www.newsteelconstruction.com

NSC

College cantilevers at Foyle

May 2016
Vol 24 No 5

Last link in Pancras Square

Supercomputer helps Met forecasts

New vibration guidance

Academy for Anstruther

Cover Image
Four Pancras Square, London
Main client: Argent
Architect: Eric Parry Architects
Main contractor: BAM Construction
Structural engineer: AKT II, BAM Design
Steelwork contractor: Severfield
Steel tonnage: 1,900t

NSC

May 2016
Vol 24 No 5

EDITOR
Nick Barrett Tel: 01323 422483
nick@newsteelconstruction.com

DEPUTY EDITOR
Martin Cooper Tel: 01892 538191
martin@newsteelconstruction.com

PRODUCTION EDITOR
Andrew Pilcher Tel: 01892 553147
admin@newsteelconstruction.com

PRODUCTION ASSISTANT
Alastair Lloyd Tel: 01892 553145
alastair@barrett-byrd.com

COMMERCIAL MANAGER
Fawad Minhas Tel: 01892 553149
fawad@newsteelconstruction.com

NSC IS PRODUCED BY BARRETT BYRD ASSOCIATES ON BEHALF OF THE BRITISH CONSTRUCTIONAL STEELWORK ASSOCIATION AND STEEL FOR LIFE IN ASSOCIATION WITH THE STEEL CONSTRUCTION INSTITUTE

The British Constructional Steelwork Association Ltd
4 Whitehall Court, Westminster, London SW1A 2ES
Telephone 020 7839 8566
Website *www.steelconstruction.org*
Email *postroom@steelconstruction.org*

Steel for Life Ltd
4 Whitehall Court, Westminster, London SW1A 2ES
Telephone 020 7839 8566
Website *www.steelforlife.org*
Email *steelforlife@steelconstruction.org*

The Steel Construction Institute
Silwood Park, Ascot, Berkshire SL5 7QN
Telephone 01344 636525 Fax 01344 636570
Website *www.steel-sci.com*
Email *reception@steel-sci.com*

CONTRACT PUBLISHER & ADVERTISING SALES
Barrett, Byrd Associates
7 Linden Close,
Tunbridge Wells, Kent TN4 8HH
Telephone 01892 524455
Website *www.barrett-byrd.com*


Cellular Power
Choose Jamestown cellular beams for strength and flexibility.
STEEL
for life
HEADLINE
SPONSOR
Made By
JAMESTOWN
www.jamestownprofiling.com
e: info@jamestownprofiling.com
t: +353 45 434 288
BCSA

Path to BIM clearly charted

Nick Barrett - Editor

Building Information Modelling Level 2 has been compulsory for use on all central government construction projects since 4 April. The government has thrown its weight strongly behind this move to promote more collaborative and efficient ways of working and has worked for four years to get the construction industry ready.

However it seems, if some of the surveys published on the eve of BIM's introduction are to be believed, that about two thirds of those surveyed believe the industry is not ready and is unable to comply with BIM requirements. Just over half the industry is reported to be actually using BIM, which is the same as two years ago, so there is little sign of a last minute rush to become compliant.

In contrast and as is well known, the steel construction sector has been well placed to support its clients in their drive towards BIM. Thanks to the early introduction of CNC equipment and the widespread use of 3D modelling software the sector is well on the way to BIM compliance. Benefits being reported from the new focus on BIM include better coordination of construction documentation, cost efficiencies, improved visualisation throughout the design and construction process, and happier clients.

Now, thanks to the launch of the BCSA's Steel Construction BIM Charter, steelwork contractors can formally demonstrate compliance with Level 2 BIM requirements. The good news for clients is that using a BCSA member that has signed up to the Charter is a simple and assured way of ensuring that they are meeting the government's BIM requirements.

The Steel Construction BIM Charter means BCSA Member companies can now be certified against the requirements of both PAS 91:2013 and PAS 1192-2:2013. So clients can be sure that, among other things, a BCSA member that has taken the steps to join the Charter is able to work on projects using a Common Data Environment.

They can take comfort from knowing that their constructional steelwork supplier has all the relevant documented policy, systems and procedures to achieve Level 2 BIM maturity, and complies with supply chain assessment requirements. Such a company will also have arrangements in place for training employees in BIM related skills and for assessing their capabilities.

The BCSA's BIM Charter certification process requires companies to carry out online assessments, which are followed up by onsite audits. The BCSA's online directories mean clients and main contractors can see which companies have been assessed against the BIM Charter.

The introduction of BIM has been hailed as the UK showing global leadership in a drive to digitize the construction industry. It is fitting that steel construction, a sector that is acknowledged as the world leader in its field, is leading this drive.

BCSA welcomes sale of Tata Steel long products division

The British Constructional Steelwork Association (BCSA) has welcomed the announcement of the sale of Tata Steel's Long Products Europe (LPE) business to Greybull Capital, possibly saving up to 4,400 jobs in the UK.

The BCSA said that a UK supply of high quality steel creates a competitive and efficient market, and supports the UK economy. The Association and its members have supported UK Steel's calls for a level playing field for UK steelmaking, and the government's new steel procurement requirements.

Director General, Sarah McCann-Bartlett said that procuring constructional steelwork from a UK or Irish steelwork contractor is the best way to support UK steelmaking.

Greybull will take on the entirety of Tata Steel UK's steelworks operations in Scunthorpe, as well as two mills in Teesside, an engineering workshop in Workington and a design consultancy in York along with a mill in Hayange, France.

The sale also includes the associated sales and distribution network. Following completion of the deal, the steelworks business will trade under the brand name British Steel.

Greybull, which is a British-based investment group, will pay a nominal £1 for the business and has arranged a £400M investment and financing package.

The existing management team will stay on to run the new business, and try to return the company to profitability.

Marc Meyohas, a partner at Greybull, said the aim was to avoid any redundancies, grow the business and become profitable within a year.

"We are delighted to have reached agreement for the acquisition of LPE, which we believe can become a strong business, with a highly skilled workforce and

great potential."

The deal is expected to complete within weeks, assuming the completion of the financing arrangements for LPE and contract agreements with key suppliers are agreed.

Hans Fischer, Chief Executive of Tata Steel's European operations, said: "Under these current challenging market conditions in Europe with the soaring levels of imports from China, we are happy that Tata Steel UK and Greybull Capital have entered the final stage of completion of the sale."

Steel drives Sky car park delivery

Steel construction's speed of delivery has come to the fore as an 830-space multi-storey car park for media company Sky had its frame erected and flooring installed in just eight weeks.

Sky's headquarters in Osterley, west London has undergone a major expansion with new offices and a new multi-storey car park both being constructed.

Bourne Parking was the main contractor and steelwork contractor for the car park.

"Normally the build programme would be much longer but the client wanted the car park as quickly as possible, so with four cranes working simultaneously for the steel erection we were able to achieve this fast programme," explains Bourne Parking Senior Project Manager Greg Brown.

The car park measures 90m-long × 50m-wide and consists of seven levels, including ground floor and an open rooftop level.

The structure is a steel braced frame that supports precast flooring planks, with steelwork erected around a 7.5m × 16m grid pattern.

Prior to Bourne starting onsite, the plot for the car park had already been cleared with an old office block demolished under a separate contract.

Once the piling and the installation of ground beams had been completed, as well as the construction of two precast cores, the steel erection programme was able to begin.

Westonbirt canopy walkway opens to visitors

The STIHL Treetop Walkway at the Westonbirt National Arboretum in Gloucestershire officially opened to visitors on 27th April.

Offering spectacular views across the arboretum landscape, access to the walkway is included in the cost of admission.

As reported in April's *New Steel Construction* magazine, the walkway incorporates 180t of structural steelwork that was chosen for its durability and lightweight attributes.

The main walkway is step-free, making it accessible to visitors on foot, using mobility scooters, wheelchairs and pushchairs and to those with dogs on leads. It is 300m-long and gradually rises on gentle inclines to a height of 13m.

Visitors can now experience stunning new views and discover more about Westonbirt's world-renowned collection of 15,000 trees from high above the ground.

There are seven interactive hotspots to give visitors of all ages the chance to get up-close with nature and learn more about the fascinating world of trees.

The walkway's route follows a serpentine path through the trees and along the contours of the site into the leafy canopy. Each season of the year will reveal new views and new experiences of trees and nature.

Working on behalf of the client, the Forestry Commission and main contractor Speller Metcalfe, S H Structures fabricated, supplied and erected the project's steelwork.

Dynamic response calculator available now

New design software that allows designers to make an immediate assessment of the dynamic response of a floor solution is now available at *www.steelconstruction.info*

The results from this software provide an improved prediction of the dynamic response compared to the 'manual method' in SCI P354.

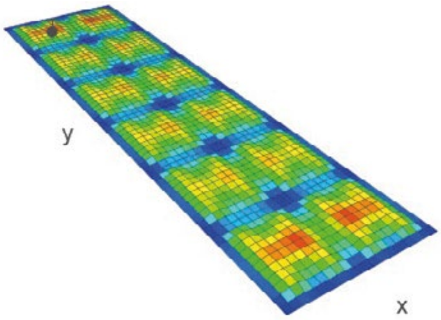
The software can be used to examine complete floor plans or part floor plans as well as for comparing alternative beam arrangements.

It reports the results of approximately 19,000 arrangements of floor grid, loading and bay size, which have been investigated using finite element analysis.

The designer selects between a variable action of 2.5 kN/m^2 and 5 kN/m^2, being typical imposed loads on floors, while 0.8 kN/m^2 is added to allow for partitions.

The designer also selects the arrangement of secondary and primary beams with typical spans which depend on the arrangement of the beams. Secondary beams may be placed at mid-span or third points.

The pre-set damping ratio of 3% is recommended for furnished floors in normal use.



When a decking profile is chosen, an appropriate range of slab depths are then available to be selected.

The primary and secondary beams are selected automatically from the UB range (grade S355) as the lightest sections which satisfy strength and deflection requirements. The selection of the lightest sections is made to produce the most conservative dynamic response, as stiffer beams will reduce the response.

A visual plot of the response is also provided for both the steady state and transient response. Hovering over the plot shows the response factor.

Steel groundscraper nears completion in the City

More than 13,000t of structural steelwork has been erected for 5 Broadgate, one of the UK's first 'groundscrapers'.

The new 13-storey City of London headquarters for UBS is a steel-framed building measuring 120m × 60m that was designed to accommodate extensive trading floors.

The length of the building that incorporates 65,000m^2 of space, and crucially four trading floors of 6,000m^2 each, gave rise to the term 'groundscraper'.

Working on behalf of main contractor Mace, Severfield has fabricated, supplied and erected the steel package.

A BREEAM 'Excellent' rating is expected for 5 Broadgate and UBS is scheduled to take occupation of the building by the end of the year.

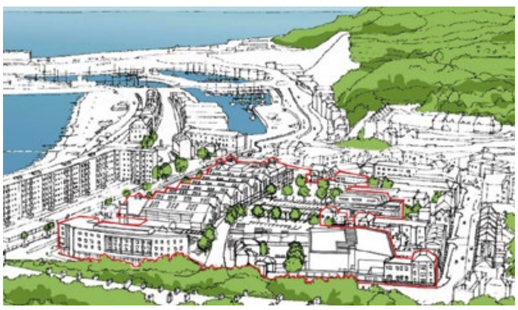
Dover retail and leisure complex kicks off

Work is under way to regenerate a large swathe of central Dover with the construction of a large M&S anchor store, a six-screen multiplex Cineworld cinema, a 108-bed Travelodge and five restaurant outlets.

Known as the St James scheme, developer Bond City in partnership with Laker Developments, cleared the site with a demolition programme earlier this year, with utility diversion works currently being undertaken.

Main contractor Kier is reportedly about to begin the main phase of construction work, with the use of structural steelwork expected to play a leading role.

Tim Ingleton, Head of Inward Investment, Dover District Council, said: "Work starting on the foundations of the St James development is another key milestone in our plans to reinvigorate Dover town centre. Investor and tenant interest in the scheme remains strong."



NEWS IN BRIEF

BE Wedge [part of the Wedge Group] has played its part in the redevelopment of the fire-damaged Hastings pier in East Sussex by providing more than 15t of galvanized steel plates. As the plates are situated in a marine environment, it was vital that they were galvanized and given the best lifespan possible.

Scottish heavy engineering and steel fabrication specialists **Cairnhill Structures**, has won a £400,000 contract for a fast track framing system which will help form the skeleton of the new Dumfries and Galloway Royal Infirmary.

