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NSC

Flexibility key to Dublin retail

June 2018 Vol 26 No 6

Cellular design on Canary Wharf

Steel galore at Highlands distillery

SuperHub for Peterborough

Steel stars at Rushden cinemas

Cover Image
One Bank Street, Canary Wharf, London
Main client: Canary Wharf Group
Architect: Kohn Pedersen Fox
Main contractor: Canary Wharf Contractors
Structural Engineer: Arup
Steelwork contractor: William Hare
Steel tonnage: 9,500t

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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

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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*

No post-Brexit workforce concerns for steel


Nick Barrett - Editor

News that two steel construction related sites have been longlisted as potential assembly centres, or logistics hubs, for the construction of Heathrow airport's expansion (see News) highlights a key factor about the sector that could become even more important in a post-Brexit world.

The British Steel site at Scunthorpe and a Severfield site at Dalton Airfield, near Thirsk, are a long way from Heathrow and the fact that they have been longlisted is recognition of the major benefits that can be gained by the offsite manufacturing processes that steel construction has always led on.

Steelwork contractors are based at fabrication workshops the length and breadth of the UK, mostly away from the employment hotspots where attracting and retaining skilled workers can be difficult. Attracting enough skilled labour looks like it could become a drag on the construction sector in coming years, but one that the steel sector looks well placed to manage.

The issues around labour availability could very well be exacerbated by Brexit which, although it is fast approaching, still has many questions unanswered about the process for EU citizens to remain in the UK, as well as questions about the future movement of labour and immigration requirements.

Some 10 per cent of the UK construction workforce is from the EU, but this percentage is significantly higher in some areas. In London over 30 per cent of construction workers are from the EU. This reliance on EU labour makes the construction industry particularly vulnerable to Brexit.

Construction employers are already reporting issues with recruitment of workers because of Brexit. Recent official figures show that more EU nationals are leaving the UK than at any time since 2008 and there are also fewer EU nationals arriving in the UK compared to the peak in 2016.

Whether this trend continues will largely depend on the extent to which free movement is maintained following Brexit. Also important will be the perception that EU workers have of being able to find jobs and live here.

Steelwork contractors have always proudly boasted of the skills of their mostly locally recruited, highly trained, specialist workforces. Suitably skilled and experienced EU nationals have always been welcome to work in the sector on the same terms and conditions as local workers, but the fact is that, for the most part, the steel construction sector has not come to rely to a large extent on EU nationals to man its fabrication workshops or site erection teams.

It is a stable workforce compared to the often itinerant site-based construction workforce, with all the beneficial impacts that has on family life as well as on the quality of the sector's products.

Whatever the post-Brexit requirements are for EU construction workers, who will remain an invaluable source of skills, the steel construction sector is confident of being able to continue to recruit and retain the workforce needed to meet the needs of its customers in the post-Brexit world.

Steel sites longlisted for Heathrow expansion logistics hubs

British Steel's Scunthorpe site and Severfield's Dalton Airfield facility near Thirsk have both been longlisted as potential offsite construction centres for the building of Heathrow Airport's new runway and expansion.

The two facilities form part of a 65-strong list of sites still in the running to be logistics hubs for the Heathrow expansion. These hubs will help ensure that businesses across the UK form part of the airport's supply chain, enabling Heathrow's new runway to deliver a legacy of construction excellence across the UK.

Heathrow representatives are currently visiting all longlisted locations to assess their suitablilty, before putting successful bids through to the next round.

Heathrow expansion is a critical national infrastructure project for the UK that is expected to deliver up to £12bn in economic benefits.

Heathrow is pioneering logistics hubs, where components of the airport will be pre-assembled before being transported in consolidated loads to the airport.

They will be essential in ensuring that the Heathrow expansion delivers for the whole country by spreading jobs, boosting productivity and modernising the construction industry outside of London and the South East. They will ensure that 60% of the procurement spend will be outside of London, spreading the benefits of local investment up and down the country.

Severfield Managing Director Gary Wintersgill said: "It's great to be longlisted and we will be demonstrating all the reasons we think this site would be an ideal location for one of Heathrow's logistics hubs."

River Carron communities connected by new bridge

A new steel composite bridge has been installed across the widest part of the River Carron near Falkirk; the first time this part of the river has ever been spanned.

The £840,000 Abbotshaugh Footbridge will provide an important link between the Bainsford, Langlees, Carron and Carronshore communities. It spans 48m - the same length as seven double decker buses - and is held together by 1,500 bolts.

Fabricated and supplied by Cairnhill Structures, the bridge required 70t of structural steelwork. It was hoisted into place by a 500t-capacity crane.

Councillor Paul Garner, Spokesperson for the Environment, said: "The Abbotshaugh Bridge represents a significant investment for the local area, and is the first brand new bridge in the Falkirk Council area for over 100 years. It will connect residents and visitors to recreation, amenities, employment, the Helix and the Kelpies – one of the biggest tourist attractions in Scotland."

ArcelorMittal achieves NHSS accreditation

ArcelorMittal Downstream Solutions [AMDS], Scunthorpe has extended its quality management system to comply with the requirements of BS EN ISO 9001:2015 and National Highways Sector Scheme 3B (NHSS 3B).

The scope of the registration to NHSS 3B is for stocking and distribution activities for structural steel products and has been achieved in advance of the scheme being fully implemented by Highways England on 15 September 2018.

NHSSs have been developed as bespoke integrated management schemes within an ISO 9001 framework and are applicable to particular infrastructure related projects within the UK, as well as being mandatory for Highways England contracts.

Together with ISO 9001, NHSSs are designed to address a number of key quality aspects including, providing an industry benchmark, identifying risks and opportunities, ensuring that all processes are planned, providing a basis for continuous improvement, focusing on quality as an objective and reducing costs for clients and organisations.

AMDS General Manager Lee Knowles said, "AMDS has been supplying steelwork contractors working in the infrastructure sector for many years with a wide range of structural sections.

"We are very pleased to have gained accreditation to NHSS 3B, this quality achievement coupled with our integrated mill supply and access to rollings is a natural step for AMDS to support its customers in an important sector of UK construction."

Design software for SIN beams now available

The Steel Construction Institute (SCI) has completed designing a software programme for Ireland-based steelwork contractor Kiernan Structural Steel, covering fabricated girders with sinusoidal beam webs, commonly known as SIN beams.

"The new SIN beam design software enables consulting engineers and steelwork contractors to quickly design plate girders with a corrugated web; taking into account restraint conditions, end moments and deflection limits. This allows the designer to quickly determine whether the SIN beam could be a cost-effective solution in potential scenarios such as roof rafters, mezzanine floor beams and footbridges," said Kiernan Structural Steel Sales Manager Paul Watson.

The sinusoidal profile stiffens the web, meaning thin material can be used, reducing the weight of the section. Design rules are given in Annex D of BS EN 1993-1-5, which identifies the flanges to carry the bending moment and any axial force, and the web to carry the shear.

Lateral torsional buckling between restraints uses the simplified rules in BS EN 1993-1-1 clause 6.3.2.4. Both bending deflection and shear deflection is calculated by the software and compared with user-defined limits.

The beam itself may be tapered or of uniform depth, with the opportunity to apply UDLs, point loads, end moments and axial forces. Restraints may be added to either flange independently or a fully restrained flange specified. The individual components of the beam may be verified separately or the lightest weight flanges and web automatically selected.

"The wide range of applied loading and the requirement to verify the member between user-defined restraint positions would lead to laborious hand calculations making a software solution very attractive," said SCI Associate Director David Brown.

"Alternative member cross sections can be examined immediately to identify an efficient solution, with automatic lowest weight solutions found for a given beam depth."

The software has been written to accommodate design to the UK National Annex or the Irish National Annex.

The SIN beam design software can be downloaded from www.sinbeamsteel.com/downloads

SIN beams forming a long span stucture for a timber merchant in Ireland

Installation complete for Taplow bridge

Site work has now been completed for a new River Thames footbridge designed by Knight Architects and structural engineers COWI at Taplow in Buckinghamshire.

