coefficient of heat transfer by convection, taken as $\alpha_c = 25$ [W/m²K] when the standard temperature-time curve is used

θ_g is the gas temperature in the vicinity of the fire exposed member [°C]

θ_a is the surface temperature of the member [°C]

The radiant heat flux is calculated as:

$$\dot{h}_{net,r} = \phi\,\varepsilon_m\varepsilon_f\,\sigma[(\theta_r + 273)^4 - (\theta_a + 273)^4] \ [W/m^2] \qquad \text{Eq. (4)}$$

where:

ϕ is the configuration factor, conservatively taken as 1.0

ε_m is the surface emissivity of the member

σ is the Stephan Boltzmann constant, $\sigma = 5.67 \times 10^{-8}$ [W/m²K⁴]

ε_f is the emissivity of the fire, which is generally taken as 1.0

θ_r is the effective radiation temperature of the fire environment, which for fully fire engulfed members may be taken as $\theta_r = \theta_g$ [°C]

θ_r is the surface temperature of the member [°C]

The density and specific heat of galvanized steel is the same as that of non-galvanized steel, and they can be determined in accordance with EN 1993-1-2, clauses 3.2.2 and 3.4.1.2, respectively. The surface emissivity of non-galvanized steel is given in EN 1993-1-2, clause 2.2 as $\varepsilon_m = 0.70$ for all temperatures. An emissivity value for galvanized steel has now been derived from studies by a number of European researchers, and an amendment to EN 1993-1-2 will be included in the next revision of the standard (due to be published in about 2023) in which the surface emissivity for galvanized steel will be given as:

$\varepsilon_m = 0.35$ for $\theta_a \leq 500$°C

$\varepsilon_m = 0.70$ for $\theta_a > 500$°C

Therefore, when calculating the increase in temperature of a galvanized steel member, all the required parameters (with the exception of the surface emissivity) are the same as those used to determine the increase in temperature of a geometrically equivalent (i.e. same section factor A_m/V and correction factor k_{sh}) non-galvanized steel member. The slower temperature increase in a galvanized steel member is therefore only due to the lower radiant heat flux introduced, as shown by equation (4).

▸26

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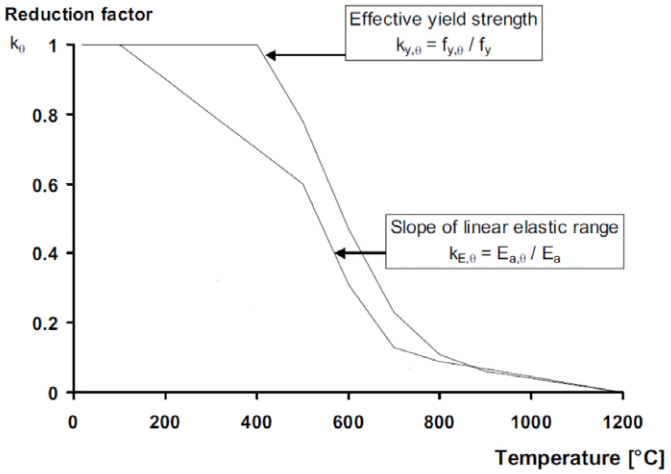

Figure 1: Strength and stiffness reduction factors of steel at elevated temperatures

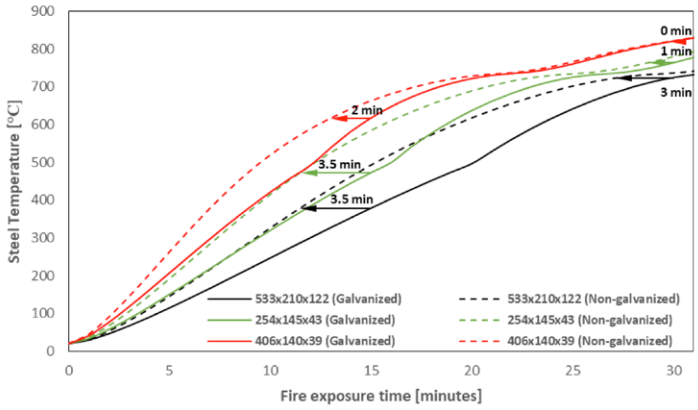

Figure 2: Temperature rise of galvanized and non-galvanized steel sections subject to the standard nominal fire curve