Software developer **StruMIS** has launched V10 (version 10) of its steel fabrication software, which is said to offer an array of updated enhancements for the medium and larger-sized steelwork contractors. StruMIS V10 is also said to include many new features to operate steel fabrication sites more efficiently including an integrated 3D BIMReview tool.

Lindapter Hollo-Bolts have been used to secure structural hollow sections to circular hollow sections to form five 27m-tall bowstring trusses at the Central Square project in Leeds. The trusses create a large winter garden that will accommodate restaurants and other leisure facilities. Countersunk M16 Hollo-Bolts were chosen to secure the beams and splice connections because of their independent product approvals, high clamping force and discrete architectural finish.

AROUND THE PRESS

Construction News
8 April 2016
Olympic media hub gets unique revamp
"The structural frame was built as a portal frame and wasn't designed to have this kind of glazed façade on it," Laing O'Rourke's Mr O'Dell says. "So we have had to stiffen the building. This has included putting in about 200 tonnes of extra steelwork."

Building Magazine
8 April 2016
Tata construction steel division sale on track
Ian Lawson, chief executive of the UK's biggest steel contractor, Severfield said encouraging people to buy British was 'absolutely the right thing to do' but added: "At the end of the day businesses, whether it is in the public sector or private sector, still have budgets that they have to work to."

Construction News
15 April 2016
4,400 jobs saved as Tata Steel announces long products sale
Executive chairman of the long products business Bimlendra Jha said: "This sale is the best possible outcome for employees who have worked relentlessly to ensure the business's survival and helped make it attractive to a potential buyer."

New Civil Engineer
May 2016
Freeing space
[Nova Victoria] - The superstructure's steel frames begin at ground floor level with a complex connection to the site's numerous plunge columns. As many of the columns are inclined, Severfield has to ensure the plunge to structural column connection joined exactly.

New Civil Engineer
May 2016
Spread the load
[Leicester Square] - Waterman Structures Director Jody Pearce says: "One of the key aspects of a façade retention scheme is the alignment of new floors with existing window openings. We promoted the use of a steel frame as it offered the flexibility needed to suit the various interfaces that occur with the existing façade."

Steel Construction BIM Charter launched

British Constructional Steelwork Association (BCSA) steelwork contractors are now able to demonstrate compliance with Level 2 Building Information Modelling (BIM) with the launch of the Steel Construction BIM Charter.

The UK Government's requirement for Level 2 BIM on all central government projects means the construction industry wants to know which suppliers are BIM compliant.

The Steel Construction BIM Charter means BCSA Member companies can now be certified against the requirements of both PAS 91:2013 and PAS 1192-2:2013 as outlined below.

Compliance with PAS 91:2013 section 4.2 table 8, and specifically that:

- The company has the capability of working within a project using a 'Common Data Environment' as described in PAS 1192-2:2013.
- The company has a documented policy, systems and procedures to achieve 'Level 2 BIM' maturity as defined by PAS 1192-2:2013.
- The company has the capability of developing and delivering or working to (depending upon the role(s)) a BIM Execution Plan (BEP) as described in PAS 1192-2:2013.
- The company has arrangements for training employees in BIM related skills and assessment of their capabilities.

Compliance with the supply chain assessment requirements outlined in PAS 1192-2:2013 and specifically defined in sections:

- 6.4 Suppler BIM assessment form
- 6.5 Supplier information technology (IT) assessment form
- 6.6 Supplier resource assessment form

The certification process requires companies to carry out an online assessment, which is then followed up by an onsite audit.

Certified companies are provided with a comprehensive document summarising the company's BIM capability, which they can then provide to the supply chain.

The BCSA's online directories mean clients and main contractors can see which companies have been assessed against the BIM Charter, with the Charter providing a simple way to prequalify steelwork contractors as BIM compliant.

Steelwork to transform Haywards Heath station

Structural steelwork erection is nearing completion on the £15M Haywards Heath station and Waitrose project.

Forming part of a wider regeneration project that also includes a new multi-storey car park and station footbridge, the scheme being undertaken by BAM Construction requires 430t of steel for the supermarket and its car park.

Located on a plot that was formerly occupied by the station's car park, BAM initially had to remove 19,000m³ of overburden in order to level the previously sloping site.

Elland Steel Structures is fabricating, supplying and erecting the steel for the project. It is forming a 2,300m² ground level Waitrose store with a 60-space car park situated above alongside office and back-of-house storage areas.

Councilor Garry Wall, Leader of Mid Sussex District Council said: "The project will deliver an improved integrated transport hub at the station, a 'radically enhanced public realm' around the station, improved pickup and drop-off facilities, more station car parking, a direct link from the car park to platforms, and a new Waitrose with its own parking.

"The regeneration of the station quarter will be a boost for Haywards Heath and this investment is a real vote of confidence in the town."

The Waitrose store is due to open by the end of the year.

Complicated interfaces top Irish school

A series of complex steel interfaces between one and two-storey elements have contributed to a challenging steel programme for a new school in Antrim, Northern Ireland.

Parkhall Integrated College will replace the nearby existing school, which will be demolished as part of the final element of the project, providing space for new sports pitches.

Main contractor O'Hare & McGovern began work last year and approximately 650t of structural steelwork is being fabricated, supplied and erected for the project by Walter Watson.

"The building on plan is a skewed H-shape and the main challenge for us has been maintaining the ridge heights, as well as marrying in the roof slopes at the various intersections," says Walter Watson General Manager Structural Division Trevor Irvine.

As the school is a mix of one and two-storey parts, the roof structure has some very complicated interfaces and geometry where sloping and curving elements meet.

Catering for pupils aged between eight and 12 years old, the school is being constructed for 735 students and will open its doors from September 2017. The entire project, including the demolition of the existing buildings and the creation of new sports pitches, will be completed by 2018.

Light Steel Information Sheets available from SCI

Three new technical information sheets are available on www.Steelbiz.org. Produced with the Light Steel Forum, they will be distributed to SCI Members in the coming weeks.

BIM and 3D Modelling in Light Steel Construction (P407)
This information sheet highlights how BIM and 3D modelling are extensively used in the light steel construction sector.

The use of computerised production methods for the components has meant that light steel producers have been early adopters of BIM and have fully embraced its principles. A general overview of the different BIM levels is also provided.

Light Steel Load-Bearing Walls (P408)
The primary attributes and benefits of light steel load-bearing walls are explained in this information sheet, such as speed of construction and design flexibility.

The structural design considerations are described, including load resistance and the provision of vertical bracing systems incorporated into load-bearing light steel walls.

Value Benefits of Light Steel Construction (P409)
Speed of construction, lightweight and quality are generally the three overriding value benefits associated with light steel construction. These benefits and others are introduced in this technical information sheet.

Value benefits are supported with real data from construction projects and comparisons with other methods of construction.

Innovation gong for offloading frame

Leach Structural Steelwork's offloading frame won the Innovation category at the North West Construction Safety Group awards.

Allowing an operative to safely load and unload steel while working on the back of a truck, the frame was designed and built at the company's own premises.

The frame comprises a walkway section measuring approximately 7.5m-long, with a support for two inertia reels.

Weighing 550kg, the frame locates into sockets on the trailer, usually provided by the bottom bearers, which are welded to the spine beams of the unit.

The frame is delivered to site on the first delivery and it is then hoisted from the trailer using permanent lifting points.

Once it is set level on the ground and brought to vertical using lifting points, the frame is then hoisted and inserted into the sockets on the trailer. It can be attached to either side of the trailer, generally opposite the storage area to maximise crane access.

Contract awarded for RAF's F-35 facilities

An £82M contract has been signed between BAE Systems and Balfour Beatty to build aircraft engineering facilities at RAF Marham in Norfolk for the UK's first F-35 Lightning II fighter jets.

Work is expected to begin at RAF Marham this month, with the project team constructing three facilities to support the operation of the F-35 fleet; a maintenance and finish hangar, a logistics operations centre and an integrated training centre.

Steel construction will play a significant role in the works that are scheduled to be completed by early 2018.

Cliff Robson, Senior Vice President - F-35 Lightning II at BAE Systems Military Air & Information business, said: "The construction work at RAF Marham signals the start of an exciting time for the BAE Systems and Lockheed Martin team as the UK prepares for the arrival of the first F-35 Lightning II jets.

"The contract also underlines BAE Systems' continued involvement with the F-35 Lightning II programme and our company's credentials in providing infrastructure for the UK's military aircraft operations. We have a proven pedigree in delivering maintenance and support to the Royal Air Force fast jet fleets at bases throughout the UK, including RAF Marham where we have been supporting the operation of the Tornado GR4 fleet for the last decade."

Dean Banks, Balfour Beatty managing director UK construction services, said: "We are committed to making this exciting development a success and extending the excellent track record BAE Systems and Balfour Beatty have for delivering defence projects in the UK.

"Our proven expertise in defence and aviation means that we have developed technically advanced delivery solutions that will help to ensure that RAF Marham's operational capability is maintained throughout our construction activities on base."

Diary

For SCI events contact Jane Burrell, tel: 01344 636500 email: *education@steel-sci.com*

Tuesday 24 May 2016
Steel Construction and the Circular Economy
1 hour lunchtime webinar free to BCSA and SCI members.

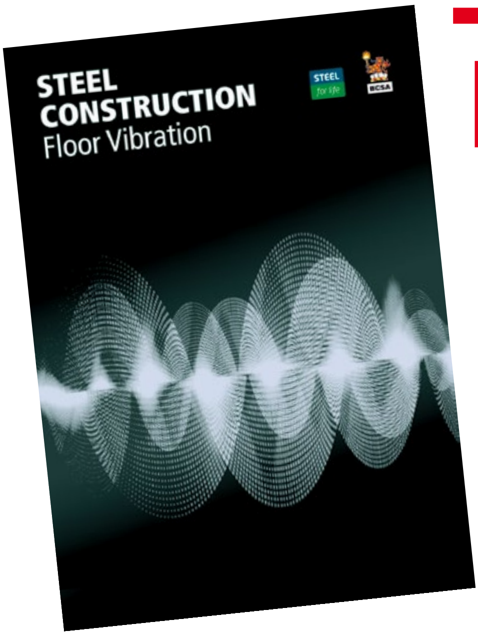
Wednesday 25 May 2016
Simple Beam & Column Design to EC3
NEW – Four hour course containing minimum theory and maximum hands-on member design – focusing on practical design using the Blue Book. The course is aimed at designers of orthodox structures where the resistance tables are the preferred way of selecting members.
Bristol.

Thursday 26 May 2016
Simple Beam & Column Design to EC3
As Wednesday 25 May
Birmingham

Thursday 16 June 2016
Steel Building Design to EC3
This course will introduce experienced Steel designers to the Eurocode provisions for steel Design
Dublin

Tuesday 21 June 2016
Light Guage Steel Design
This course introduces the uses and applications of light gauge steel in construction, before explaining in detail the methods employed by Eurocode 3
Birmingham

Tuesday 28 June 2016
Floor Vibrations
1 hour lunchtime webinar free to BCSA and SCI members.



Floor dynamics - no need to get over-excited!

Accompanying this issue of *New Steel Construction* is a brochure summarising the issue of floor dynamics and what the structure designer should do to confirm there isn't a problem. The brochure provides an overview of the dynamic behaviour of floors, the acceptance criteria commonly adopted and, importantly, the techniques for actually calculating the floor response.

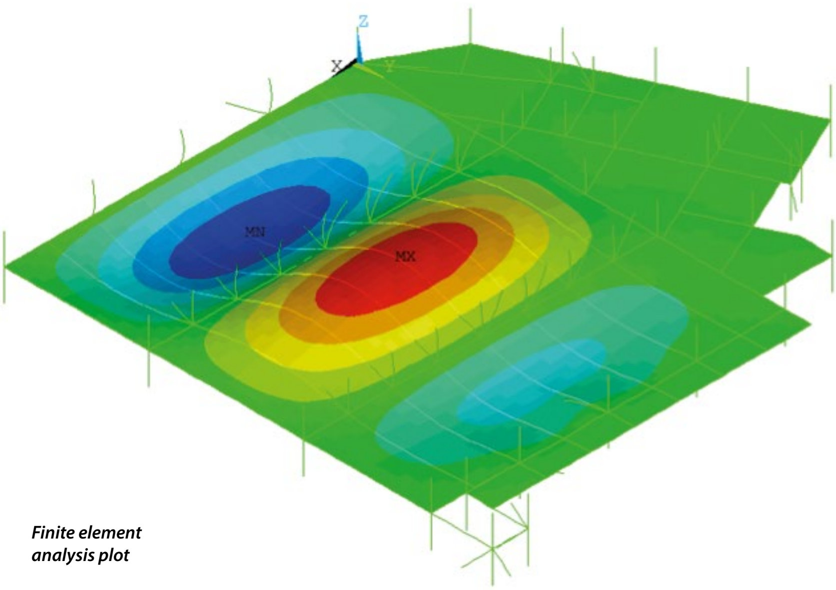
Traditionally, a very basic approach was taken to calculate a natural frequency of the floor based on deflection and to avoid any resonance with walking activity. Up-to-date assessment requires the calculation of a response factor, with different limits appropriate for different environments, such as offices, bedrooms, hospitals etc.