Berkeley Homes is the client for the project, which will provide a new pedestrian link in the Thames Path to connect the new Taplow Riverside development with Maidenhead.

The shallow arch form of the design is inspired by Brunel's nearby Maidenhead Bridge and is echoed in the slender steel box structure.

Fabricated triangular-section box girders form the twin structural arches that support the deck. Slender steel plate hangers complete the composition and ensure the structure is lightweight and transparent in river views.

Working on behalf of main contractor Land & Water, fabrication of the bridge sections was undertaken by S H Structures (SHS).

SHS site-assembled the 39m-long, 38t footbridge, having brought it to site in sections. Land & Water then lifted it onto a barge so it could be taken along the river and then rotated into position.

NEWS IN BRIEF

Specialist metal decking contractor, **Composite Profiles** has won the national award for Best Company Culture at the Business Excellence Forum & Awards held in Liverpool.

East Ayrshire Council has signed up **Morrison Construction** to construct a new £59M learning and enterprise campus in Cumnock. The project is said to be one of Scotland's largest and most ambitious education projects through a two-stage design and build process. The steel-framed complex will consist of four linked structures up to three-storeys high, three school pavilions and a sports centre.

Cheshire County FA, in partnership with Cheshire West and Chester Council and ION Developments, has confirmed its intention to open a unique world-class football facility in Northwich, Cheshire. The site will become a leading centre for the provision of women and girls football and Cheshire County FA has also confirmed that it is in discussions with a Women's Premier League club to become a partner on what will be a 'best in class' football environment.

Computer software producer **Trimble** supported its client Wentworth House Partnership in raising over £5,000 for charity AHOY in a Thames boat race. The event saw seven staff members from Wentworth make the journey from Greenwich to Dartford Bridge and back, travelling a total of 50km on the River Thames.

Skanska has been awarded the contract to build K1 Knightsbridge, a mixed-use scheme for The Olayan Group worth £141M. The 31,600m^2 project combines commercial, residential and retail space in the Royal Borough of Kensington and Chelsea. The Olayan Group's developer for the project is Chelsfield.

PRESIDENT'S COLUMN

I was interested to read a recent opinion piece in the construction press that painted the construction sector as an industry divided on the issue of retentions. A good read, but it completely missed the big picture which is that the construction sector is unanimous that retentions should be abolished. As usual, it's in the fine print of implementation where there is some disagreement.

The danger with our lack of agreement on implementation is that it will allow the government to sit on its hands and take the 'do nothing' path once again. This can't happen in a post-Carillion world where hundreds of sub-contractors so recently lost retentions to the failed Tier 1 contractor.

BuildUK has developed a 'Retentions Roadmap' that has the long-term objective of abolishing retentions by 2023. Excellent, except that time and experience has shown that it's almost impossible for such a disparate, fiercely competitive sector to all implement such a radical departure. Because of the nature of contracting, in order to win a job main contractors and then sub-contractors often feel forced or coerced into agreeing to terms and conditions, including cash retentions, that they know represent a commercial risk, especially when faced with project slippage and factory loadings to manage.

There is also a myth that retentions are vital to protect the interests of the client – the stated reason for holding one is to ensure that any defects are rectified. But in the structural steelwork sector, I have completely failed to find a company that has had a retention withheld for that purpose. Other reasons have certainly been given, including using retention monies to help cashflow, bolstering year end accounts and even as a source of capital. It's ludicrous that SME sub-contractors are actually financing the rest of the construction sector!

So this is where the simple concept of holding retentions in trust comes in. For those who can't let go of cash retentions, hold them in trust, like the tenancy deposit scheme. This will protect sub-contractors' monies in the case of insolvency, like Carillion, but it will also act as a disincentive to ask for cash retentions in the first place. If you can't use the retentions for the purpose that they were really taken, then what's the point? And then the industry will really be on its way to abolishing cash retentions as outlined by BuildUK.

The Peter Aldous Private Members Bill, which proposes legislating to hold cash retentions in trust, has its second reading in the House of Commons soon. I'll be reminding my MP, Jenny Chapman, that she should make sure she votes on this important issue. I recommend that you contact your MP too.

Tim Outteridge
BCSA President & Sales Director Cleveland Bridge

Teesside Beam Mill wins RoSPA Gold Award for third successive year

British Steel's Teesside Beam Mill (TBM) has been handed a prestigious award for a third time for helping its employees get home safely at the end of the working day.

TBM has achieved a Gold in the internationally-renowned RoSPA Health and Safety Awards, one of the longest-running industry award schemes in the UK.

The RoSPA Awards scheme, which receives entries from organisations around the world, recognises achievement in health and safety management systems, including practices such as leadership and workforce involvement.

TBM Plant Manager Andy Williams said: "This is a fantastic achievement which everyone at Teesside Beam Mill has contributed to.

"Nothing is more important than going home safely after your shift so together we all work extremely hard to maintain the highest of standards.

"We're proud of our safety performance at TBM but won't rest on our laurels, and we'll continue to look at ways in which we can further improve our performance."

Julia Small, RoSPA's Head of Qualifications, Awards and Events, said: "The RoSPA Awards are the most highly-respected in the health and safety arena, with almost 2,000 entrants every year, and allow organisations to prove excellence in the workplace, demonstrating a commitment to the wellbeing of not only employees but all those who interact with it."

TBM was previously awarded a RoSPA Gold Award in 2016 and 2017. Recently it also has won the Apprenticeship Award at the North East Business Awards 2018 for the support employees give to apprentices.

Steelwork creating university sports legacy

Due to complete in March 2019, the University of Warwick's new sports hub is quickly taking shape with the aid of 900t of structural steelwork erected by Hambleton Steel.

The scheme will create one of the foremost sports facilities at a UK university – including what is claimed to be the country's largest gym facility in the higher education sector.

Replacing the current sports centre on the campus, the hub will feature a 16-court sports hall, a 25m-long swimming pool with a moveable floor, fitness suites, climbing and bouldering walls and flexible studio spaces, as well as squash courts, outdoor 3G sports pitches and netball courts. It will also be the official training ground of Coventry's Wasps Netball Superleague team.

Willmott Dixon Managing Director in the Midlands Peter Owen said: "This is a fantastic project to be part of, creating cutting edge sporting facilities for the community at the University of Warwick which will really benefit its users."

Commercial addition for St James's redevelopment

The latest scheme in London's ongoing St James's redevelopment is the eight-storey steel-framed Duke's Court office block which will help to further enhance the area's business credentials.

The building will provide 3,234m² of office accommodation, spread over six upper floors with two levels of retail offering 1,034m² of space.

The building aims to achieve BREEAM 'Outstanding' for its commercial floors and BREEAM 'Very Good' for its retail zone, while the project as a whole has a WELL standard rating of Gold. The latter certification recognises the building has been designed as a healthy and productive space for its future occupants.

Occupying a footprint of 34m × 24m, Duke's Court replaces two old buildings that were demolished prior to main contractor Skanska starting on site.

Bourne Steel is fabricating, supplying and erecting 600t of steelwork for the project.

Big beams installed on confined Dublin site

Working on behalf of main contractor MP Construction, steelwork contractor Fox Bros. Engineering has successfully installed two 11t transfer beams as part of the refurbishment works at the Grafton Capital Hotel in Dublin.

The 11m-long Kloeckner Westok plate beams cantilever over a substation, which could not be moved, and support six-storeys of new bedrooms.

"It is a very confined site with limited access and no margin for error. We had to install the beams on a Sunday morning as a road closure had to take place in order to get a crane in to do the lifting," said James O'Hara of Fox Bros.

Kloeckner Westok's Design Team Manager John Callanan added: "These monstrous 800kg/m plate beams with chunky 80mm flanges were ideally suited to our automated plate girder line."

Overall Fox Bros. will fabricate, supply and erect 250t of structural steelwork for the hotel project.

The steel package is due to be completed by November this year.