24 Fire resistance

The design resistance of a steel member in fire is determined in a similar manner as the design resistance at room temperature, with an allowance made for the reduction in the relevant mechanical properties of the steel at elevated temperatures. When the resistance is not governed by member instabilities, such as the resistance of tension members, or the bending moment resistance of laterally restrained beams, the only material parameter affecting the resistance is the yield strength, and its reduction with temperature is accounted for through the reduction factor $k_{y,\theta} = f_{y,\theta} / f_y$, where $f_{y,\theta}$ is the yield strength at elevated temperature, and f_y is the yield strength at room temperature. When the resistance is governed by member instabilities, such as columns susceptible to flexural buckling, the resistance is also affected by the reduction in stiffness of the steel with temperature, which is accounted for through the reduction factor $k_{E,\theta} = E_{a,\theta} / E_a$, where $E_{a,\theta}$ is the slope of the linear elastic range at elevated temperature, and E_a is the modulus of elasticity at room temperature.

EN 1993-1-2, Table 3.1 gives values for $k_{y,\theta}$ and $k_{E,\theta}$ at discrete temperatures ranging from 20°C to 1200°C. These are shown in Figure 1, and are applicable to both galvanized and non-galvanized steel. Therefore, for a given fire exposure, the slower temperature increase in galvanized steel can be expected to lead to structural members with a higher fire resistance than an equivalent non-galvanized steel member. Or put in other words, when subject to the same loading conditions, a galvanized steel member can be expected to achieve a longer fire exposure than an equivalent non-galvanized steel member.

Benefit of using galvanized steel in fire

The benefit of utilizing galvanized steel members for fire resistance is apparent in structures that require short fire resistance periods, that is, 15 or 30 minutes of fire exposure, where the temperature reached by the galvanized steel members is around 500°C. Examples of structures that require such fire resistance periods include car parks and single-storey residential/office buildings[5]. There may also be benefit in using galvanized steel for other types of structures, such as single storey industrial buildings or some multi-storey office buildings, where the use of sprinklers may enable a reduction of the minimum fire period to 30 minutes.

Another important factor that affects the rate at which the temperature in a steel member increases is the section factor. In EN 1993-1-2, the section factor is defined as the surface area of the member exposed to a fire per unit length, A_m, divided by the volume per unit length, V. Therefore, a beam exposed to a fire on four sides has a higher section factor than an equivalent one exposed on three sides. This factor has the same effect irrespective of whether the section is galvanized or non-galvanized, as it only depends on the geometric proportions of the cross-section.

Figure 2 compares the rise in steel temperature of galvanized and non-galvanized steel beams for three different Universal Beam sections

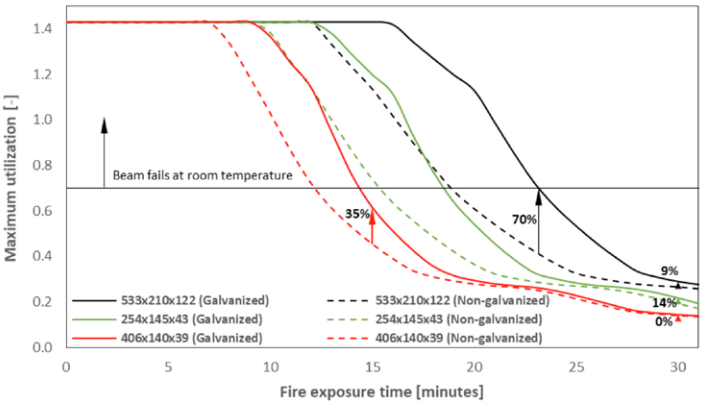

Figure 3: Fire resistance of galvanized and non-galvanized steel beams exposed to fire on three sides as a function of time