The calculation of the floor response is complex, because different dynamic modes contribute to the overall response. SCI publication P354 offers a simplified approach which was developed to give a conservative answer compared to the accuracy available by completing a Finite Element analysis. Recent work has shown that in some situations the simple method in P354 can be *very* conservative, indicating that certain floor arrangements have a response much higher than FE analysis predicts.

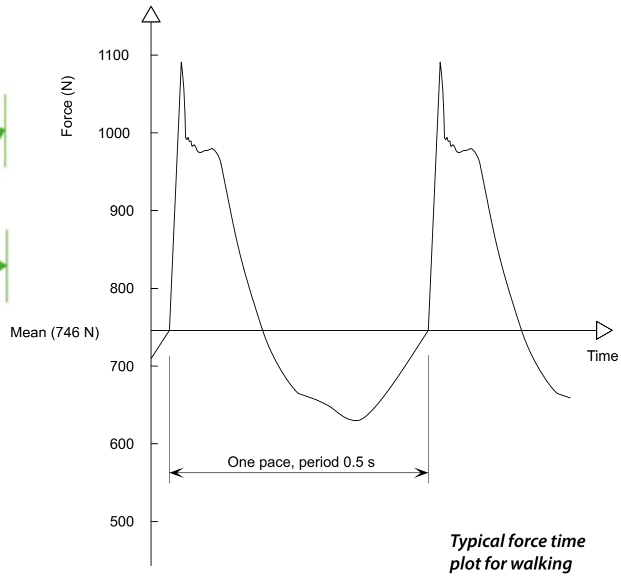
The good news for structural engineers is that there is a brand new design tool available on *www.steelconstruction.info* which may be used to give an immediate and accurate assessment of floor response, for a wide range of structural arrangements. Nearly 20,000 FE analyses of different floor grids, different composite slab thicknesses and different bay arrangements have contributed to the data within the tool. The brochure gives detailed advice on how the tool may be used, but the basic approach is to select the arrangement nearest to the proposed solution, including the beam arrangement and spans (a wide range of typical grids is included), and the tool will immediately report the response of the floor. This can then be compared to the limit for the building type.

Although there are clearly infinite permutations of spans, layout, beam sizes, slabs, etc, if the proposed solution differs from the pre-set arrangements in the tool, the designer simply has to recognise that stiffer beams than assumed in the FE will reduce the response, as will using thicker slabs (with corresponding stiffer beams).

Together, the brochure and the online design tool provide both the background and the practical implementation of what would otherwise be a complicated and time-consuming assessment. Engineers will find it is straightforward to demonstrate that a proposed floor solution will have a satisfactory response.



Finite element analysis plot



Typical force time plot for walking

A lesson in steel efficiency

A revised, streamlined and value engineered design has helped a new steel-framed school take shape rapidly in Fife.

FACT FILE
Waid Community Campus incorporating Waid Academy, Anstruther, Fife
Main client: hub East Central Scotland, Fife Council
Architect: BDP
Main contractor: BAM Construction
Structural engineer: AECOM
Steelwork contractor: BHC
Steel tonnage: 520t

A new secondary school is being delivered by BAM Construction in the Fife coastal town of Anstruther as part of the ongoing hub Scotland initiative.

Replacing the existing school, the new steel-framed structure will also provide a home for the council's local office, a library, a base for police officers, and consequently the project is officially known as The Waid Community Campus incorporating Waid Academy.

The overall campus includes an existing primary school and a community sports centre, while the 800-place Waid Academy's new sports facilities, including an all-weather rugby pitch, will be open to the public at certain times.

Typically, the ground floor of the building houses the community facilities with the school occupying the first and second floors, with one of the exceptions being the dining area which is in the centrally-located atrium.

Work on site started last year but, prior to the project team beginning, the initial design had been value engineered in order to bring the scheme within budget. Without this streamlining design work taking place the project may not have started at all.

"As well as different cladding systems, the main alteration was to change the roof to a mono-pitched design from one that originally had a multi-pitched roof profile," explains BAM's Construction Director Martin Cooper.

The new economical pitched roof is said to reflect the project's rural setting and is a nod to the many agricultural buildings in the surrounding countryside.

With its more economical steel-framed design settled upon, the job was able to kick off with BAM initially installing a new access road.

"An existing road alongside the construction site is used by people taking their children to the primary school and by users of the sports centre," says Mr Cooper.

"It was our decision to construct a new road, and now we have our own dedicated route for deliveries, including the steelwork, which is much safer for all concerned."

Once the road was completed, a series of piled foundations and a concrete ring beam were installed in advance of the steel erection programme commencing.

Steelwork contractor BHC is fabricating, supplying and erecting 520t of steel for the project. This equates to approximately 1,400 individual pieces, requiring 2,850 connections and a grand total of 16,822 bolts.

During its 15-week erection programme, BHC used two 80t-capacity mobile cranes, in conjunction with various sized MEWPs, to erect the entire steel frame and install metal decking and precast planks.

The speed of the erection process and the knock-on effects this has for the whole construction programme was the main reason for choosing steel as the framing solution, according to BDP's Project Architect Stuart Duncan.

The building is roughly square-shaped on plan with each elevation measuring approximately 65m-long. For the erection programme, the building was divided into three zones, with each one completed to its full height before BHC moved onto the next zone.

BHC's second mobile crane would then follow on behind the steel erection gang and install the flooring systems for each completed zone.

Mobile cranes erected the frame in 15 weeks

The three zones encompass the structure's two outer wings, and a central zone includes the building's large atrium and drama hall.

AECOM Project Engineer Craig Kempsell says: "We proposed a combination of flooring construction, comprising insitu concrete on metal decking and precast concrete slabs with in situ structural concrete topping.

"The precast concrete planks are supported on a grillage of steel ultra shallow floor beams, providing a reduced structural zone and promoting an efficient overall floor zone with exposed soffits within the classrooms."

Between the teaching wings the use of insitu concrete on metal decking provides a bridge between the two stiff precast floor plates. The use of conventional downstand universal beams provided additional efficiency and this was possible due to the introduction of suspended ceilings in these areas with a reduced floor-to-ceiling height.

The steel frame's columns are spaced at 7.5m intervals to form the teaching area. These were brought to site in 12m lengths corresponding to the overall height of the structure and providing effective robustness for the category 2B structure.

Next to the centrally positioned atrium is a double-height drama hall and this

Dining facilities are housed in the atrium

space was particularly challenging to design and build. The proposed installation of retractable tiered seating and the intended occupation of the space required a detailed assessment of the dynamic response of the floor plate, due to the potential effects of rhythmic synchronized movement.

Steelwork within the floor acts compositely with the slab, with strategically positioned columns providing local enhancements to achieve adequate floor plate stiffness.

Occupying two thirds of the structures central zone is the full height atrium. This part of the building is formed by five 30m-long ×1.8m-deep steelwork trusses, which had to be spliced at mid-span to facilitate transport to site in two pieces for subsequent assembly on site prior to being lifted into position.

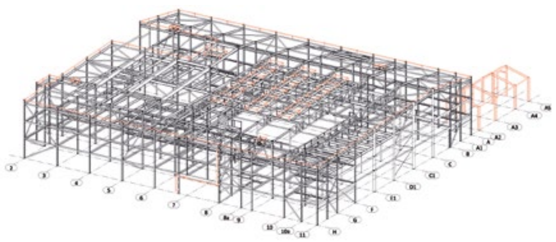
A series of internal exposed CHS columns surround the atrium space with large 406mm diameter columns positioned within the adjoining elevation. These were required to provide adequate stiffness to the lateral supports of the glazed façade. As the columns were unrestrained over their full length the increased section size was essential, providing both function and form.

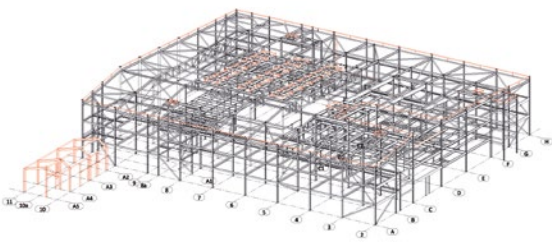
Overall the steel frame is stabilised by the two precast floors in the two teaching wings, which provide stiff plate diaphragm action, transferring lateral and notional forces to vertical steel bracing located within the perimeter and internal partition walls.

Due to curtain wall, window and service penetration positioning, locating the bracing was challenging. A number of bracing techniques were utilised. Typically SHS/RHS bracing was adopted within the secondary steel zone in order to conceal it behind finishes.

Because Anstruther is a coastal town the steelwork was primed with an enhanced protective paint specification to protect the structure against atmospheric corrosion while it was exposed during the erection and ongoing construction process.

Waid Academy is scheduled to be open in time for the 2017 autumn term.





One of the five trusses that form the central zone is lifted into place

Computer designed frames

The Collaboration Space has a challenging steel-framed design

Two steel-framed structures will house and service the Met Office's new supercomputer, a device that will bolster the UK's position as a world leader in weather and climate prediction.

FACT FILE
The Met Office, Exeter
Main client: The Met Office
Architect: Stride Treglown
Main contractor: Willmott Dixon
Structural engineer: WSP Parsons Brinckerhoff
Steelwork contractor: William Haley Engineering
Steel tonnage: 230t

Construction is under way at the Exeter Science Park for a new Met Office facility to house one of the most powerful supercomputers in the world.

As well as helping the Met Office to improve its weather predictions, the computer will also be a catalyst for regional growth in the South West, supporting collaboration and partnerships between science, business and academia.

Located a short distance from the Met Office's current headquarters, the computer will be housed in a purpose-built structure [IT Hall] currently being built by a team led by main contractor Willmott Dixon. Adjacent to this, a distinctive sloping two-storey office structure, known as the Collaboration Space, is also under construction.

The IT Hall is a single storey steel portal-framed structure measuring approximately 90m-long and 25m-wide, but importantly offering a central 15m-wide column-free span for the computer hall.

The Collaboration Space is a far more complex steel structure leaning in two directions, which has required enhanced stability systems to resist the forces generated by the complex and eccentric geometry.

Both of these buildings have gone through a process of design development as WSP Parsons Brinckerhoff Associate Director Ian Branch explains: "Throughout the design process, a variety of materials were considered for both buildings. The choice of steel was made primarily to suit the challenging programme requirements.

"The use of Revit 3D modelling greatly benefitted the development of difficult details for the complex geometry. This was then easily transferred to the steelwork contractor for them to incorporate into their model."

Once the design was finalised work started on site last year. The project sits on a greenfield site on the edge of Exeter Science Park, a recent development on the outskirts of the city that has further expansion plans

Early works included the installation of pad and strip foundations in readiness for steelwork contractor William Haley Engineering to begin the steel erection programme.

Steelwork erection started with the

IT Hall, the simpler of the two frames. This structure had to be the first to be erected as it houses the supercomputer and consequently needs to be ready first. Powering and serving the computer are a high volume of complex services, all of which needed to be coordinated via 3D modelling in Revit.

Using a single 50t-capacity mobile crane William Haley erected the IT Hall in approximately three weeks. The propped portal frame has sloping sides formed with raking columns, with two internal column lines providing the large open central space for the computer hall, while the two outer 5m wide spans accommodate ancillary spaces.

As it will house the supercomputer, the IT Hall may be considered to be the more important of the two structures. However the hexagon-shaped Collaboration Space was the most challenging to design and erect.

The structure's accommodation space is formed around a two-storey internal box based around a 7.2m × 4.8m grid pattern. The two main elevations, with the front sloping inwards and the back doing the reverse, are built from this steel box.

The internal box was erected first and was initially stabilised by temporary bracing. An in situ concrete lift shaft, combined with moment frames and braced bays within the sloping walls, provided the stability in the final condition.

CHS columns set at an angle of 60 degrees form the two sloping elevations.

"Tubular steelwork was chosen for this part of the structure for aesthetic reasons as it will be left fully exposed behind glazing," explains WSP Parsons Brinckerhoff Senior Engineer Catherine Mungall.