New home for York's sports teams under way

York's professional football and rugby league teams (York City and York Knights) will both have a new home to share from next summer as an 8,000-seat stadium, including leisure and cinematic facilities, is currently under construction at Huntington on the city's outskirts.

Main contractor Buckingham Group has value engineered the original designs for the scheme alongside Caunton Engineering, who are the design and build steelwork contractor for the job. This exercise has included a complete design review of the project's steel frames.

A decision was made to replace precast planks with metal decking in the cinema seating areas, as it offers a more efficient build solution for the follow-on trades.

The stadium's cantilevering roofs have also been redesigned.

"Solid UB rafters were originally going to be used, but by changing to Westok beams we have lighter and less expensive members, and ones that are tapered at no extra cost to give a more aesthetic appearance," explains Caunton Engineering Senior Structural Engineer Richard Beesley.

Overall, structural steelwork is being used to form the entire stadium project which consists of four elements; the cinema block that adjoins the stadium's south stand, the east stand which also includes a two-storey building housing an NHS drop-in surgery, a library and the stadium's corporate facilities on the upper level, a leisure block that adjoins the scheme's north east corner and includes three pools, a gym and a sports hall, and the north and west stands.

New town in London Docklands announced

British Land has entered into a Master Development Agreement with Southwark Council and submitted an outline planning application for the Canada Water Masterplan, one of London's most significant development projects which will create a new urban centre for the capital.

Alongside the overall Masterplan the planning submission also includes a detailed planning application for the project's first three buildings, which include workspace, homes (of which 35% will be affordable) and a new leisure centre.

These three buildings are part of a major first phase of the development covering a total of 168,000m^2 of mixed-use space with construction due to begin in spring 2019.

Cllr Peter John, Leader of Southwark Council, said: "It is fantastic to see this project moving forward. British Land has done great work to consult and engage with local people and the resulting Masterplan will deliver what local people want to see, including a guaranteed 35% affordable housing split 70% social rent and 30% shared ownership in the first phase, new retail spaces and job opportunities, education and health facilities and a brand new leisure centre.

On completion, the Masterplan will be home to approximately 20,000 jobs with thousands of people working on site during construction, including apprentices and trainees. A decision on the planning application is expected by the end of the year.

Diary

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

Tuesday 26 June 2018
How can drone technology complement your business?
An introductory 1 hour webinar on drone technology and how it is changing and enhancing traditional working techniques

Thursday 28 June 2018
Steel Hybrid Onshore Wind Towers Installed with Minimal Effort
This event will present an economical solution for tall onshore wind towers based on a hybrid design

Tuesday 3 July 2018
Straight to the Point in Eurocode Design - Half Day Course
This four hour course contains minimum theory and maximum hands-on member design

Electric Egg/Shutterstock

The Angel of the North has become one of the country's most recognisable landmarks

SSDA celebrates 50 years

Having started in 1969, the Structural Steel Design Awards are this year celebrating their 50th anniversary. In the third of a series of articles, NSC looks back at the 1990s.

Since the Structural Steel Design Awards (SSDA) were initiated in 1969 by the British Constructional Steelwork Association (BCSA) and the British Steel Corporation there have been many changes in the construction and the steel sectors, but one constant asset is the way that steel not only confers efficiency and economy but also has an aesthetic which designers are able to exploit to the benefit of the built environment.

The qualities of engineering excellence, innovation, attention to detail, economy and speed of construction have been brought together in each of the structures that have been given awards during the past 49 years.

Following on from last month's look back at the 1980s, in this issue we highlight the 1990s. Two examples of this decade's Award winners are the UK Pavilion, Expo '92, Seville, Spain (a winner in 1993) and The Angel of the North (a 1998 winner).

Built for the then Department of Trade & Industry, the UK's Pavilion for Expo '92 was a first-class exhibition space that became the principal exhibit for Britain's participation at the international event.

Structural steelwork was chosen to allow the structure to be accurately manufactured in the UK in large pre-fabricated elements, transported hundreds of miles and be assembled as quickly as possible.

The Pavilion consisted of an outer envelope 65m-long × 38m-wide and 25m-high, enclosing three similar 'pods' which provided the exhibition space. The main east wall of the pavilion was fully glazed with water pouring down the outside, while stacked water-filled steel containers on the west face gave protection from the sun.

The internal pods were erected first and each provided two decks 14m x 20m in plan. They were formed by concrete slabs with composite steel decking supported on the bottom flanges of universal beams.

The external envelope consisted of ten identical tubular steel frames, each comprising two vertical wall trusses 21.7m-high supporting a roof truss with a 32m clear span.

Each frame acted as a pair of vertical cantilevers linked by a roof member. Transverse forces on the envelope, including those from the internal pods, were therefore resisted by bending in the wall trusses.

Constructed by main contractor Trafalgar House Construction, the SSDA judges said this magnificent Pavilion integrates successfully the very best of British engineering and architectural innovation.

The Angel of the North is one of the most viewed pieces of art in the world, seen daily by drivers on the A1 and train passengers on the East Coast Main Line. Sitting on a

The sculpture stands 20m high and has wings measuring 54m across

hill just south of Gateshead, the weathering steel statue is 20m-high × 54m-wide and is one of the largest sculptures in the UK.

Designed by Turner Prize-winning sculptor Antony Gormley, the sculpture was designed as 'a material image of a spiritual subject' and was created by using techniques from heavy industry and shipbuilding, two sectors the North East formerly excelled in.

Aeronautics and anatomy are combined in an exoskeleton of ribs and diaphragms and an inner body made of plate. The vertical ribs on the body and the horizontal ribs on the wings are the main structural elements carrying bending moments, due to a wind loading of up to 125mph.

Acting as both main contractor and steelwork contractor, Hartlepool Steel Fabrications formed the internal structure skin from conical and flat sections, while the external skin was formed from 6mm thick plate.

The wings were fabricated in four sections, then each pair of these was joined by a single central section. The body involved over 2,000 pieces of welded internal horizontal rib over which the cosmetic skin was fitted.

The three pieces of the Angel (body and two wings) travelled overnight to the site and were then lifted into place before the permanent welded connection and infill skin panels were added.

A full list and description of all Award winners can be found at: *https://www.steelconstruction.info/SSDA_2018_-_50th_Anniversary_Year*

The 2018 Awards, which are jointly sponsored by the BCSA and Trimble Solutions (UK) Ltd, will be announced in early October.

The Pavilion formed the UK's principal exhibit at Expo '92

The Pavilion was prefabricated in large elements before being transported to Spain

Copper tanks are lowered into position through holes in the steelwork

Steel blend for distillery

Steel construction is playing a leading role in the building of a new distillery in The Highlands.

FACT FILE
Ardross Distillery, Alness
Main Client: Ardross Investments
Architect: NORR
Main contractor: Morrison Construction
Structural engineer: Blyth & Blyth
Steelwork contractor: Mackay Steelwork & Cladding
Steel tonnage: 200t

Set in the picturesque Averon Valley, some 30 miles north of Inverness, a new distillery is being built within the grounds of the abandoned and rundown 19th Century Ardross Mains farmstead.

The project's client, Ardross Investments, purchased the site, which consists of 50 acres of private land with its own loch, in order to build a modern, state-of-the-art distillery that will produce a number of different spirits.

To this end a steel-framed design that incorporates some retained and salvaged elements from the original buildings has been adopted as the most efficient construction method.

The main distillery building, containing the main entrance, still house, tun room, mash house and mill room, will be an L-shaped structure that partially surrounds an inner courtyard.

The majority of this main building is a steel-framed structure, albeit with two original stone walls incorporated into the design and the area housing the main entrance and lobby which is timber-framed.

The walls at the rear of the main building have been removed and rebuilt with a steel frame to increase the size of the new two-storey facility.

Main contractor Morrison Construction started on site late last year, inheriting a plot that had already been partially cleared with only building shells and stone walls left.

Adding to the overall aesthetics of the scheme and helping to preserve the character of the project, stone and slate from the farm's collapsed buildings will be reused to roof some of the distillery structures.