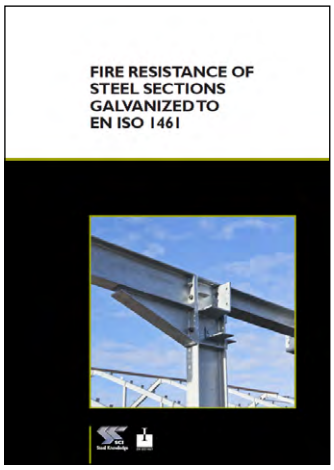

Figure 4: New SCI publication (P429) for the fire design of galvanized steel members

(533 × 210 × 122, 254 × 146 × 43, 406 × 140 × 39) exposed to fire from three sides with section factors $k_{sh}\,[A_m/V]_m$ of 75 m^{-1}, 109 m^{-1} and 170 m^{-1}, respectively. The figure shows that by using galvanized steel, the maximum fire exposure can be increased by up to 23 %. If the gains in fire exposure time using galvanized steel are translated into increased resistance, the advantages are more pronounced. Figure 3 shows that for the steel beams discussed, the resistance (or utilization) at 15 minutes fire exposure can be increased by up to 35 % as a result of galvanizing.

SCI publication for the design of galvanized steel members in fire

As shown here, the process of designing a steel member in fire is made complicated primarily due to the need to know the temperature of the member at the time of interest. This is in essence an iterative process which requires solving equation (1) hundreds of times. SCI has recently published a design guide which greatly simplifies the design of galvanized steel members in fire, avoiding any need for iteration[6] (Figure 4). The publication includes design tables to calculate fire resistances and maximum fire exposure periods for galvanized steel beams, composite beams, columns, and plates in tension, according to the Eurocodes[4,7], and the UK and Irish National Annexes. Design tables in accordance with BS 5950[8] are also provided. The design tables clearly show where the use of galvanized steel leads to an increase in fire resistance or fire exposure compared to non-galvanized steel. Worked examples are also provided to illustrate the use of the tables.

The publication is available as a free download from the SCI bookshop and Steelbiz (*https://portal.steel-sci.com/shop.html*) and Galvanizers Association website (*https://www.galvanizing.org.uk*)

References

[1] EN ISO 1461: 2009 Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods, CEN, 2009

[2] HEINISUO, M. Effect of zinc coating to the resistance of WQ-beam bottom flange in fire, Tampere University of Technology, 2014

[3] GAIGL, C. and MENSINGER, M. Fire resistance of galvanized structures, 25th International Galvanizing Conference (Intergalva 2018), Berlin, Germany, 2018

[4] EN 1993-1-2: 2005 Eurocode 3: Design of steel structures – Part 1-2: General rules -Structural fire design, CEN, 2005

[5] The Building Regulations 2010 Approved Document B: Fire safety (Amendments to the Approved Documents 2019 edition), HM Government, UK, 2020

[6] MEZA, F. and BADDOO, N. Fire resistance of steel sections galvanized to EN ISO 1461 (P429), SCI, 2020

[7] EN 1994-1-2: 2005+A1:2014 Eurocode 4: Design of composite steel and concrete structures – Part 1-2: General rules – Structural fire design, CEN, 2014

[8] BS 5950-8: 2003 Structural use of steelwork in building – Part 8: Code of practice for fire resistant design, BSI, 2003

AD 458:
Web panel shear resistance

This AD relates to a bolted moment-resisting connection and the determination of the shear force in the column web panel, and in particular the selection of a lever arm as part of that calculation. In the following advice, the axial force in the beam is assumed to be zero, for simplicity.

In a moment resisting connection designed in accordance with BS EN 1993-1-8, the total tension, being the summation of the force in each bolt row, cannot exceed the resistance of the compression zone, or the shear resistance of the column web panel. If necessary, the forces in the bolt rows are reduced.

The moment resistance of the connection is then calculated by multiplying the resistances of the bolt rows (reduced if necessary) by their lever arms. The connection resistance is then compared to the applied moment.