Supercomputer

The supercomputer will be 13 times more powerful than the current system used by the Met Office and will have 120,000 times more memory than a top-end smartphone. It will be able to perform more than 16,000 trillion calculations per second, and at 140t it will weigh the equivalent of 11 double-decker buses.

The supercomputer's sophisticated forecasts are anticipated to deliver £2bn of socio-economic benefits to the UK by enabling better advance preparation and contingency plans to protect homes and businesses.

Met Office Chief Executive Rob Varley says: "We are very excited about this new investment in UK science. It will lead to a step change in weather forecasting and climate prediction, and give us the capability to strengthen our collaborations with partners in the South West, UK and around the world."

As well as the two main sloping façades, the structure has two folded ends formed by two rows of raking CHS columns. To form the fold, the bottom members slope outwards and the top sections slope inwards with a central bolted connection holding the shape in place. The columns were all designed as moment frames.

As well as the two large glazed façades, the remainder of the Collaboration Space will be wrapped in zinc cladding.

"To avoid any clashes and deal with the unusual geometry and complex cladding details on this structure we laser-surveyed the building to produce a 3D model," explains Willmott Dixon's Leigh Dickson.

"This way of producing a model is very fast and allowed the team to get on with the cladding installation quickly."

The Met Office supercomputer is being installed in three phases with the final phase due to be completed in Spring 2017.

The supercomputer will be housed in the IT Hall

Sloping CHS columns create the elevations of the Collaboration Space

One pod is suspended via cantilevering beams

Historic college graduates with steel

400-year old Foyle College is to vacate its current premises for a new shared steel-framed facility overlooking the Derry/Londonderry riverfront. Martin Cooper reports.

FACT FILE
Foyle College and Ebrington Primary & Nursery School, Derry/Londonderry
Main client: Foyle College and Education Authority Western Region
Architect: Isherwood & Ellis Architects
Main contractor: Heron Bros
Structural engineer: Mott MacDonald
Steelwork contractor: Walter Watson
Steel tonnage: 1,100t

Located in the Waterside area of Derry/Londonderry a new £31M shared campus for Foyle College and Ebrington Primary School is quickly taking shape.

Constructed primarily with structural steelwork, the new educational facility is not only being built on a site easily accessible from all over the city, but one with a long military history.

During the Second World War a US naval base was set up on the site to accommodate personnel charged with servicing vessels guarding the North Atlantic convoys.

The Americans maintained a presence until 1971 and during that time the base was renowned for having one of Ireland's first bowling alleys. After the War most of the site was handed over to the British military who remained there until quite recently.

Commenting on the site, Robin Young, from the school's board of governors says: "We looked at various sites but this one in the heart of Waterside brings everything together on one location.

"Foyle College will be 400 years old in 2017 so that will certainly be a big year for us, and to open the new school in that year is a tremendous thing."

Both schools will be vacating their nearby existing sites, with the primary school opening in January 2017 and the secondary school opening its doors to pupils one year later.

Work on what had been a vacant plot for a number of years began in the summer of 2015 with a large cut and fill operation. This work was needed to level the previously sloping site, prior to groundworks and the steel erection programmes kicking off.

The campus is essentially one large braced structure, with Ebrington Primary School single storey and the secondary part having elements up to three storeys high.

The secondary school (Foyle College) part of the campus is entirely steel-framed and consists of two-storey and three-storey teaching blocks, as well as a sports hall and gym, multi-purpose hall, and kitchen/dining area.

The attached single storey primary school areas of the campus are predominantly of masonry construction with a raking truss roof structure, with the exception of a large steel-framed multi-purpose/dining hall. Adjacent to the primary school there is also a separate stand-alone nursery school building containing two classrooms.

"The bulk of the project was always considered to be built with a steel frame supporting concrete planks because of its ease of construction," says Mott MacDonald Project Engineer Andrea Johnston. "A steel frame with blockwork walls has also given the college flexibility, as classroom partitions can be removed in the future to create larger teaching spaces."

Working on behalf of main contractor Heron Bros, Walter Watson is fabricating, supplying and erecting approximately 1,100t of structural steelwork for the project.

Using 50t capacity mobile cranes and a variety of MEWPs, Walter Watson began the steel erection with the structure adjacent to the primary school, which had already been built earlier in the construction programme. This area consists of a shared kitchen with separate dining halls for each school

Visualisation of the completed campus

Block B takes shape

Roof pods are said to add volume to the structure

positioned either side.

"Both dining halls are single storey column-free areas with spans of up to 12m, created with roof level trusses," explains Heron Bros Project Manager Paul McNamee. "To create the desired clear span, the primary school's dining hall had to have a steel frame."

Adjacent to the college's dining area (block D), are a series of interconnected blocks (A, B and C) that contain the sports hall, three levels of classrooms, the main entrance and two levels of classes respectively.

Blocks B and C feature eye-catching conical steel pods that protrude above the top of the building and incorporate halo rooflights. Formed with a ring of columns and curved horizontal members, they are positioned within central communal areas and circulation routes that also double-up as informal teaching and performance spaces. The conical pods begin at ground floor level providing an interesting backdrop as they will be painted in various colours as a way-finding tool for staff, pupils and visitors.

Glazed halo roof lighting encircles the uppermost part of the pods allowing natural light to penetrate the communal parts of the school.

"The pods form a backdrop for an informal teaching wall or small performance space, as well as an information wall," says Isherwood & Ellis Project Architect Mark Porter. "In this way they remain an interesting visual element of the school, but also functional."

The pupil snack bar area (block D) also contains a halo rooflight pod, however this one is suspended from the roof via an arrangement of cantilevering steel beams.

In this way a clear space is left for the ground floor dining area, while above the same circular rooflights are provided. Viewed from outside, the three pods look similar and convey a sense of volume.

Entering the school grounds from the adjacent main road, the first part of the college visitors and pupils will see is teaching block E/F, which is a 60m-long finger block that extends out from the rest of the main school.

To create some visual drama the tip of the block features a 2.5m-deep first floor cantilever, highlighting the way towards the school's main entrance.

The inset of the cantilever accommodates a terrace with a series of planters and steps that cascade down to meet the path that leads up towards the stone-clad entrance block.

The ground floor level of the southern elevation is set back forming a colonnaded walkway along its length. This block contains two floors of classrooms separated by a central corridor set out on a regular grid pattern.

Looking forward, Mr McNamee says the main logistical challenge for the project team will come next year once the primary school has opened.

"We will have to manage deliveries, fit-out and noise more tightly as the project team will be finishing off the college while students will be studying in the adjoining parts of the building."

A cantilevering wing points the way to the campus main entrance

Weathering steel highlights offices

An exo-skeleton, fabricated entirely of weathering steel, has created the standout appearance and the column-free spans for the final commercial development at London's Pancras Square.

The exo-skeleton wraps around the entire building

The ongoing Kings Cross redevelopment programme has, over the last few years, radically changed a former run-down industrial site in central London into a vibrant business neighbourhood.

Described as one of the largest regeneration schemes in Europe, it will include 50 new buildings, 2,000 new homes, 20 new streets and 10 new public squares spread over 67 acres. The area even has its own brand new postcode – London N1C.

One of the main elements of this huge scheme is Pancras Square, situated between the two large London rail terminuses of Kings Cross and St Pancras.

The square consists of seven buildings arranged around a steel-framed wedge-shaped podium that accommodates a shared basement delivery space with the top level supporting a landscaped public realm [see box].

Four of the surrounding buildings are either steel-framed or feature substantial structural steel elements, including Four Pancras Square which is the final structure to be built around the public realm.

Similar to the adjacent buildings, Four Pancras Square is an 11-storey commercial block offering Grade A office space with ground floor retail zones.

What makes this building different from

Pancras Square – the ongoing story

Over the last three years *New Steel Construction* (NSC) has reported on the continuing development of Pancras Square, beginning with the construction of the centrally-positioned steel-framed podium (see NSC Jan/Feb 2013).

Requiring 600t of steel this vital component not only supports the public realm and provides the buildings with a shared basement, it also created a workspace platform and a delivery access point for the subsequent construction phases.

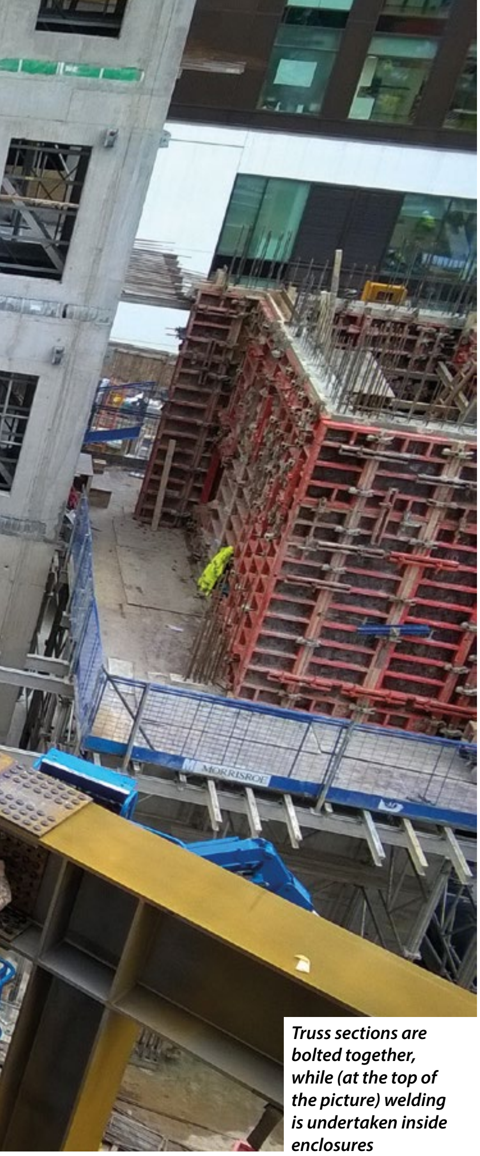
BAM Design also changed its design from an insitu concrete frame to steel in order to speed up the programme, saving six weeks in the process.

Sitting opposite St Pancras Station on the western side of the development is 6 Pancras Square (see NSC March 2014). Vinci Construction was the main contractor for this 11-storey steel-framed project that provides 39,500m^2 of office space.

Last year (NSC October 2015) we reported on Three Pancras Square, an 11-storey headquarters building for a multinational advertising and public relations company.

Working on behalf of BAM, Severfield erected 1,900t of steel for this building. The company was also the steel contractor for the podium as well as 6 Pancras Square.

Interestingly 5 Pancras Square, which accommodates Camden Council offices and leisure facilities, is a concrete-framed structure containing a number of steel elements to provide its essential long span column-free areas.



Truss sections are bolted together, while (at the top of the picture) welding is undertaken inside enclosures

its neighbours is that instead of using a single framing solution, this structure is using two.

The building is essentially concrete-framed, a solution chosen by the client and design team as the office floors are formed around internal spans of no more than 9m.

However a long column-free span was required for the entire main entrance elevation, while longer column spacings were also desired for the other ground floor façades.

As this could not be achieved with the chosen framing material, a steel exo-skeleton wraps around the entire building. Project architect Eric Parry conceived this idea from gas holders that previously occupied the site.

The steel skeleton forms the exterior of the entire building, supporting all of the internal floor slabs along each of the four elevations. The external steelwork and the floors are connected at key strategic locations that allow differential movements between the two to occur.

The main feature of the steelwork is a storey-high Vierendeel truss that encircles the building at first floor level.

"The main function of the steel truss is to create a 27m-long column-free façade along the building's main entrance elevation, that not only overlooks the public realm but forms an important architectural 'open letterbox' between the building and the outdoor area," explains BAM Design Associate Mike Hayes.

Aside from the main entrance façade, the truss allows the other elevations to have ground floor column spacings of up to 15.6m, which gives the building the desired architectural long span look. Above the truss the steel columns are aligned with the internal concrete columns at the shorter 4.5m spacings.

As well as delivering a structural solution for the desired ground floor configuration, the steelwork exo-skeleton will also give the new building the industrial look that was also desired by the client and architect.

As Victorian era gasholders formerly occupied the site, the steelwork façade will create a heritage look reminiscent of these times.

This is because weathering steel has been used for the entire skeleton, and its hue will subtly change over time lending itself to the desired heritage appearance. Another benefit of using this type of steel is the fact that, even though it will remain exposed, it will not need painting or any maintenance throughout its lifetime.

"As weathering steel is only produced in plate, all of the columns are bespoke fabricated sections, with hidden internal connections for a clean aesthetic appearance," explains Severfield Project Manager Gary Dooley.