"As well as retaining and reusing as much of the on-site materials as possible, the building's steelwork, which has all been galvanized against corrosion, will be left exposed within the completed structure, adding to the high-spec interior requested by the client," says Morrison Construction Contract Manager Gordon Williamson.

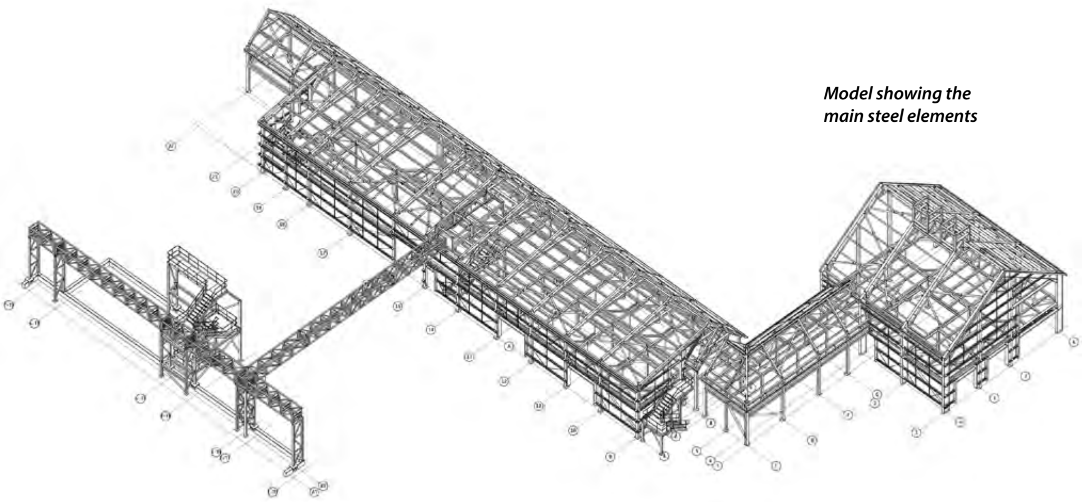
Steelwork contractor for the project is locally-based Mackay Steelwork & Cladding and it has erected 200t of structural steel for the main building and an adjacent boiler house. Also within the company's remit is the supply and installation of metalwork, predominantly consisting of grating to form the distillery's first floor, as well as stairs, hand railings, composite roof and wall cladding.

A steel-framed solution was chosen for its ease and speed of construction, as well as its ability to provide the column-free areas for the main building's two floors. The steel columns are also carrying a considerable weight as the cladding will be topped with slate, and so the members are slightly larger sections than would ordinarily be used on a structure of this size.

Forming the roof of the steel-framed part of the distillery building are a dozen 10.5m-long × 3m-deep trusses, which were brought to site as complete fully-welded sections in order to avoid unnecessary on-site work.

"The roof bracings and roof purlins are a bespoke system, in that the CHS bracings and hot rolled PFC roof purlins are all

The distillery sits within a large rundown farmstead



Model showing the main steel elements

within the depth of the primary steel rafters, which results in the bracings stopping and starting either side of the purlins," explains Mackay Steelwork & Cladding Director Neil Mackay.

Using one 80t-capacity mobile crane for the steelwork, and a 55t-capacity crane for the cladding, Mackay completed the majority of its programme in six weeks.

"The biggest challenge has been trying to co-ordinate all of our activities in a tight site, where most of the time we could only operate one mobile crane," adds Mr Mackay.

"At the same time, areas of roof steel and cladding had to be left out to allow installation of distilling stills and tanks. This happened during our construction phase and these areas of roof steel and cladding were then installed retrospectively."

As well as the main distillery building, Mackay has also erected a pipe bridge that connects water tanks (known as the tank farm) with the distilling process within the mash house area, and a small steel-framed boiler house to the rear of the site.

Other buildings on the site are being renovated to form ancillary structures for the distillery. Two detached stone one-and-a-half storey cottages to each side of the main building will become offices and staff accommodation. An old dairy building behind the staff quarters will become a blending and product development laboratory, while a three-storey house will be converted into a vaulted cask storage area.

The Ardross Distillery is expected to produce its first spirits by the end of the year.

Summing up, the Highland Council says that through the use of appropriate materials, with new sections of the building being sensitively sited and designed when viewed alongside the existing buildings, the project will safeguard the long-term future of the dilapidated historic buildings.

In a report it concluded: "It is encouraging to see the future of the listed buildings protected and secured through a high-quality design, which respects the setting of the steading and the nearby Category A listed Ardross Castle."

New steel elements are connected to retained stone walls

Ice cold frame

A steel frame has proven to be the only viable solution for a cold storage facility near Peterborough.

A £10M, 5,667m² cold storage facility for national logistics provider Yearsley Logistics is being built at the Great Haddon Employment Zone near Peterborough.

The project forms the initial part of a £65M development of a 20-acre site, known as "SuperHub South".

The large steel-framed depot will become the UK's largest single site temperature controlled facility and will create more than 300 new jobs. The first phase is set for completion in September, when the temperature will be pulled down to minus 25 degrees and the depot will immediately become operational. Subsequent phases will follow over the next few years.

The investment will create the latest in a series of superhubs across the UK, part of Yearsley Logistics' strategic plan to minimise food miles and increase operational efficiency on behalf of its customers; food manufacturers, retailers and catering providers nationally.

SuperHub South will serve the south of England and the major shipping ports with an eventual 150,000 pallet capacity.

Working on behalf of main contractor Russells Construction, the project's steelwork has been fabricated, supplied and erected by BD Structures. The main cold store measures 65m × 65m and a series of Westok cellular rafters have been used to create the column-free spaces needed for the facility.

The cellular rafters are 32.5m-long × 1,434mm-deep with 1,100mm diameter openings. They are supported on 20m-high perimeter columns spaced at 6.5m intervals and by one line of internal columns, thereby creating two large open-plan areas.

Kloeckner Westok Technical Advisory Engineer Walter Swann says: "Our involvement initially involved looking closely at the performance requirements for the rafters. The roof has a very shallow pitch at one degree, and to ensure that it drained adequately an imposed load deflection limit of 50mm was specified by the engineer (a span/depth limit of 650 for a 32m span).

"By choosing more appropriate cell data it was possible to massage the beam depth up, and reduce the weight of the beam by 20%, yet still maintain the very strict deflection criteria."

Kloeckner Westok and BD Structures worked together to determine a splice position to suit the available bar lengths.

With the splice position fixed, the connection was designed and detailed to ensure that the centre of force in each of the tee's was aligned with the centroid of the bolts.

Model showing the 65m x 65m main store and its attached facilities

FACT FILE
Great Haddon cold storage depot
Main client: Yearsley Logistics
Architect: AEW Architects
Main contractor: Russells Construction
Structural engineer: Healey Consulting
Steelwork contractor: BD Structures
Steel tonnage: 500t

Roof bracing extends around the entire structure

Standing on an exposed site the building will be subjected to high wind loads

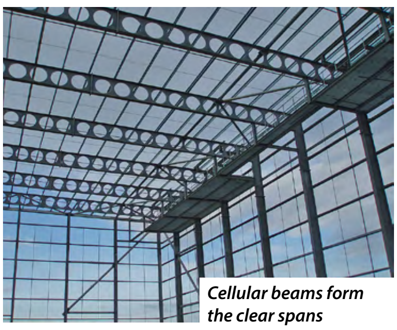
"This, coupled with some minor tweaking of the cell pitch, meant that in 120t of Westok beams there was not one infill – resulting in a very economical solution," adds Mr Swann.

As well as being an efficient steel member with which to form the required spans, cellular beams were also chosen because they will allow cold air from the building's chillers to pass through.

Standing 20m-high on an exposed site, the structure will be subjected to potential high wind loads as Healey Consulting Engineer Mark Bradbury explains. "It's a tall building and so stability for the structure is provided by 6.5m-deep lattice beam roof bracing that extends around the entire perimeter of the steel frame."