It should be noted that in this process, the *resistance* of the connection is calculated.

If the resistance if the column web panel was limiting the development of tension in the bolt rows, and thus limiting the moment resistance of the connection, it may be appropriate to reinforce the column web panel. This requires knowledge of what the applied shear force is. Although this sounds straightforward, the process described above determines the resistances, not the applied forces.

In many cases, especially if the resistance of the connection is not greatly in excess of the applied moment, it would not be too conservative to assume the applied shear force to be equal to the summation of the bolt row resistances.

If more effort is worthwhile, BS EN 1993-1-8 clause 5.3(3) specifies that the applied shear force is given by the applied moment, divided by a lever arm, z. Note that this correctly relates to the applied moment, not the moment *resistance*.

The lever arm, z, is determined via a forward reference to clause 6.2.7, which in turn refers to Figure 6.15. The bottom row in Table 6.15 covers bolted connections with two or more bolt rows in tension – the common case. Two alternatives are given for the lever arm z:

1. The distance from the centre of the compression flange to mid-way between the two furthest bolt rows, and,
2. A "more accurate" value, taken as z_{eq} from the method described clause 6.3.3.1

Clause 6.3.3.1 covers the calculation of joint stiffness; the calculation of z_{eq} is part of the process. It is very likely that the "more accurate" value z_{eq} is smaller than the dimension described in (1) above, and thus would produce a higher shear force.

If designers are calculating the shear force in the web panel based on clause 5.3(3) they should be careful to use the "more accurate" value, as use of the approximate value is not always conservative. Calculation of the "more accurate" value is not without its own challenges, so designers should remember that assuming the applied shear force to be equal to the summation of the bolt row *resistances* will be conservative, and probably economical in terms of design effort.

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

New and revised codes and standards

From BSI Updates January 2021

BS EN PUBLICATIONS

BS EN 17412-1:2020
Building Information Modelling. Level of Information Need. Concepts and principles
no current standard is superseded

BS EN 17423:2020
Energy performance of buildings. Determination and reporting of Primary Energy Factors (PEF) and CO_2 emission coefficient. General Principles, Module M1-7
no current standard is superseded

BS IMPLEMENTATIONS

BS ISO 20414:2020
Fire safety engineering. Verification and validation protocol for building fire evacuation models
no current standard is superseded

PUBLICLY AVAILABLE SPECIFICATIONS

PAS 79-1:2020
Fire risk assessment. Premises other than housing. Code of practice
supersedes PAS 79:2012

PAS 79-2:2020
Fire risk assessment. Housing. Code of practice
supersedes PAS 79:2012

BRITISH STANDARDS REVIEWED AND CONFIRMED

BS EN ISO 9972:2015
Thermal performance of buildings. Determination of air permeability of buildings. Fan pressurization method

BS EN 16687:2015
Construction products. Assessment of release of dangerous substances. Terminology

BS ISO 16540:2015
Corrosion of metals and alloys. Methodology for determining the resistance of metals to stress corrosion cracking using the four-point bend method

NEW WORK STARTED

EN ISO 11127-6
Preparation of steel substrates before application of paints and related products. Test methods for non-metallic blast-cleaning abrasives. Determination of water-soluble contaminants by conductivity measurement
will supersede BS EN ISO 11127-6:2011

EN 15941
Sustainability of construction works. Data quality for environmental assessment of products and construction works. Selection and use of data
will supersede PD CEN/TR 15941:2010

BS 40101
Building Performance Evaluation
will supersede None

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – ADOPTIONS

20/30426069 DC
BS EN ISO 3834-1 Quality requirements for fusion welding of metallic materials. Criteria for the selection of the appropriate level of quality requirements
Comments for the above document were required by 19 January, 2021

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FROM Building with Steel November 1970

framed in steel

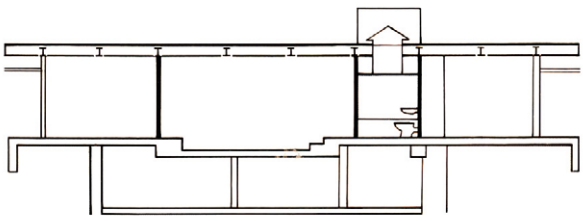
This latest house from Michael Manser has a structural steel frame as have many of his previous designs. The photographs show how the steel is an integral part of the building and contributes to its clean appearance and sharp detailing while the text gives brief details of the general design.