Erecting the steelwork began with the installation of the storey-high truss, beginning with the 27m-long column-free span along the entrance elevation.

The truss was fabricated by Severfield and then brought to site in 18 sections, including four corner pieces. The truss elements measured up to 17m long with the heaviest weighing 72t.

As the truss elements all measure 5m-high they had to be transported to site on tilt frames, holding the steelwork at an angle to lessen their height allowing them to be transported by road. The height of each steel element was further increased by a series of stainless steel stems that were welded into place during the fabrication process. These stems have an attached bracket which supports the concrete floor slabs.

Once the truss elements arrived on site erecting them proved to be a challenge, as access around the site was restricted due to a busy road along one elevation and buildings and the completed public realm along the other sides.

"The solution was to erect the initial parts of the truss from within the building's footprint using a 500t-capacity mobile crane," explains BAM Construction Manager ▶20

FACT FILE
Four Pancras Square, London
Main client: Argent
Architect: Eric Parry Architects
Main contractor: BAM Construction
Structural engineer: AKT II, BAM Design
Steelwork contractor: Severfield
Steel tonnage: 1,900t

▶19 David Bee. "We eventually erected the entire truss from three crane positions, the final two being just outside of the site and needing temporary road closures."

The project had initially gone through a number of design changes as well as a value engineering process. During these processes the team had realised that the only way to erect a proportion of the truss was to position a large mobile crane within the project footprint.

The design team had consequently strengthened the substructure so it could support a large crane, although a fair amount of temporary props and trestles were also needed below the ground floor slab.

The truss sections that form the 27m-long column-free entrance elevation were erected using a series of temporary trestles that had to remain in place until the connections had been made and the steel could support itself.

Most of the exo-skeleton has bolted connections, with approximately 10,000 Tension Control Bolt's used throughout the frame. However, along the southern elevation the truss sections are joined with welded connections.

"The bolted option would have given time and cost benefits but could not be achieved on this large truss, so we have welded connections that give a different aesthetic appearance," says BAM Design Associate Stuart Hinde.

As the truss sections have 65mm-thick flanges and 50mm-thick webs. These large steel elements required lengthy onsite welding programmes.

"From within temporary enclosed towers, each of the two connections between truss sections required a combined total of 72 hours of welding," explains Mr Hayes.

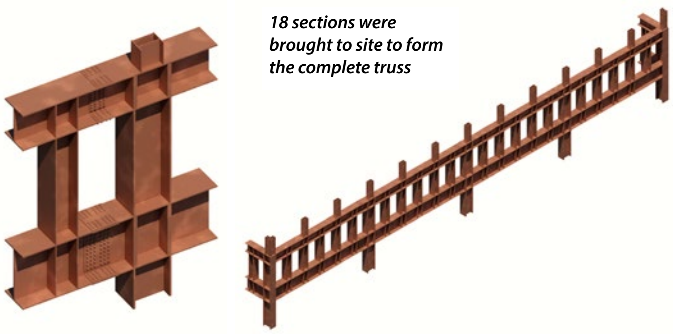
It took four weeks to erect the truss around the building's perimeter. Once it was completed the remainder of the weathering steel exo-skeleton was erected in sequence with the concrete floor slabs.

From the truss upwards the steel fabricated columns were erected in two-storey high sections and held in place with temporary props. Once the adjacent slabs had been installed, the props were removed and a further set of columns was erected. This sequence was repeated until the final section of steelwork, comprising an uppermost three-storey high set of columns, was up.

"All of the steel columns above the truss are concrete-filled for fire protection," adds AKT 11 Associate Director David Illingworth. "They also have ventilation holes to stop pressure building up within the sections in a fire."

These measures were the result of some exhaustive fire engineering tests to determine the interaction between the steelwork and the concrete slabs in a fire condition.

Four Pancras Square is due to be completed in early 2017.



18 sections were brought to site to form the complete truss

Successful site welding

by David Brown, SCI

The major site welds at Four Pancras Square demonstrate that when properly planned and executed, site welding is a safe, reliable and high quality technique. Planning and controlled execution are absolutely key to success.

The first requirement is a Weld Procedure Specification (WPS), which covers the steel type, thickness, joint type etc and specifies how the joint is to be completed, including the welding consumable, sequence and speed of welding runs and electric parameters. Severfield already had an appropriate WPS, as otherwise a test piece would need to be welded and tested, to demonstrate that the proposed specification would produce a satisfactory weld.

The primary driver for a WPS is the avoidance of hydrogen cracking. Sources of hydrogen are any contamination, the steel and consumables and the atmosphere. BS EN 1011 provides guidance on the control of hydrogen, relating the weldability of the parent steelwork (as measured by the Carbon Equivalent Value (CEV)) and the heat input (which depends on current, weld speed and consumable size) to the need to pre-heat the joint. When thick elements are connected – with a large 'combined thickness' – the steel acts as a heat sink, allowing the steel to cool more rapidly and increasing the risk of hydrogen cracking. The management of these issues is the responsibility of the Steelwork Contractor, who will have a qualified and experienced Responsible Welding Contractor. Weathering steel has a higher CEV than ordinary steel, which increases the risk of hydrogen cracking and was therefore reflected in the WPS used at Four Pancras Square.

The encapsulation of the joints described in the main article serves a number of purposes. Safe access is obviously essential, but the protection also shields the joint from the elements and - importantly - prevents wind from disturbing the shielding gas used during welding. At Four Pancras Square, the joint was pre-heated to a minimum of 100°C, which reduced the risk of hydrogen cracking. Pre-heat requirements are specified on the WPS.

The skill of the welder is obviously very important. The welder must be qualified for the relevant welding process and welding position. The welding position relates to the physical position, but also the direction of travel of the welding, because the force of the weld arc may act with, or against, the action of gravity on the molten metal. On site it is obviously not possible to turn the members to provide a more convenient position for welding.

Although welding is the responsibility of the Steelwork Contractor, design engineers may find the following references helpful background.

- Welding steels without hydrogen cracking. Bailey N, Coe FR, Gooch TG, Hart PHM, Jenkins N, Pargeter RJ. The Welding Institute, 1993
- Typical Welding Procedure Specifications for Structural Steelwork, BCSA publication 50/09
- Guide to Site Welding, SCI Publication P161
- www.steelconstruction.info/Welding

The steel frame was erected quickly with mobile cranes

Steel proves a safe bet

bet365, one of Stoke's largest employers is moving into a new steel-framed development that has been designed around the use of cellular beams.

The new headquarters building for online gambling company bet365 is located in the Stoke-on-Trent suburb of Etruria, on a plot formerly occupied by the local newspaper offices. Measuring approximately 120m-long × 50m-wide, the offices are nearly double the size of the company's current premises.

bet365 Joint Chief Executive Denise Coates says: "We are proud to be the largest private sector employer in Stoke-on-Trent so we like to think this is good news for us and good news for the city."

"We have reached the stage where we have outgrown our existing offices and it's important for us to proceed with this project which will enable us to continue to

Cellular beams have been used throughout base ourselves in the area, taking account of both our existing workforce and planned future growth."

Main contractor John Sisk & Son started on site last year after a demolition phase had been completed. New piled foundations were installed and a ground improvement programme initiated prior to the steelwork erection commencing.

Steelwork contractor James Killelea erected the steelwork in a 14-week programme using three erection gangs and three cranes.

"There were a number of revisits to install secondary steelwork after work by other contractors had been carried out," explains James Killelea Contracts Director Bob Allan.

"These were notably in the atrium areas and all of this work required a significant amount of careful planning and monitoring to ensure that erection ran smoothly."

The building has two atriums, centrally located at either end of the building.

"One has an ETFE roof, while the other is open and more of a courtyard," explains WSP Parsons Brinckerhoff Project Engineer Aaron Wall.

"These two large voids provided the best location for the structure's bracing as most of it is placed around their perimeters."

Some bracing is also located in stairwells and along corridor partitions.

Overall, the structure is based around a regular steel grid pattern of three spans, two outer 18m spans and a central 14m one. This pattern creates the long open-plan office space that the client desired.

The upper floors accommodate the offices, while the ground floor has meeting rooms, plant zones and kitchen areas. As the open-plan upper levels were the most important spaces to the structural design, some of the columns at ground floor level have been moved.

To maintain and optimise the upper floor's long spans one row of columns at ground floor level would have intruded into meeting room spaces. Consequently, there are transfer structures at ground floor ceiling height.

Kloeckner Westok supplied all of the cellular beams to the project's steelwork contractor James Killelea. More than 350t of Westok cellular beams have been used as part of the steel frame for the headquarters building.

These beams form an integral element of the three-storey building as they create the long internal spans, which are up to 18m long, and accommodate all of the structure's services within their depth.

With 18m-long open clear spans required to suit the flexible working spaces demanded by the client, Westok floor and roof beams proved to be the ideal framing solution. Kloeckner Westok provided value engineering design services for the floor and roof steelwork at a critical time of the design process. Steelwork savings needed to be generated at a time when the crucial M+E service solution for the building had yet to be finalised.

Kloeckner Westok's Design Team Leader John Callanan explains, "At Westok, we're always keen to ensure that the most economical cellular beam design solution is adopted. We responded to Sisk's request to undertake value engineering by hosting a multi-disciplinary design workshop at our head office in Leeds.

"The drivers were the need to generate cost savings, while ensuring that the intricate current and future service requirements of the building were satisfied. Time was short and steel fabrication was imminent. I must say all parties came to the table to work in a collaborative manner."

In the end, an optimised cellular solution providing a string of minimum 400mm diameter cells, along with 400mm × 700mm elongated cells strategically located to suit the wide rectangular service runs was chosen as the best solution.

The structural design always envisaged a steel frame for this project as it provides the most cost-effective solution," says Mr Wall. "However, having the detailed workshop with everyone involved was the best way of formulating the beam design."

The bet365 headquarters is scheduled for completion this summer.

Other buildings

As part of James Killelea's steel erection programme it has also erected a separate standalone energy centre building. This single-storey braced structure measures 30m-long x 10m wide. Previously under another steelwork contract a steel-framed data store was erected, while a Victorian building known as the Roundhouse, dating back to when the site was a Wedgwood Pottery factory, will be incorporated into the new development.

FACT FILE
bet365 Headquarters, Stoke-on-Trent
Client: bet365
Architect: Wood Goldstraw Yorath
Main contractor: John Sisk & Son
Structural engineer: WSP Parsons Brinckerhoff
Steelwork contractor: James Killelea
Steel tonnage: 850t

Bracing is primarily located in stairwells

The management of destabilising loads

Although destabilising loads on unrestrained beams may be infrequent in orthodox building structures, they are sometimes found in domestic construction and can be quite common in steelwork supporting industrial equipment. David Brown looks at the provisions in BS 5950 and BS EN 1993-1-1.

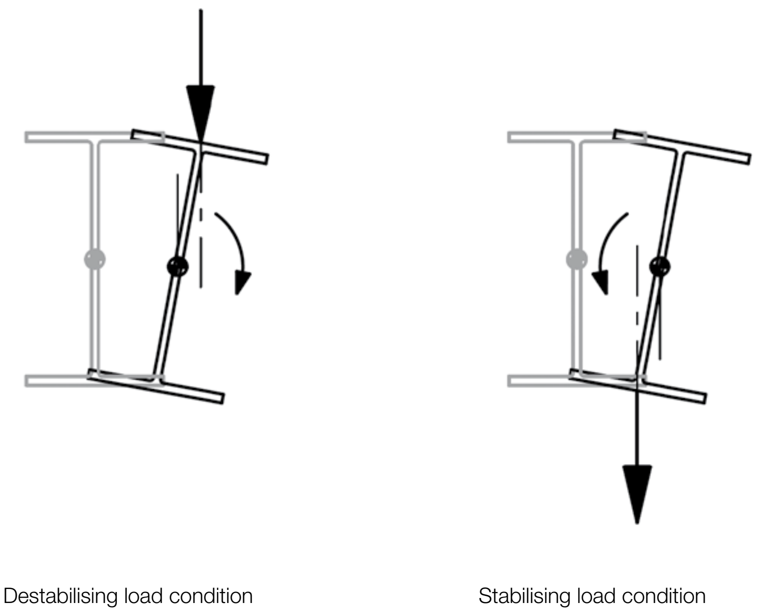


Figure 1: Load arrangements

Is the load destabilising?

The common definition of a destabilising load is if the load is free to move with the flange, it's a destabilising load. BS 5950 describes the situation in clause 4.3.4 as when both the load and the flange are free to deflect laterally. The situation is shown in Figure 1.