Vertical diagonal bracing is located at each of the four corners of the square building elevations, where a tubular brace transfers the large wind reactions from the roof lattice frame to the structure's foundations through two bays.

Many cold stores are designed as a box-within-a-box, whereby the outer steel frame surrounds another inner freezer box. On this project, a more economical solution was used as the steel frame and its cladding act as the only 'skin' surrounding the freezer.



Cellular beams form the clear spans

"A lot of design work was required to ensure thermal isolation was achieved by the frame and determine the most appropriate sub-grades of steel members to cater for the -25 degree conditions," explains BD Structures Director Chris Heys.

The cold store's steelwork is all left exposed within the completed project and so it was galvanized to ensure it will not corrode under the extreme conditions. Meanwhile, to achieve thermal isolation, the cold store column baseplates are seated onto thermal break isolation pads, which are on top of the concrete pad foundations.

As well as the main cold store structure, the project also includes an office block and loading bay that extends along slightly beyond one elevation.

Measuring 75m-long × 18m wide the majority of this linked, but structurally-independent, portalised steel frame accommodates the loading bay. One end of this structure also houses a two-storey office block, which has been designed to accept a further floor if needed in the future.

Yearsley Logistics Managing Director Tim Moran says: "This ambitious project is all part of our ongoing strategy to achieve faster, leaner and more efficient supply chains though the creation of a national network of SuperHubs, and demonstrates our long-term commitment to the UK frozen food sector at a time when others are withdrawing from national locations.

"This is a scheme to meet our needs now and long into the future, as we continue to bring on new customers. Overall, the SuperHub strategy allows us to improve operational efficiency and optimise costs, both of which are welcomed by our customers. This project, designed to achieve a BREEAM 'Very Good' rating, also helps us to achieve the ever higher environmental standards that we set ourselves to reduce food miles and minimise emissions."

Andrew Russell, Director for Russells Construction, says: "We have more than a decade's experience in the delivery of temperature controlled facilities, with more than 76,000m^2 commissioned for Yearsley Logistics and another 9,000m^2 for other clients.

"In that time, we've developed a fast and efficient methodology which, combined with a trusted supply chain and excellent relationship with our clients, allows us to provide contracted programme schedules, enabling them to have their buildings operational for customers much sooner than expected."

How the completed facility will look

Lakeside scheme expands with steel

Phase 2 of the Rushden Lakes development is under way as steelwork erection nears completion on a 14-screen cinema block, and further restaurant and retail units.

FACT FILE
Rushden Lakes Phase 2, Northamptonshire
Main client: LXB Retail Properties, The Crown Estate
Architect: The Harris Partnership
Main contractor: Winvic Construction
Structural engineer: BE Design
Steelwork contractor: Caunton Engineering
Steel tonnage: 2,500t

Set within a Site of Special Scientific Interest (SSSI), the Rushden Lakes development is centred around a series of man-made and natural lakes in the Nene Valley, Northamptonshire, and includes 30 retail outlets, a visitor centre as well as lakeside restaurants and a boathouse providing aquatic craft for hire.

Adjoining phase one of the scheme (see *NSC* November 2016) which opened last year, a second phase of construction is under way and consists of a 14-screen cinema block with ground floor leisure outlets, an attached 120m-long two-storey western restaurant and leisure terrace that overlooks a lake, and a fourth retail block (Block D).

Steel construction was successfully employed for the first phase retail zones. This has led the project team to use steel once again for its second phase.

The steel-framed 28m-high cinema block contains an IMAX screen and 13 other smaller screens, all housed at first floor level. Ground floor has the main entrance lobby and a number of leisure outlets, including an indoor climbing zone.

Structurally the cinema block is a large braced box, stabilised with cross bracing located in cores, stairwells, walls and in the roof steelwork.

Having 14 screens all sat within one large building and on top of leisure facilities has meant a lot of design work was necessary to stop noise permeating between the various zones. To mitigate against this the cinema screen's steelwork includes acoustic isolation pads.

"There are between 30 and 40 connections per screen within the main cinema frame that needed acoustic isolation packs," explains Caunton Engineering Project Engineer Chris Duff.

These connections are either located where beams connect to perimeter walls or in partitions between individual cinema screens.

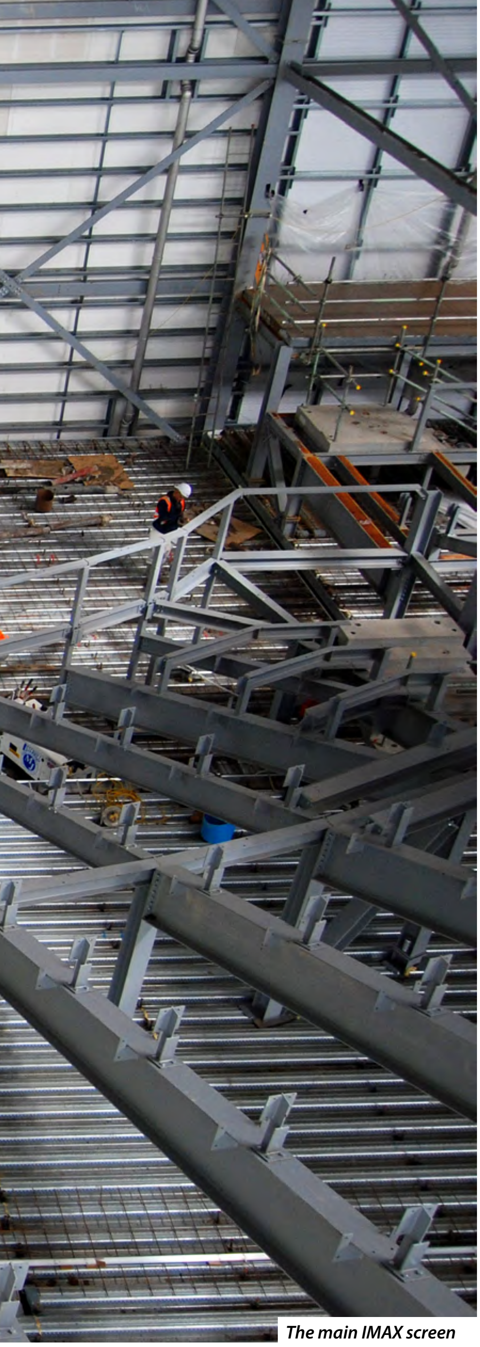
"The pads also completely isolate the ground floor steelwork from the first floor, which is why some of the columns are spliced at this level with pads inserted between the two members," adds Mr Duff.

All of the cinema screens are open-plan column-free spaces with the IMAX being the largest and measuring 24m × 27m. A series of spliced rafters form the roof as well as a plant deck over this screen.

Using up to four mobile cranes - with capacities of between 50t and 80t - at any one time, Caunton Engineering started the erection programme with retail Block D, which is located on the opposite eastern end of the development.

Steel erection then moved on to the IMAX screen. This part of the cinema building reaches the maximum 28m

The completed Phase 2



The main IMAX screen

The cinema screens all vary in size

Steel erection begins on the 120m-long restaurant and leisure block

height, while the remainder of the block is 22m-high.

"We then erected the rest of the cinema block working in a north to south direction before turning our attention to the long restaurant block," explains Caunton Engineering Contracts Manager Adrian Downing.

The cinema block's steel grid pattern is irregular as the screens are mostly different sizes, while the ground floor features a more open-plan layout for the leisure facilities. Numerous plate girder transfer beams support the first floor's more frequent column lines.

The two-storey restaurant and leisure block is separated from the cinema by a movement joint, and halfway along its length it has a slight kink, mimicking the adjacent lake's shoreline.

This 14m-high building is a portal frame formed with a series of 26m-long rafters spliced at midpoint. The building features a mezzanine level that accommodates further leisure facilities within an open-plan column-free zone.

Below, at the ground floor restaurant level, there are two internal column lines supporting the mezzanine floor.