The owners Mr and Mrs J. M. Howard required a small weekend house in which they could live comfortably, all the time if necessary. The site is on high ground near Horsmonden and was part of the estate of Capel Manor, a grandiose Victorian mansion which was demolished after the war. All that remains of the previous structure are the foundations, the steps and ornate balustrade from one level to the other, and the shell of the original Winter Garden. These are all stone constructions and are quite stable.

The house is on the upper terrace from which there are long southern, eastern and western views, in particular to the hill top town of Goudhurst. The flat plateau on which the house is located is surrounded by forest trees and tiered banks of rhododendron bushes.

As the remains of the terrace and stone stairs gave a strong axiality to the site it was decided to place the new house on the axis and to put a swimming pool in the Winter Garden. The new house was lined up with the existing stonework in height and proportions and the design was kept simple.

1



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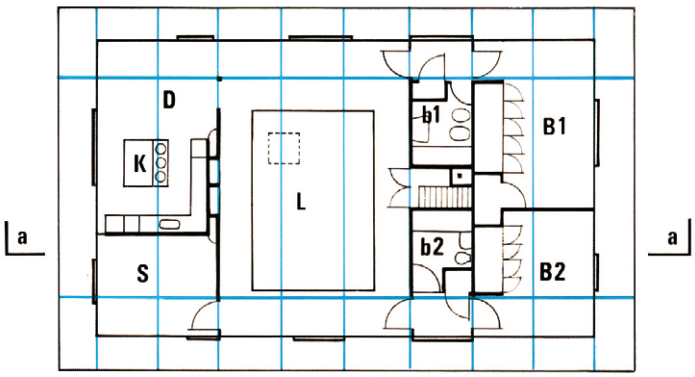

Plan at ground level showing steelwork over

2

3

Michael Manser had had considerable experience of steel-framed structures for houses and he has put this to use in the Howard house. The steelwork consists of roof members, perimeter and transverse, and four supporting columns. The structural elements are exposed and, as can be seen, their simple directness contributes greatly to the overall aesthetic. The columns sit on a concrete podium which is clad in dark blue quarry tiles. Under the podium is the cellar of the old house and this has been used for the furnace storage etc.

The walls are entirely bronze tinted glass with sliding panes where access is required. Heating is by ducted warm air supplied from the basement furnace.

4

1. The house seen across the swimming pool in the old winter garden
2. The terraces of the old house
3. Detail showing the perimeter steel and main beams
4. Interior showing the exposed steel beams
5. Kitchen with stainless steel worktop
6. Interior again showing exposed beams and the effect of the bronze tinted glass

Architects	**Michael Manser and Associates**
Structural Engineers	**Hockley and Dawson**
Quantity Surveyors	**Widnell and Trollope**

6

5

Capel Manor House in Horsmonden, Kent, is now widely regarded as one of the finest examples of Modernist architecture in the UK. It is Grade II* listed and has been designated a World Heritage Site. There is a scale model of the house in London's Victoria and Albert Museum.

Steelwork contractors for buildings

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

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

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

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- **D** High rise buildings (offices etc over 15 storeys)
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- **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
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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
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Notes
(1) Contracts which are primarily steelwork but which may include associated works. The steelwork contract value for which a company is pre-qualified under the Scheme is intended to give guidance on the size of steelwork contract that can be undertaken; where a project lasts longer than a year, the value is the proportion of the steelwork contract to be undertaken within a 12 month period.