In the destabilising load condition, the vertical load has moved with the compression flange, which is deflecting laterally. The vertical load is eccentric to the shear centre and the resulting moment encourages further lateral deflection of the flange. The stress due to the lateral bending of the flange is increased, which means the beam is closer to buckling than it would be without the additional moment.

Figure 1 also shows the effect of a load applied which is a stabilising load. In this case, the load produces a restoring moment, which serves to reduce the lateral bending of the compression flange; the load may be increased before the onset of buckling.

Destabilising loads are relatively common in steelwork supporting equipment, where there may be no floor to provide restraint. Equipment supported on multiple beams may still be a destabilising load, if all the beams can buckle in the same direction and the load can move, as shown in Figure 2.

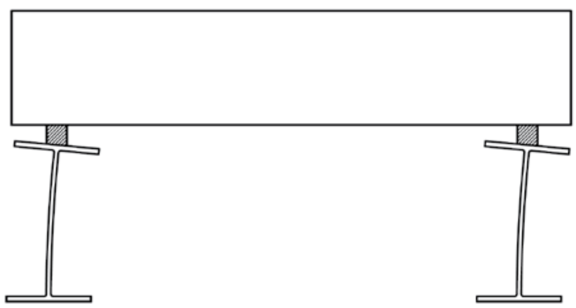


Figure 2: Possible load arrangements supporting equipment

BS 5950 provisions

BS 5950 deals with destabilising loads by increasing the effective length, L_E, as specified in Table 13. The effective length of the beam is really the effective length of the all-important unrestrained compression flange. With a beam loaded in the conventional sense, it is easy to visualise the compression flange from a bird's eye view, and consider the fixity at the end of the beam flange. Full rotational fixity leads to shorter effective lengths and less fixity leads to larger effective lengths. For a comparison with BS EN 1993-1-1, it will be assumed that both flanges are free to rotate on plan. Sometimes this is known as a fork end support, as indicated in Figure 3 – the beam has vertical and lateral support, but nothing stops the flanges rotating on plan.

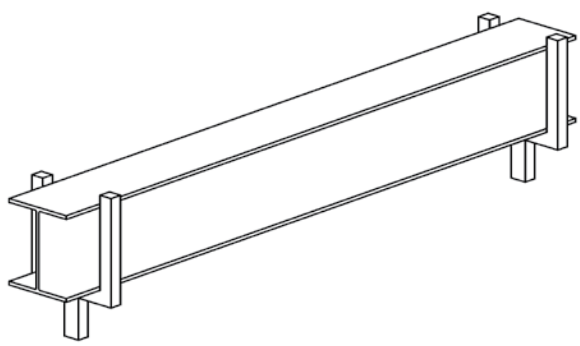


Figure 3: Beam with fork end supports

With a beam supported in this way, Table 13 of BS 5950 indicates that the effective length L_E is 1.0 L_{LT} under normal conditions, and 1.2 L_{LT} if the loads are destabilising.

This is the only provision that BS 5950 makes for destabilising loads; from then on, the process of determining a lateral torsional buckling resistance follows the normal rules.

Before leaving Table 13, the condition with the compression

flange unrestrained should be noted. This is the case often encountered in domestic construction when beams sit on padstones. Two options are offered in Table 13; when the bottom flange is positively connected to the support and secondly when the beam simply sits on the support with no positive connection. If one imagines looking again with a bird's eye view of the top flange, an unrestrained compression flange can deform laterally even at the support. As shown in Figure 4, the effective length is increased in this situation. Table 13 specifies 1.2 L_{LT} + 2D for the normal loading condition and 1.4 L_{LT} + 2D when loads are destabilising.

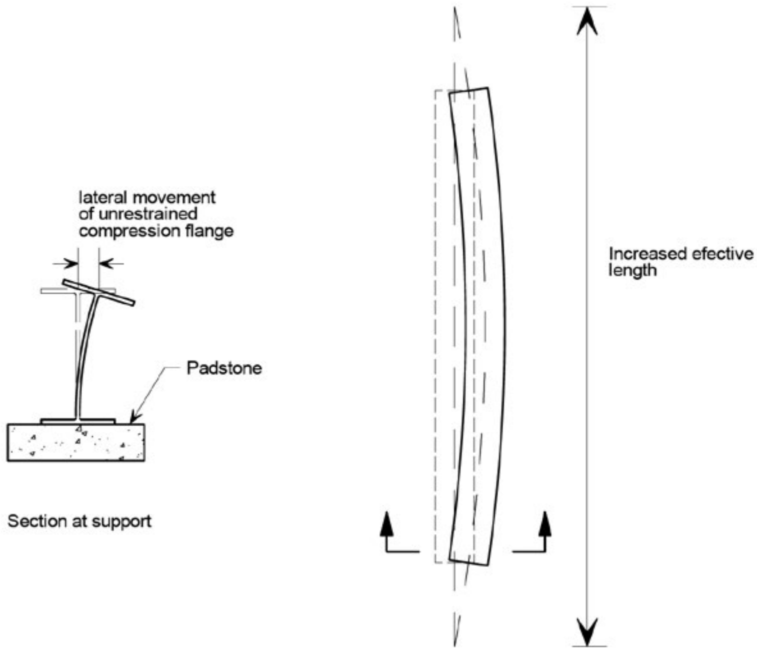


Figure 4: Unrestrained compression flange at supports

Finally, note that clause 4.3.4 alerts the designer to the possibility of destabilising loads, but in all other cases specifies that the normal loading condition be assumed. In BS 5950 therefore, there is no way of allowing for the beneficial effects of stabilising loads.

BS EN 1993-1-1 provisions

Within the Eurocode approach, the impact of the load position is accounted for in the determination of M_{cr} which may be calculated by a closed expression or determined using software. If designers conclude that the loads *are* destabilising, the general form of the closed expression (for a beam with fork end supports) is shown below.

$$M_{cr} = C_1 \frac{\pi^2 EI_z}{L^2} \left(\sqrt{\frac{I_w}{I_z} + \frac{L^2 GI_T}{\pi^2 EI_z} + (C_2 z_g)^2} - C_2 z_g \right)$$

This expression is fully defined in NCCI ; of interest to this discussion is the C_2 value and the z_g dimension.

Rather like the C_1 value, the C_2 value depends on the shape of the bending moment diagram. Values for both factors can be obtained from NCCI. Two simple loading conditions and the values of C_1 and C_2 are given in Table 1, for a simply supported beam.

Loading condition	C_1	C_2
UDL	1.13	0.45
Central point load	1.35	0.63

Table 1: C_1 and C_2 values for standard cases

The dimension z_g is the distance from the shear centre to the point of load application. As shown in Figure 5, in the conventional orientation, if the load is applied to the top flange (a destabilising load), z_g is positive. If the load is stabilising, applied below the shear centre, z_g is negative.

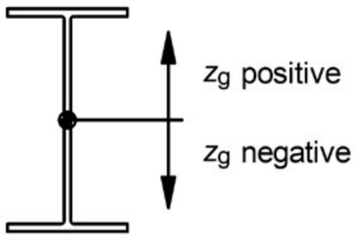


Figure 5: Sign convention for z_g

In Figure 6, *LTBeam* has been used to consider a destabilising load. Of note, the z_g dimension (highlighted) is positive and subtly, the load sketch shows the loading applied *above* the beam.

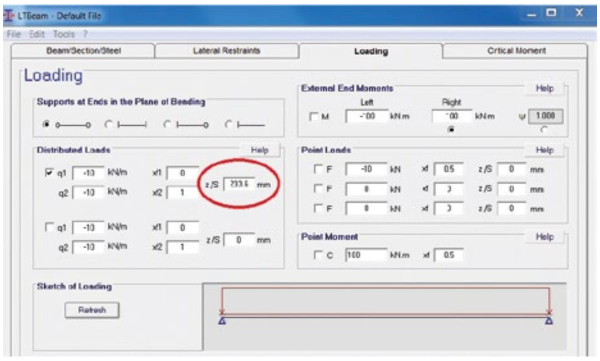


Figure 6: LTBeam software – destabilising load

In Figure 7, the same load has been applied as a stabilising load. The dimension z_g is negative.

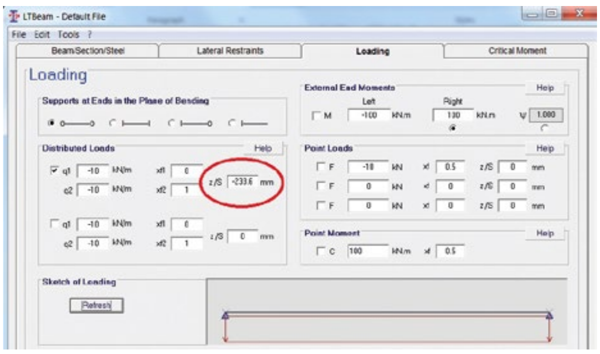


Figure 7: LTBeam software – stabilising load

What difference does it make?

The objective of this comparison is not to compare BS 5950 with BS EN 1993-1-1; the Eurocode is expected to deliver a larger resistance. Rather, the following example is presented to demonstrate the danger of ignoring destabilising loads – the resistance may be significantly lower.

The example is a 457 × 191 × 98 UB in S355. It is 6 m long, and subject to a UDL. It is assumed that the beam has fork end supports – i.e. the flanges are free to rotate on plan.

BS 5950

The intermediate values and final buckling resistances for both loading conditions are shown in Table 2.

	Normal load conditions	Destabilising loads
Effective length, L_E (m) (Table 13)	6	7.2
λ	138.6	166.3
λ/x	5.37	6.44
v (Table 19)	0.80	0.75
$\lambda_{LT} = uv\lambda$	97.7	109.9
p_b (Table 16 for p_y = 345 N/mm^2)	142.5	119.0
M_b (kNm)	**317.8**	**265.4**
m_{LT} (Table 18)	0.925	0.925
M_{max} (kNm)	343.6	286.9

Table 2: Member capacities according to BS 5950

	Normal load (applied at shear centre)	Destabilising load (applied at top flange)	Stabilising load (applied at bottom flange)
Dimension z_g (mm)	0	223.6	-223.6
M_{cr} (kNm) (*LTBeam*)	537	398	724
M_{cr} (kNm) (*expression*)	535	402	712
λ_{LT}	1.20	1.39	1.03
χ_{LT} (α_{LT} = 0.49)	0.525	0.434	0.621
$\chi_{LT,Mod}$	0.536	0.440	0.632
M_b (kNm)	**412.4**	**338.5**	**486.2**

Table 3: Member resistance according to BS EN 1993-1-1

The buckling resistances may be compared directly with the resistances in P202[ii]. The quoted resistance at 6 m is 318 kNm, so the calculations above appear to be correct!

Note that the maximum moment in the destabilising condition is only 83% of the value if normal load conditions had been assumed.

BS EN 1993-1-1

A similar exercise may be completed for BS EN 1993-1-1, as shown in Table 3 for three loading conditions. The load is assumed to be applied at the outside of the flange for both the stabilising and destabilising conditions. M_{cr} was calculated using *LTBeam* and by the expression above; both values are shown in Table 3.

In this case, if loads are destabilising, the resistance is again only 82% of the resistance if the loads are applied at the shear centre. Note that if the loads were stabilising, the resistance shows an enhancement of 17%.

General observations

This article has attempted to warn designers about the dangers of undiagnosed destabilising loads – whichever Standard is used, the lateral torsional buckling resistance is reduced significantly. The Eurocode allows the benefit of stabilising loads to be calculated, which may be an advantage in that relatively uncommon design situation.

This exercise also demonstrates that the BS 5950 approach of increasing the effective length by 20% is a good approximation to allow for the effect of destabilising loads. If M_b is recalculated according to the Eurocode, but with a buckling length of 7.2 m, the resistance is 348 kNm, which compares favourably with the precise calculation of 338 kNm. To increase the buckling length by 20% is a good rule of thumb when selecting an initial section, as the Eurocode resistance tables can then be used directly. To verify members to the Eurocode, an initial section is necessary, so that the dimension z_g can be determined.