"The reason the first floor has been designed as a mezzanine is because it allowed us to have a very shallow floor depth, giving us the maximum possible headroom for the leisure floor," says Mr Duff.

Floor-to-ceiling height is important as the upper floor will house an indoor trampoline facility. Vibrations exerted by this activity have been taken into account and the steel mezzanine has been designed to 8Hz instead of the more usual 4Hz.

Caunton Engineering completed the main steelwork programme in May, but will return later this month (June) to complete cold rolled steel stairs in the cinema.

It will also erect 5m-high canopies alongside the restaurants, once the cladding has been installed, and erect plant decks to the roofs of this two-storey block.

Winvic Construction Director Danny Nelson says: "When steelwork is going up and buildings become more than drawings, it is an exciting stage for any project.

"Rushden Lakes is a landmark development in the UK, for its size and modern take on how people will interact in a retail and leisure space. Therefore, we were thrilled to have been contracted by LXB and The Crown Estate to drive this second phase for them, following the success of the first.

"Many challenges that come with such a significant project have to come to the fore, and these include the creation of piled retaining walls by the lake, extensive work to accommodate new traffic flow and moving 25,000m^3 of earth for flood alleviation measures."

Summing up, LXB Retail Principal, Jon McCarthy adds: "Winvic's delivery of Phase 1 went extremely smoothly and the company's experience and commitment to managing a project of this scale, with the challenges it brings, was evident from the start. LXB is therefore thrilled that the partnership with Winvic is continuing on Rushden Lakes Phase 2 and the units are already evolving at pace."

Banking on steel

The latest steel-framed office tower at Canary Wharf features a sloping western façade as well as a flexible design based around cellular beams.

The sloping façade overlooks the River Thames

London's Docklands has been a hive of construction activity since the early 1990s and one area in particular, Canary Wharf, always seems to be playing host to yet another high-profile high-rise project.

Within a stone's throw of One Canada Square, a building that lays claim to being the UK's second tallest structure and a project that kick-started the entire Canary Wharf development, another steel-framed office is under construction.

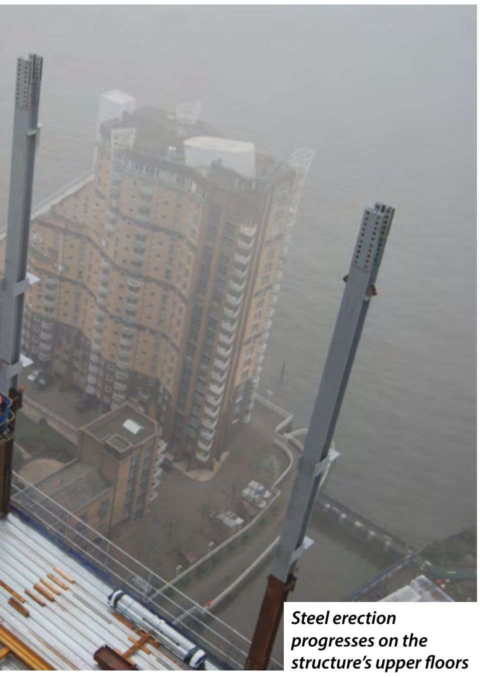
One Bank Street is a 27-storey commercial building that will offer 60,000m² of high-quality office space including three levels of state-of-the-art trading floors, a retail unit at ground level, a free-standing retail kiosk on South Dock Promenade, public realm, planting and landscaping, and basement car and cycle parking.

Designed by world-renowned architects Kohn Pedersen Fox, One Bank Street will contribute to strengthening the role of Canary Wharf as a prime London office and employment location, providing capacity for an additional 5,837 full-time jobs.

Designed to achieve a BREEAM 'Outstanding' rating, the steel-framed structure sits atop a triple 16m-deep basement and gains its stability from a large centrally-positioned reinforced concrete core.

Attached to two sides of the concrete core, the building features another outer 'soft core' that accommodates risers.

"To maximise the flexibility of this space it was established at concept stage that the MEP zone would be framed in steel, with a line of columns located at the outer edge on each face, with shallow steel beams spanning to the core to suit the riser layout," says Arup Associate



Steel erection progresses on the structure's upper floors

FACT FILE
One Bank Street, Canary Wharf, London
Main client: Canary Wharf Group
Architect: Kohn Pedersen Fox
Main contractor: Canary Wharf Contractors
Structural engineer: Arup
Steelwork contractor: William Hare
Steel tonnage: 9,500t

One Bank Street will feature glazed façades

Dominic Munro.

The steel columns adjacent to the core are part of a vertical steel truss system, which transfers all the vertical loads to the core. The diagonal members of the truss are, in effect, hangers supporting the floor below. The main advantage of this truss system is that the load in the steel columns is greatly reduced.

"We have estimated that approximately 600t of steel was saved as a result of this idea. The concrete core benefits from the additional vertical load as tensile stresses from wind loading are reduced. The continuous truss also means that there is very little differential movement between the steel and concrete elements of the core," adds Mr Munro.

Adjacent to the core, the building has two large atrium spaces that are separated by a floor slab at level eight, which is supported from above by inclined hangers. The lower atrium extends upwards from level four to the separating slab, while above the second atrium then proceeds upwards to level 10.

The steel frame is primarily arranged around the core with Fabsec cellular beams radiating outwards on all four elevations to create column-free spans of up to 14m to the perimeters.

Many of these cellular beams have in-built flexibility, as they have additional holes for future services routing.

An exception to the column-free design is the sloping western elevation, which overlooks the River Thames.

From the top of level three to level 12, a series of raking columns facetted on each floor, create a feature slope which then continues upwards less steeply to level 23, via cantilevering floors, until level 23 where the elevation becomes vertical.

Along this elevation, the structure's internal floorplate is no longer column-free, as at level four there are two lines of internal columns. However, as the slope decreases the size of the floorplate, there is only one line of columns by level eight and none are present by level 12.

According to Dominic Munro, each floor along the raking façade has to resist a horizontal compressive force which is a function of the given floor's load (plus the effect of any additional change of inclination).

This results in the building leaning onto the core and pushing it towards the east.

"In order to mitigate this effect, we came up with the idea of breaking the two corner raking columns at levels where they come near a vertical column, namely level 14 and level four," says Mr Munro.

"Where the breaks in the raking columns occur, loads are transferred to nearby vertical columns via transfer beams. This has the double advantage of reducing the force running down the raking columns, and hence the forces leaning on the core, and also creates a balanced system whereby the transfer floors and the stability core are subject to a symmetric set of forces with no overall twisting effect."

Although the raking columns continue all the way down to ground level, they

▶18

▶17

are absorbed into a more traditional rectangular three-storey element at the tower's western lower levels.

Three floors (first to third) cantilever out by 4m to avoid a line of perimeter columns that would obstruct a pedestrian thoroughfare.

This cantilever is formed by a series of 10m-long plate girders positioned at first floor, each weighing 44t. The installation of these members required steelwork contractor William Hare to use a 250t-capacity mobile crane.

"Most of the remainder of our 9,500t steel tonnage has been erected via tower cranes that are positioned on top of the core," explains William Hare Senior Site Manager Ben Burns, "apart from the 90t perimeter columns which required a 90t-capacity mobile crane to be brought to site."

One Bank Street is due to complete during 2019.

The building cantilevers over a pedestrian thoroughfare

Soft cores

One Bank Street adopts the familiar approach to office building construction of concrete core surrounded by steel frame with some particular features. Richard Henderson of the SCI discusses some of the details.

The construction sequence at One Bank Street required the concrete core arrangement to be fixed and under construction before the details of risers for building services were finalised. This led to the adoption of a "soft core" in a 4m zone on the long east and west sides of the concrete core which could be finalised later, bounded by a row of steel columns.

Inclined hangers and horizontal beams in vertical trusses between the columns and the core wall transfer vertical load to the concrete core. The horizontal component of the axial tension in the inclined hangers is balanced by the thrust in the horizontal beams, with connections to cast-in plates which transfer the vertical load into the core walls through reinforcement. The inclined hangers are arranged to carry the same loads where possible so that out of balance forces are minimised. Horizontal forces on the core are present at the top and bottom of the vertical truss where inclined hangers are not provided. The principles are illustrated in Figure 1.