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3		●	Up to £4,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●							●		✔	2	✔	●	Up to £3,000,000
Advanced Fabrications Poyle Ltd	01753 653617				●	●	●	●		●	●			●	●	✔	2			Up to £800,000
AJ Engineering & Construction Services Ltd	01309 671919			●	●		●		●	●	●			●	●	✔	4		●	Up to £3,000,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4			Up to £1,400,000*
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2			Up to £800,000
Arromax Structures Ltd	01623 747466			●	●	●	●	●	●	●	●				●		2			Up to £800,000
ASME Engineering Ltd	020 8966 7150			●	●	●		●		●	●			●	●	✔	4		●	Up to £4,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●			●	●			●	●	✔	2			Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2	✔	●	Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●			●	✔	4		●	Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £1,400,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●		●	●	✔	4	✔	●	Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		4			Up to £3,000,000
Bourne Group Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●		●	●	●	✔	4			Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●						●	✔	4		●	Up to £6,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●		●	●	●	●	●		●	●	●	✔	3		●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4		●	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✔	4			Up to £6,000,000
Cook Fabrications Ltd	01303 893011			●	●		●			●	●			●	●		2			Up to £1,400,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●	✔	4			Up to £1,400,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £40,000
D Hughes Welding & Fabrication Ltd	01248 421104				●	●	●	●	●	●	●		●	●	●	✔	4			Up to £400,000
Duggan Steel	00 353 29 70072	●	●	●	●	●	●	●	●		●				●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	4		●	Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	●	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●		●	●	●			●	✔	3		●	Up to £3,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●		●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●			●		●	●	●	●	●		●	●	●	✔	3		●	Up to £2,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●		●	●				●		2			Up to £2,000,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	2			Up to £1,400,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**FPC**	**BIM**	**SCM**	Guide Contract Value (1)

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
G.R. Carr (Essex) Ltd	01286 535501	●		●	●			●			●			●	●	✔	4			Up to £800,000
H Young Structures Ltd	01953 601881			●	●	●	●	●						●	●	✔	4	✔	●	Up to £3,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●	●	●			●	●	●	✔	3			Up to £3,000,000
J & A Plant Ltd	01942 713511				●	●									●		4			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●		●			4			Up to £6,000,000*
Kiernan Structural Steel Ltd	00 353 43 334 1445	●		●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4		●	Up to £6,000,000
LA Metalworks Ltd	01707 256290				●	●				●	●			●	●	✔	2			Up to £2,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		●	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
Littleton Steel Ltd	01275 333431				●					●	●			●	●	✔	3			Up to £1,400,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	4		●	Up to £3,000,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £2,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £1,400,000
Maldon Marine Ltd	01621 859000				●	●			●	●	●				●	✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						3			Up to £3,000,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £1,400,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●			●	●				✔	4		●	Up to £2,000,000
North Lincs Structures	01724 855512			●	●					●	●				●		2			Up to £800,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		●	Up to £6,000,000
Painter Brothers Ltd	01432 374400	●			●				●	●	●				●	✔	3			Up to £6,000,000*
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £1,400,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●				●	✔	3			Up to £2,000,000
S H Structures Ltd	01977 681931	●		●	●	●	●	●	●	●	●	●			●	✔	4	✔	●	Up to £3,000,000
SAH Luton Ltd	01582 805741			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
SGC Steel Fabrication	01704 531286				●					●				●	●	✔	2			Up to £200,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●		●			●				●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £2,000,000
South Durham Structures Ltd	01388 777350			●	●	●				●					●		2			Up to £800,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £1,400,000
Steel & Roofing Systems	00 353 56 444 1855	●		●	●	●	●				●	●		●	●	✔	4			Up to £4,000,000
Taunton Fabrications Ltd	01823 324266				●					●	●				●	✔	2		●	Up to £2,000,000
Taziker Industrial Ltd	01204 468080	●		●	●		●			●	●		●	●	●	✔	3			Above £6,000,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●			●	●			●	●	✔	2			Up to £400,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●			●	●	✔	3	✔	●	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●	●			●			●			2	✔		Up to £2,000,000
Underhill Engineering Ltd	01752 752483				●		●	●	●	●	●			●	●	✔	4	✔		Up to £3,000,000
W I G Engineering Ltd	01869 320515				●					●					●	✔	2			Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	4			Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●		●	●	●	●	●	●	●	●				●	✔	4		●	Up to £800,000
William Haley Engineering Ltd	01278 760591				●	●	●									✔	4		●	Up to £6,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