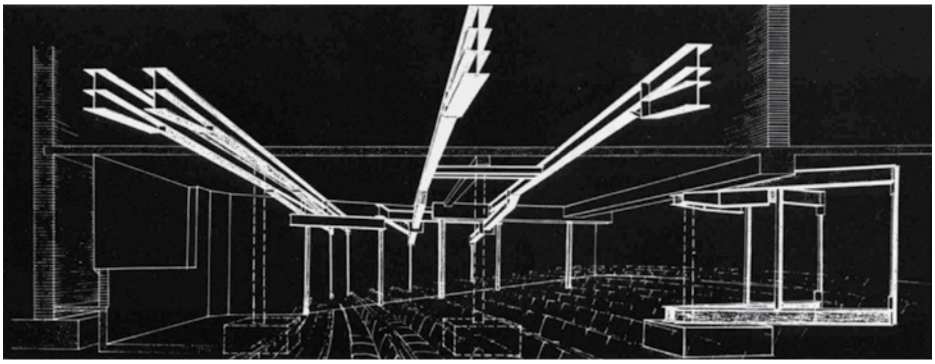
Finally, this exercise considered destabilising loads applied to the top flange. If equipment is supported from stools, themselves on top of the beams, it may be prudent to increase the z_g dimension further, to allow for the increased destabilising effect.

[i] AD 311: T-sections in bending – stem in compression Available from *http://www.steelbiz.org/*

[ii] P202 Section properties and member capacities to BS 5950-1

BUILDINGWITHSTEEL

The adaptability of steelwork



Top: The auditorium seats 400 and was formerly the basement. Particularly noticeable is the three dimensionally curved ceiling of anti-clastic profile enabling the use of beams of small depth. Above: The disposition of the steelwork for converting the basement into a separate cinema.

The original 600-seat Academy cinema was built at street level and is about 50 years old. In 1963 a small auditorium was added at first floor level, which now operates as a cinema club and bar. The floor was originally designed for office loading only and therefore, to gain the necessary By-Law approvals, strengthening of joints was carried out by welding, additional steelwork added to produce openings, fireproof walls erected and the floor of the auditorium inclined to improve the sight lines.

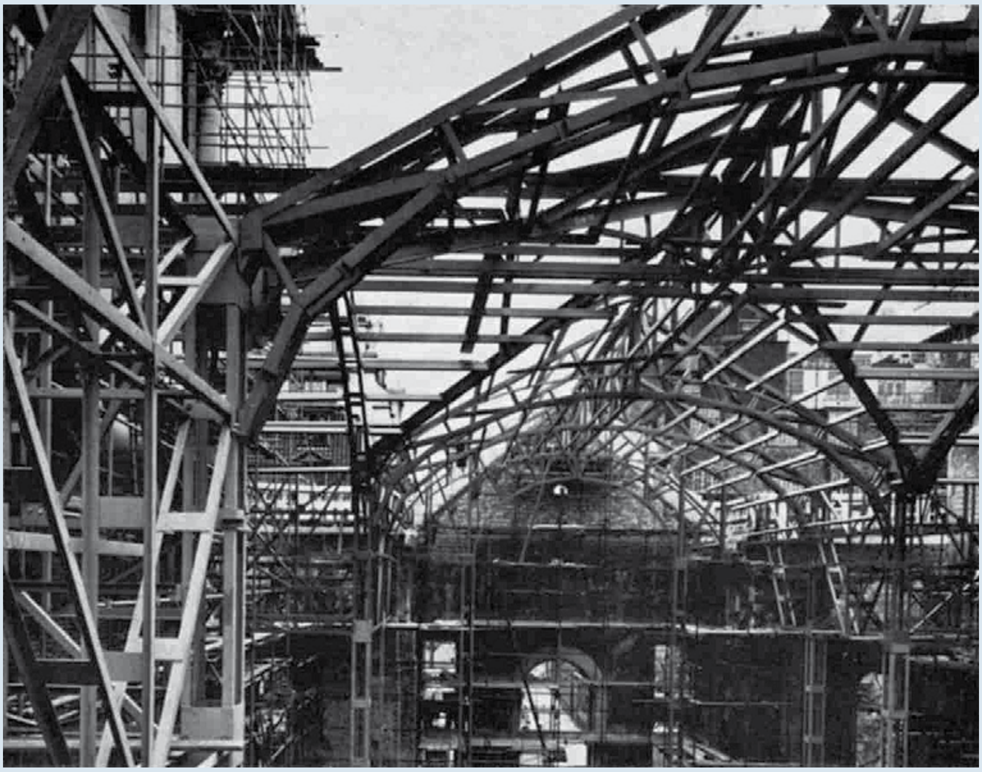
The Consulting Engineers were then asked to make a feasibility study for the provision of another auditorium in the basement, below the existing ground floor cinema, to seat at least 400. The operation was to be carried out while performances in the existing two cinemas continued without interruption.

The floor of the existing cinema was supported by a large number of columns in the basement. The layout of seating was planned in such a way that sightlines, excellent by modern standards, could be gained by the removal of three of the columns, one of which carried a load of 185 tons. The resulting space which would have to be spanned by new beams was 44 ft in the best and 58 ft in the worst case, the existing columns occurring at midspan.

The lack of adequate headroom represented the main problem to be overcome. Excavation had to be limited, not only because of the expense and difficulty of disposing surplus material via Oxford Street, but more critically to avoid underpinning of the grillage foundations belonging to the adjoining building and supporting about 600 tons.

A precast post-tensioned beam support system was investigated but rejected in favour of steelwork which allowed easier handling in the restricted situation. The seating plan was revised, omitting the usual central gangway, permitting the placement of columns immediately adjacent to the ends of the rows of seats. Not only was the span of the new beam system reduced but a fixed-end structural system was made feasible. Reactions to the columns were off set towards the centre of the auditorium where no interference was caused to the existing foundations at the perimeter. The basement floor was designed as a thin raft to distribute the load more uniformly. Beams were cambered upwards to avoid deflection in the existing floor while taking up the load with the beam system.

(b) Church restoration: St. John's, Smith Square, London



The church of St. John the Evangelist, Smith Square was burned out during an air raid, leaving only the shell. It remained in this scarred condition until it was decided to restore it as a Cultural Centre.

The original building was completed in 1728. It was destroyed by fire in 1742 and rebuilt without any internal pillars.

The steelwork in the restored building includes roof and valley trusses, lattice girders, battened angle stanchions and ceiling angles supporting ceilings of ceilings of elliptical and radial forms. It is of welded construction, with high strength friction grip bolts for the site joints. The stanchions carry virtually all the roof loading and bear on the existing brick piers in the crypt, which carried the original pillars: by careful design it has been possible to avoid taking any of the roof load on the existing walls. Brackets have been left on the main stanchions to allow the fixing of a balcony at a later date.

When the high level elliptical ceiling intersects the centre of the church some difficulty was experienced in providing a suitable section for the valley trusses because the minimum distance available between the ceiling and roof was less than a foot. Spot lights are situated inside the framework of the girders: to reach these from roof level four lattice girders were necessary.

New and revised codes & standards

From BSI Updates April 2016

BS EN PUBLICATIONS

BS EN 10139:2016
Cold rolled uncoated low carbon steel narrow strip for cold forming. Technical delivery conditions
Supersedes BS EN 10139:1998

CORRIGENDA TO BRITISH STANDARDS

BS EN ISO 9606-1:2013
Qualification testing of welders. Fusion welding. Steels
CORRIGENDUM 2

NA+A1:2015 to BS EN 1993-1-4:2006+A1:2015
UK National Annex to Eurocode 3: Design of steel structures. General rules. Supplementary rules for stainless steels
CORRIGENDUM 1

BRITISH STANDARDS UNDER REVIEW

BS EN 10021:2006
General technical delivery conditions for steel products

BS EN 10079:2007
Definition for steel products

NEW WORK STARTED

BS 7668
Weldable structural steels. Hot finished structural hollow sections in weather resistant steels. Specification
Will supersede BS 7668:2004

EN 1993-1-13
Eurocode 3. Design of steel structures. Rules for beams with large web openings

CEN/TR WI 00250194
Eurocode 1. Actions on structures. Traffic loads on bridges. Track-Bridge Interaction

ISO/TS 7705
Guidelines for specifying Charpy V-notch impact prescriptions in steel specifications

ISO /TS 10108
Steel. Conversion of hardness values to tensile strength values

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – ADOPTIONS

16/30335270 DC
BS EN ISO 23279 Non-destructive testing of welds. Ultrasonic testing. Characterization of indications in welds.
Comments for the above document were required by 11 April, 2016

16/30336473 DC
BS EN 1011-8 Welding. Recommendations for welding of metallic materials. Part 8. Welding of cast irons
Comments for the above document were required by 4 April, 2016

16/30336476 DC
BS EN 287-6 Qualification test of welders. Fusion welding. Part 6. Cast iron
Comments for the above document were required by 4 April, 2016

AD 397:
UK NA to BS EN 1991-1-3: General Actions – Snow loads

In December 2015, BS EN 1991-1-3 was published with Amendment A1. At the same time, the UK National Annex was revised to reflect the changes made in the Eurocode. Unfortunately, some inconsistent text appeared in the NA, which has led to some confusion, especially for monopitch roofs. This AD provides clarification in advance of the NA being corrected.

Clause NA.2.17 refers to monopitch roofs and provides recommendations for roofs with a dimension *greater than* 10 m. The title of the associated Figure NA.2 gives snow load shape coefficients for roofs *no longer than* 10 m. This title is incorrect – the Figure covers roofs which have a dimension greater than 10 m. The title of Table NA.1 makes no reference to length, when in fact it presents the same information as Figure NA.2 and covers roofs with a dimension greater than 10 m.

In both Figure NA.2 and Table NA.1, the information given for μ_2 should be deleted, because μ_2 has no relevance to monopitch roofs.

In both Figure NA.3 and Table NA.2 the shape coefficient should be μ_2, not μ_1 as printed. In clause NA.2.20 the shape coefficient should be μ_4, not μ_3 as printed

These and other minor corrections will be addressed by BSI.

SCI is grateful to Professor Haig Gulvanessian for providing the clarification in this AD.

Contact: **Abdul Malik**
Tel: **01344636525**
Email: **advisory@steel-sci.com**

Is your Steelwork Contractor a BCSA Member?

BCSA

Choosing the right steelwork contractor is key to the success of your project. With over 90 registered steelwork contractor members, BCSA provides plenty of choice to ensure a suitably qualified and competitive tender list.

By using a BCSA member you can reduce time, cost and risk. Specifying a BCSA member:

- **Is easy:** Our directories are searchable and can be tailored to meet the bespoke needs of each of your projects. BCSA members are categorised by a maximum contract value each can handle.
- **Ensures you get an appropriate contractor:** Our members are pre-assessed so you know in advance that they have they specialist skills for your steelwork construction project.
- **Shows you value quality:** Listed by their quality credentials so you know that they are likely to meet the demands of your quality management system.
- **Demonstrates that you have chosen a competent contractor:** BCSA members are assessed for health and safety/CDM regulation requirements, quality of work, specialist skills, and guide steelwork contract size.
- **Ensures a competitive price:** There are over 90 member companies of the BCSA, and this provides users with plenty of choice to ensure a competitive tender list.