Inclined columns

The west elevation of the building is sloping over much of its area with inclined columns in the external face. At the connections of beams to the inclined columns, the triangle of forces composed of the vertical reaction in the beams and the increase in the inclined column axial load is resolved by a horizontal force in the beam.

The inclined columns are in effect leaning on the concrete core. This force is transferred into the concrete floorplate and resisted by the core. The axial forces which are in the same load case as the vertical loads are thus not transferred to the core through the steel floor beams, avoiding the need to design the beam connections for coincident shear and axial forces.

If the inclined columns are continued to the ground, the horizontal forces on the core are also carried to the foundations. However, by breaking the inclined columns, the horizontal component of force at the break is transferred back to the core, balancing the axial forces above. The result is that there is no shear force on the core due to the adoption of inclined columns that is carried through to the foundations.

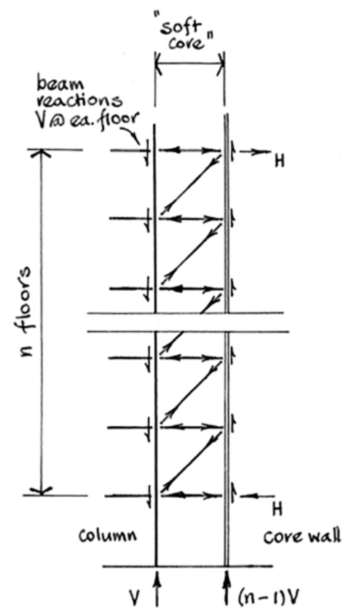


Figure 1: vertical truss in soft core

Shopping for steel

A large retail extension and refurbishment programme, with added flexibility, is being carried out at the Frascati Shopping Centre in County Dublin.

FACT FILE
Frascati Shopping Centre, Blackrock, County Dublin
Main Client: Invesco Real Estate
Architect: Newenham Mulligan Associates
Main contractor: Collen Construction
Structural engineer: Barrett Mahony Consulting Engineers
Steelwork contractor: Steel & Roofing Systems
Steel tonnage: 850t

With two prominent red tower cranes on site, the extension and refurbishment of the Frascati Shopping Centre in Blackrock, County Dublin, is easy to spot above the suburban rooftops.

The initial work, involving a new multi-storey car park, has already completed and the remaining phases, which involve the use of structural steelwork, are due to be delivered over the course of this year, with the final phase to be completed by December.

The shopping centre's owner Invesco Real Estate – a global investment manager – is spending more than £26M to increase the size of the centre from 9,290m² to 15,793m² in order to broaden its appeal to national and international traders.

The works require main contractor Collen Construction to build a large Aldi supermarket unit, further extensions to the main north east elevation as well as several new smaller units including restaurants. The company's work also includes drainage diversions, external landscaping and refurbishment of the existing centre.

The tenant mix at the centre is set to evolve and improve as a result of the strong anchor tenants in place, as well as the additional sizable units that the development will offer.

Current anchor tenants Debenhams and Marks & Spencer will be joined by Aldi later this year.

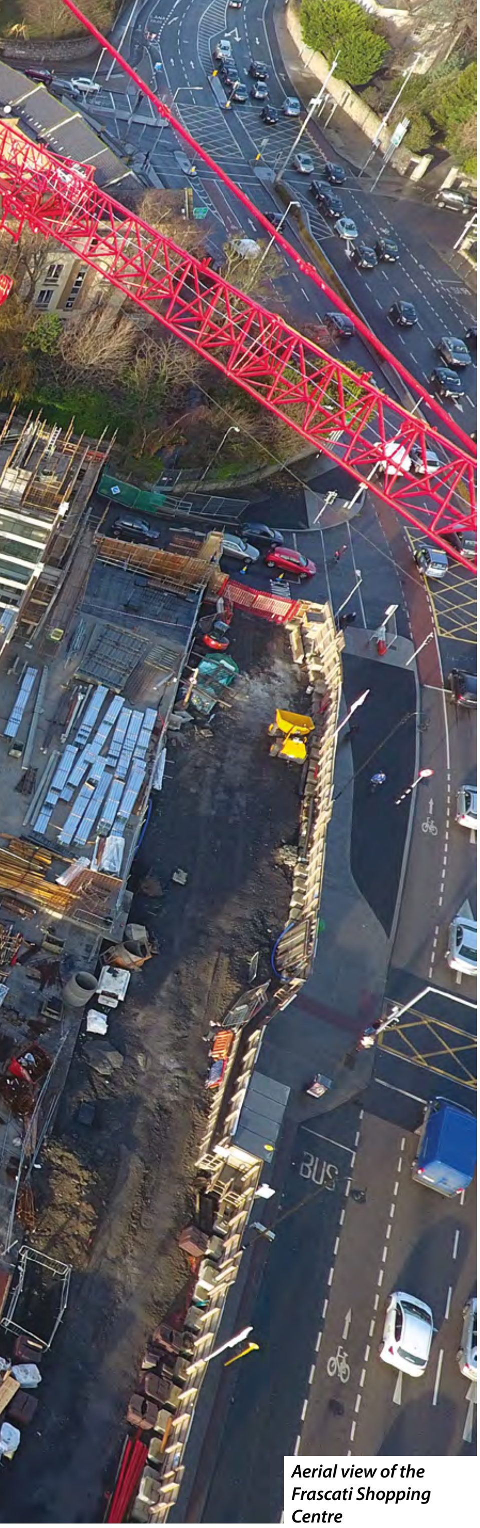
When complete, the new Frascati Shopping Centre will be a landmark on one of the most important routes connecting Dublin city centre with its south-eastern suburbs.

The new retail extensions are all compositely designed with steelwork supporting metal decking. Stability is gained from a combination of concrete cores and cross bracing, primarily located within partition walls, but some will be visible behind shopfront glazing.

Although they do link into the existing shopping centre, the new build extensions are entirely structurally independent, with three movement joints separating them into three structures.

"The old centre is a mix of concrete and steel construction, as it has been expanded over the years," says Barrett Mahony Director John Considine. "But when it came to designing the extensions, a steel frame was the only option as it offers the flexibility to change and alter shop layouts, and it is quick to build with."

The first point has been fully tested, as a


Aerial view of the Frascati Shopping Centre

couple of tenants have requested alterations to their already constructed retail units, and this has required some new service openings to be formed by cutting through the metal decking.

Another reason for choosing a steel solution is the fact that this is a very congested site surrounding an operating shopping centre, visited by thousands of customers every day.

"Steel is fabricated offsite and arrives ready to be erected," adds Mr Considine. "On a busy site like this a concrete option, with all of its associated formwork, would be very undesirable."

Steelwork contractor Steel & Roofing Systems (SRS) will fabricate, supply and erect 850t of steel for the project as well as installing all of the cladding and metal decking.

The cladding consists of 1,400m^2 of Kingspan Benchmark Evolution along the front of the new extensions and a further 1,200m^2 of Kingspan RW panels on the back-of-house areas.

SRS has divided its steel erection programme into four phases, with the first three all wrapping around the existing centre along two elevations, and the fourth phase consisting of 50t of steel to create new storage space for the existing M&S store.

The initial phase was the Aldi store which is a large braced box containing a ground floor shop, first floor storage area and office, and a further mezzanine level office space. The Aldi structure features one line of internal columns and has spans of up to 13.2m-long.

Phases two and three are both two levels high and include the remainder of the new retail outlets and also a glazed atrium and new mall entrance. The atrium has a maximum width of 9m, and its roof is formed with a series of cranked 250mm × 100mm RHS members that support the glazing.

"Part of the phase three works requires us to undertake a return visit later this summer as some existing stores need to be demolished prior to the steel frame being erected," explains SRS Project Manager Conor Whelan.