Steelwork contractors for bridgeworks

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

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

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

Notes

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

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

BCSA steelwork contractor member	Tel	FB	CF	SG	PG	TW	BA	CM	MB	SRF	FRF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
AJ Engineering & Construction Services Ltd	01309 671919	●			●	●	●	●	●			●	✓	4				●	Up to £3,000,000
Billington Structures Ltd	01226 340666	●		●	●	●	●					●	✓	4	✓	✓	✓	●	Above £6,000,000
Bourne Group Ltd	01202 746666	●			●	●				●		●	✓	4	✓		✓	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●	●	●	●		●	●	●	✓	4			✓	●	Up to £6,000,000
Cementation Fabrications	0300 105 0135	●		●	●	●	●					●	✓	3			✓	●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	●	✓	4			✓		Up to £400,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	●	✓	3			✓	●	Up to £1,400,000
ECS Engineering Services Ltd	01773 860001	●			●	●	●		●			●	✓	3				●	Up to £3,000,000
Four-Tees Engineers Ltd	01489 885899	●		●	●	●	●		●	●	●	●	✓	3			✓	●	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●			●	●				●	●	●	✓	4	✓		✓	●	Above £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●	●	●		●	✓	4			✓	●	Up to £3,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●	●	●	●	●	●					●	✓	4			✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £6,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	●	Up to £3,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499											●	✓	3					Up to £800,000
Structural Fabrications Ltd	01332 747400	●		●	●	●	●			●	●	●	✓	3				●	Up to £1,400,000
Taziker Industrial Ltd	01204 468080	●		●	●	●	●	●	●		●	●	✓	3		✓	✓		Above £6,000,000
Underhill Engineering Ltd	01752 752483	●	●	●	●	●				●	●	●	✓	4	✓		✓		Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●		●	✓	4	✓	✓	✓	●	Above £6,000,000
Non-BCSA member																			
Allerton Steel Ltd	01609 774471	●		●	●	●	●	●			●	●		4	✓				Up to £4,000,000
Centregreat Engineering Ltd	029 2046 5683	●		●	●	●	●	●	●	●	●	●	✓	4					Up to £2,000,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓		Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●	●	●	●		●	✓	4			✓	●	Up to £1,400,000
Ekspan Ltd	0114 261 1126	●				●			●	●	●	●	✓	2					Up to £400,000
Eiffage Metal	00 33 388 946 856	●	●		●		●	●	●			●	✓	4					Above £6,000,000
Francis & Lewis International Ltd	01452 722200											●	✓	4			✓	●	Up to £2,000,000
Harrisons Engineering (Lancashire) Ltd	01254 823993			●	●	●	●	●	●	●		●	✓	3		✓			Up to £1,400,000
Hollandia Infra BV	00 31 180 540 540	●	●	●	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000*
HS Carlsteel Engineering Ltd	020 8312 1879									●	●	●	✓	3			✓		Up to £200,000
IHC Engineering (UK) Ltd	01773 861734											●	✓	3			✓		Up to £200,000
In-Spec Manufacturing Ltd	01642 210716									●	●	●	✓	4			✓		Up to £800,000
Kelly's Welders & Blacksmiths Ltd	01383 512 517											●	✓	2			✓		Up to £200,000
Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £3,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●				●	●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000

Corporate Members

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

Company name	Tel
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	08457 504030

Company name	Tel
Inspire Insurance Services	02476 998924
Keiths Welding Limited	07791 432 078
Paul Hulme Engineering Ltd	07801 216858

Company name	Tel
Sandberg LLP	020 7565 7000
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.

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

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

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

SfL
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Structural components

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

Computer software

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

Steel producers

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

Manufacturing equipment

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

Protective systems

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

Safety systems

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

Steel stockholders

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

Structural fasteners

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

Welding equipment and consumables

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

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