The BCSA member directories' search criteria can be tailored to ensure you select a suitably qualified steelwork contractor for your next project. They can be viewed at www.steelconstruction.org/directories

Buildings

Bridgeworks

Components, Materials and Products

Steelwork contractors for buildings

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

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

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

- **C** Heavy industrial platework for plant structures, bunkers, hoppers, silos etc
- **D** High rise buildings (offices etc over 15 storeys)
- **E** Large span portals (over 30m)
- **F** Medium/small span portals (up to 30m) and low rise buildings (up to 4 storeys)
- **G** Medium rise buildings (from 5 to 15 storeys)
- **H** Large span trusswork (over 20m)
- **J** Tubular steelwork where tubular construction forms a major part of the structure
- **K** Towers and masts
- **L** Architectural steelwork for staircases, balconies, canopies etc
- **M** Frames for machinery, supports for plant and conveyors
- **N** Large grandstands and stadia (over 5000 persons)
- **Q** Specialist fabrication services (eg bending, cellular/castellated beams, plate girders)
- **R** Refurbishment
- **S** Lighter fabrications including fire escapes, ladders and catwalks
- **FPC** Factory Production Control certification to BS EN 1090-1
  - 1 – Execution Class 1 2 – Execution Class 2
  - 3 – Execution Class 3 4 – Execution Class 4
- **BIM** BIM Level 2 compliant
- **QM** Quality management certification to ISO 9001
- **SCM** Steel Construction Sustainability Charter (● = Gold, ● = Silver, ● = Member)

Notes

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A & J Stead Ltd	01653 693742			●	●					●	●			●	●		2			Up to £200,000
A C Bacon Engineering Ltd	01953 850611			●	●		●										2			Up to £3,000,000
A&J Fabtech Ltd	01924 439614	●			●		●				●		●			✔	3			Up to £400,000
Access Design & Engineering	01642 245151					●				●	●			●	●	✔	2			Up to £4,000,000
Adey Steel Ltd	01509 556677				●	●	●	●		●	●			●	●	✔	3		Silver	Up to £2,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●									✔	2		Gold	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 £1,400,000
AKD Contracts Ltd	01322 312203				●					●	●			●	●		2			Up to £100,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4			Up to £1,400,000
Apex Steel Structures Ltd	01268 660828			●	●	●	●			●	●			●			2			Up to £1,400,000
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2			Up to £400,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●		●	●		2			Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●	✔	4			Up to £800,000
ASME Engineering Ltd	020 8966 7150				●	●				●	●			●	●	✔	3		Gold	Up to £2,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●				●			●	●	✔	2			Up to £1,400,000
Austin-Divall Fabrications Ltd	01903 721950			●	●		●	●		●	●			●	●	✔	2			Up to £800,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●		✔	2			Up to £800,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✔	4			Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £2,000,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●		●	●	✔	4			Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●	●	✔	4		Gold	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		2			Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	Gold	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●			●	●	✔	4			Up to £4,000,000
Builders Beams Ltd	01227 863770			●	●	●	●	●		●				●	●	✔	2			Up to £1,400,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●				●	●	✔	4		Silver	Up to £3,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4		Gold	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●		✔	4		Gold	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			●	●	●	●		●	●	●			●	●	✔	2			Up to £800,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £100,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●	●		●	●			●	✔	4			Up to £4,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	3			Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✔	4		Gold	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✔	3		Gold	Up to £3,000,000
Four Bay Structures Ltd	01603 758141			●	●					●	●			●	●		2			Up to £1,400,000
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
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●		●		✔	3			Up to £3,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●		●	●			●	●	✔	2		Member	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✔	4		Silver	Up to £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)

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)
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●			●	✔	2			Up to £1,400,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766				●	●	●	●					●			✔	3			Up to £2,000,000
J & A Plant Ltd	01942 713511				●	●									●		2			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●			4			Up to £6,000,000*
John Reid & Sons (Strucsteel) Ltd	01202 483333		●	●	●	●	●	●	●	●	●	●		●	●	✔	4			Up to £6,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✔	4		●	Up to £3,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4			Up to £6,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		○	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
Luxtrade Ltd	01902 353182									●	●				●	✔	2			Up to £800,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	4			Up to £2,000,000
M J Patch Structures Ltd	01275 333431				●	●				●	●				●	✔	2			Up to £800,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £1,400,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £800,000
Maldon Marine Ltd	01621 859000				●	●		●	●	●	●			●	●	✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						2			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 £1,400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●						✔	4			Up to £4,000,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		2			Up to £400,000
Painter Brothers Ltd	01432 374400								●		●			●	●	✔	2		●	Up to £6,000,000
Pencro Structural Engineering Ltd	028 9335 2886			●	●	●	●	●	●		●			●	●	✔	2			Up to £2,000,000
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £800,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		2			Up to £1,400,000
R S Engineering SW Ltd	01579 383131				●					●	●			●	●	✔	2			Up to £100,000
Rippin Ltd	01383 518610			●	●	●	●	●						●	●		2			Up to £1,400,000
S H Structures Ltd	01977 681931	●					●	●	●	●	●	●				✔	4		○	Up to £2,000,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £1,400,000
Sean Brady Construction Engineering Ltd	00 353 49 436 4144			●	●	●	●			●	●			●	●		2			Up to £800,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4		●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●					●	●			●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £1,400,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		2			Up to £800,000
Southern Fabrications (Sussex) Ltd	01243 649000				●					●	●			●	●	✔	2			Up to £800,000
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			●	●	●	●	●	●		●			●	●	✔	2		○	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●	●			●			●			2			Up to £1,400,000
Tubecon	01226 345261						●	●	●	●				●	●	✔	4		●	Above £6,000,000*
Underhill Engineering & Building Services Ltd	01752 752483				●		●	●	●	●	●			●	●	✔	4			Up to £3,000,000
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●		4			Up to £2,000,000
W I G Engineering Ltd	01869 320515				●					●					●	✔	2			Up to £200,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	4			Up to £6,000,000
Westbury Park Engineering Ltd	01373 825500	●		●	●		●	●	●	●	●				●	✔	4			Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●			●		✔	4		●	Up to £4,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

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
A Lamb Associates Ltd	01772 316278
Balfour Beatty Utility Solutions Ltd	01332 661491
Bluefin Group	020 3040 6723
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	08457 504030
Kier Construction Ltd	01767 640111
PTS (TQM) Ltd	01785 250706
Sandberg LLP	020 7565 7000
Structural & Weld Testing Services Ltd	01795 420264
SUM Ltd	0113 242 7390
Welding Quality Management Services Ltd	00 353 87 295 5335

Industry Members

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

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

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM
AJN Steelstock Ltd	01638 555500								●		M	
Albion Sections Ltd	0121 553 1877	●									M	
Arcelor Mittal Distribution - Scunthorpe	01724 810810								●		D/I	
Autodesk Ltd	01252 456893		●									
AVEVA Solutions Ltd	01223 556655		●								N/A	
Ayrshire Metals Ltd	01327 300990	●									M	
BAPP Group Ltd	01226 383824									●	M	
Barrett Steel Services Limited	01274 682281								●		M	
Behringer Ltd	01296 668259					●					N/A	

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM
BW Industries Ltd	01262 400088	●									M	
Cellbeam Ltd	01937 840600	●									M	
Cellshield Ltd	01937 840600							●			N/A	
Cleveland Steel & Tubes Ltd	01845 577789								●		M	
CMC (UK) Ltd	029 2089 5260								●		D/I	
Composite Profiles UK Ltd	01202 659237	●									D/I	
Cooper & Turner Ltd	0114 256 0057									●	M	
Cutmaster Machines (UK) Ltd	01226 707865					●					N/A	
Daver Steels Ltd	0114 261 1999	●									M	

RQSC
The Register of Qualified Steelwork Contractors Scheme

Steelwork contractors for bridgeworks

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

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

FG Footbridge and sign gantries
PG Bridges made principally from plate girders
TW Bridges made principally from trusswork
BA Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
CM Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
MB Moving bridges
RF Bridge refurbishment

AS Ancilliary structures in steel associated with bridges, footbridges or sign gantries (eg grillages, purpose-made temporary works)
QM Quality management certification to ISO 9001
FPC Factory Production Control certification to BS EN 1090-1
1 – Execution Class 1 2 – Execution Class 2
3 – Execution Class 3 4 – Execution Class 4
BIM BIM Level 2 compliant
SCM Steel Construction Sustainability Charter
(Gold = Gold, Silver = Silver, Member = 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	FG	PG	TW	BA	CM	MB	RF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
A&J Fabtech Ltd	01924 439614	●	●		●				●	✓	3					Up to £400,000
Bourne Construction Engineering Ltd	01202 746666	●	●	●				●	●	✓	4				Gold	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	✓	4			✓		Up to £4,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●			●	●	✓	4			✓	Silver	Up to £3,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Above £6,000,000*
Donyal Engineering Ltd	01207 270909	●						●	●	✓	3			✓	Member	Up to £1,400,000
ECS Engineering Ltd	01773 860001	●	●	●	●		●		●	✓	3					Up to £3,000,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●		●	●	●	✓	3			✓	Member	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●		●				●	●	✓	4			✓	Gold	Up to £3,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●						●	●	✓	4					Up to £800,000
Murphy International Ltd	00 353 45 431384	●	●	●					●	✓	4					Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●		●	●	✓	4		✓	✓		Up to £4,000,000
S H Structures Ltd	01977 681931	●		●	●	●	●		●	✓	4			✓	Silver	Up to £2,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	✓	4			✓	Gold	Above £6,000,000
Taziker Industrial Ltd	01204 468080	●						●	●	✓	3		✓	✓		Above £6,000,000
Underhill Building & Engineering Services Ltd	01752 752483	●	●	●	●			●	●	✓	4					Up to £3,000,000
Non-BCSA member																
AIC Steel Ltd	01633 528400	●	●	●					●	✓	4		✓	✓		Up to £800,000*
Allerton Steel Ltd	01609 774471	●	●	●	●				●	✓	4			✓		Up to £4,000,000
Centregreat Engineering Ltd	029 2046 5683	●	●	●	●		●	●	●	✓	4					Up to £800,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●		●	✓	4				Member	Up to £800,000
Francis & Lewis International Ltd	01452 722200							●	●	✓	2			✓	Gold	Up to £2,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●		●	●	✓	3					Up to £2,000,000
HS Carlsteel Engineering Ltd	020 8312 1879	●	●					●	●	✓	3			✓		Up to £400,000
IHC Engineering (UK) Ltd	01773 861734	●							●	✓	3			✓		Up to £400,000
Interserve Construction Ltd	020 8311 5500							●	●	✓	N/A					Above £6,000,000*
Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	✓	4		✓		Silver	Up to £2,000,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓	N/A					Up to £3,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●						●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	✓	4				Silver	Above £6,000,000

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM
Dent Steel Services (Yorkshire) Ltd	01274 607070								●		M	
Duggan Profiles & Steel Service Centre Ltd	00 353 56 7722485	●							●		M	
easi-edge Ltd	01777 870901							●			N/A	○
Fabsec Ltd	01937 840641	●									N/A	
Ficep (UK) Ltd	01924 223530					●					N/A	
FLI Structures	01452 722200	●									M	○
Forward Protective Coatings Ltd	01623 748323						●				N/A	
Goodwin Steel Castings Ltd	01782 220000	●									N/A	
Graitec UK Ltd	0844 543 8888		●								N/A	
Hadley Group Ltd	0121 555 1342	●									M	○
Hempel UK Ltd	01633 874024						●				N/A	
Highland Metals Ltd	01343 548855						●				N/A	
Hilti (GB) Ltd	0800 886100									●	M	
Hi-Span Ltd	01953 603081	●									M	○
International Paint Ltd	0191 469 6111						●				N/A	○
Jack Tighe Ltd	01302 880360						●				N/A	
Jamestown Cladding & Profiling Ltd	00 353 45 434288	●									M	
John Parker & Sons Ltd	01227 783200								●	●	D/I	
Joseph Ash Galvanizing	01246 854650						●				N/A	
Jotun Paints (Europe) Ltd	01724 400000						●				N/A	
Kaltenbach Ltd	01234 213201					●					N/A	
Kingspan Structural Products	01944 712000	●									M	○
Kloeckner Metals UK	0113 254 0711								●		D/I	
Lindapter International	01274 521444									●	M	
Longs Steel UK Ltd	01724 404040				●						M	
MSW UK Ltd	0115 946 2316	●									D/I	
Murray Plate Group Ltd	0161 866 0266								●		D/I	
National Tube Stockholders Ltd	01845 577440								●		D/I	
Peddinghaus Corporation UK Ltd	01952 200377					●					N/A	
PPG Performance Coatings UK Ltd	01773 814520						●				N/A	
Prodeck-Fixing Ltd	01278 780586	●									D/I	
Rainham Steel Co Ltd	01708 522311								●		D/I	
Sherwin-Williams Protective & Marine Coatings	01204 521771						●				M	○
Sika Ltd	01707 384444						●				M	
Simpson Strong-Tie	01827 255600									●	M	
Structural Metal Decks Ltd	01202 718898	●									M	○
StruMIS Ltd	01332 545800		●								N/A	
Tata Steel Distribution UK & Ireland	01902 484000								●		D/I	
Tata Steel Ireland Service Centre	028 9266 0747								●		D/I	
Tata Steel Service Centre Dublin	00 353 1 405 0300								●		D/I	
Tata Steel Tubes	01536 402121				●						M	
Tata Steel UK Panels & Profiles	0845 3088330	●									M	
Tension Control Bolts Ltd	01948 667700						●			●	M	
Trimble Solutions (UK) Ltd	0113 887 9790		●								N/A	
voestalpine Metsec plc	0121 601 6000	●									M	○
Wedge Group Galvanizing Ltd	01909 486384						●				N/A	
Yamazaki Mazak UK Ltd	01905 755755					●					N/A	


V10
BRINGING *YOU* THE FUTURE; NOW.
Specialist steel fabrication management information software *proven woldwide* to reduce costs whilst maximising productivity and profitability.
STRUMIS software connects, streamlines and simplifies all your business resources.
With a zero-swap out record* **STRUMIS** is the technology driving business for the UK's most successful fabricators.
Building on the benchmark, **V10** brings a host of brilliant **NEW** enhancements to complement the core software which already boasts technically superior features such as 3D functionality and mobile apps.