Some added flexibility has been designed into phases two and three as three more floors of steel-framed apartments could be added in the future.

Mimicking the retail zone and basement car park's 8m × 8m grid, the pattern will be repeated in the residential element and column stubs have been left on the rooftop steelwork to facilitate the installation of this further extension.

Although the residential part has yet to gain planning permission, it was designed into our original scheme," says Mr Considine. "So in order to accommodate it we have larger foundations and larger steel columns than would otherwise be needed."

Adding some extra architectural highlights, the phase two and three areas have steel cantilevers along the front elevation. The largest of these cantilevers, at 4m-wide, covers an area of two bays (16m) and overhangs the main entrance to create a column-free pedestrian thoroughfare.

Summing up, Louise Donnelly of the project's real estate agency Cushman & Wakefield says: "We are already experiencing a strong level of interest in the scheme, particularly from food and beverage operators.

"It is a very exciting time for the people of Blackrock and surrounding areas and, once completed, the centre will provide an enhanced shopping experience for the immediate catchment area."


Steelwork contractor SRS also installed the cladding


The atrium roof steelwork


Extra floors can be added in the future


Steel was chosen for its flexibility

A guide to steel production equipment

Steel manufacturing equipment and its producers play an essential role within the structural steelwork sector.

CNC technology offers steelwork contractors a range of benefits

Steel manufacturing equipment is extensively used in steelwork contractors' workshops and has also become part of the added value offer from larger steel stockholders who are offering basic fabrication services to their customers.

Cutting and drilling

In the fabrication factory or steel service centre one of the first operations is to cut the sections to length and profile the plates to the desired size or shape. This can be done in a number of ways using a range of automated machinery; Band saws which are generally used for cutting to length, oxy/gas cutting which can be used to cut components from thick steel plate; components can also be cut efficiently by plasma arc systems. To support the efficiency of the steelwork fabrication process the use of drilling and punching equipment allows components to be rapidly bolted together on site.

Blast cleaning and auto-painting

For many steelwork contractors, sections and plates are blast cleaned prior to fabrication, although some choose to carry out the blast cleaning after the sections are cut to length. Shot is fired at the steel surface which displaces dirt and mill scale, and also mildly indents the steel creating a "rough" surface. Manufacturing equipment with auto-painting functions mean that prefabrication primers can be applied immediately after blast cleaning. This immediate application maintains the reactive blast cleaned surface in a rust-free condition through the fabrication process until final painting can be undertaken.

Multi-function machinery and workshop design

Equipment manufacturers are increasingly offering multi-function machines which combine a number of the processes outlined above. In addition to offering multi-function machinery, manufacturers of steel fabrication equipment work closely with steelwork contractors planning the workshop design and layout with real time simulation to find the best flow of materials and maximise production based on required output through the use of advanced simulation software.

Computer Numerically Controlled machinery

Advanced simulation software has established Computer Numerically Controlled (CNC) machinery as the standard today and it is integrated into each stage of the steel fabrication process. The process may vary between each steelwork contractor but will generally commence with the efficient and seamless transfer of 3D model information from the design office to the equipment in the workshop.

CNC machinery provides a number of added value benefits to the steelwork contractor including; less material wastage due to accuracy, faster production and increased safety through reducing material handling.

The structural steelwork sector is also seeing the adoption of modern scribe marking technologies. This software allows for full or partial contours to be scribed directly onto the steel to indicate the position of the parts that need to be welded, saving valuable time and minimising errors. In addition, information can be marked on the steel indicating quality, traceability, welding information and assembly details.

"Improvement in CNC technology and automation has been a priority for Ficep, many customers have seen the advantage of automating even a single machine in a workshop. Customers involved with steel processing have been given a boost in productivity and competitiveness to levels that we have never seen before," says Ficep Managing Director Mark Jones.

Post-sale support

The role of the manufacturing equipment providers doesn't end with the sale of the machinery. Once a customer has invested in a new machine or processing line, they want to be sure it works and continues to work properly.

In addition to the standard warranty which comes with any new piece of machinery, manufacturers also offer a range of service support contracts.

Remote diagnostics is now integral as it allows technicians and service engineers to repair equipment without visiting the customer; saving time and meaning repairs are executed faster.

The Future

The sector is moving towards the adoption of full automation of all processes on the factory floor, utilising robots or cobots (collaborative robots) where humans and robots work together with direct interaction in a defined workspace to reduce material handling and welding. While this is some way off, some steelwork contractors are already moving into robotics.

'In a world that is evolving at a faster pace than ever, Peddinghaus manufactures machinery that withstands the test of time. Integrating flawlessly with industry leading software companies our steel fabrication equipment is innovative, powerful, indestructible and backed by our 24/7 customer service department," sums up Anton Peddinghaus, CEO of Peddinghaus Corporation.

STEEL for life

Sponsors Manufacturing equipment

Gold: Ficep UK Ltd, Peddinghaus Corporation
Bronze: Kaltenbach Ltd, Voortman Steel Machinery

U-frames in bridges

Bridge designers will be familiar with compression flanges restrained by u-frames. David Brown of the SCI introduces the concept and illustrates the same principle commonly found in the design of portal frames.

Engineers are always concerned with the buckling of elements in compression and how restraint might be provided. In bridge construction and (for example) a twin truss span, it may be possible to brace between compression chords, as shown in Figure 1, to form an enclosed box.

Figure 1: Truss bridge with bracing between the compression chords

If bracing between the compression chords is to be avoided, some other means of restraining the compression chord (or compression flange, if the member is a beam) must be found. There are many examples of older footbridges where a horizontal cross member is extended laterally at deck level, and a diagonal brace provided to restrain the compression flange, as shown in Figure 2. People without an engineering background often think the metalwork was provided to support pipework (and it was often used for this), but the arrangement has a much more important function.

Figure 2: Bridges with external bracing to restrain the compression flange

With so-called "half-through" bridges, such as that shown in Figure 3, clearly no bracing is possible between the compression flanges. In this form of construction, the compression flanges are restrained by intermediate u-frames.

Figure 3: "Half-through" bridge

A typical cross section at a u-frame location is shown in Figure 4. A u-frame consists of a horizontal member (usually part of the deck steelwork) and vertical members. The connection between the horizontal member and the vertical member is continuous or semi-continuous forming a u-shaped stiff frame to provide restraint to the compression elements.

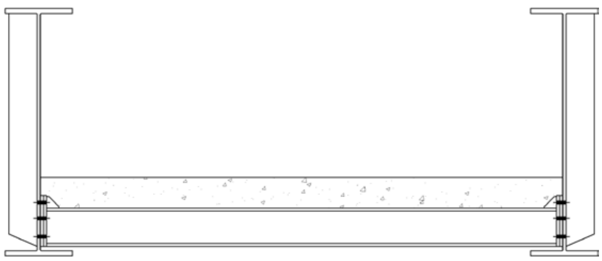


Figure 4: "Half-through" bridge typical cross section

Bridge design codes such as BS 5400-3 or BS EN 1993-2 allow designers to calculate an effective buckling length of the compression flange. The effective length primarily depends on the stiffness of the vertical members, the stiffness of the horizontal member and the stiffness of the connection between the members. Increased flexibility in the members or at the connections will lead to a longer buckling length. Detailed information on the design of half-through bridges, including the effect of u-frames, may be found on *steelconstruction.info*.

U-frames can also be seen in the footbridge pictured in Figure 5 (over page). In this form of construction, the compression flanges of the main girders are formed of square hollow sections, orientated as a diamond. Restraint to these compression flanges is provided by external u-frames fabricated from plate, which wrap around the bridge cross section at intervals along the span.

Application in buildings

Although u-frames are associated with bridge construction, the same principle is found in portal frames, when the inside flanges of the members are restrained by bracing back to the purlins or side rails, as shown in Figure 6.

Some authorities (notably in other parts of Europe) consider this restraint system results in axial loads in the secondary steelwork, and that the restraint is only effective if purlins (or rails) assumed

Figure 5: Footbridge with u-frames; cross section

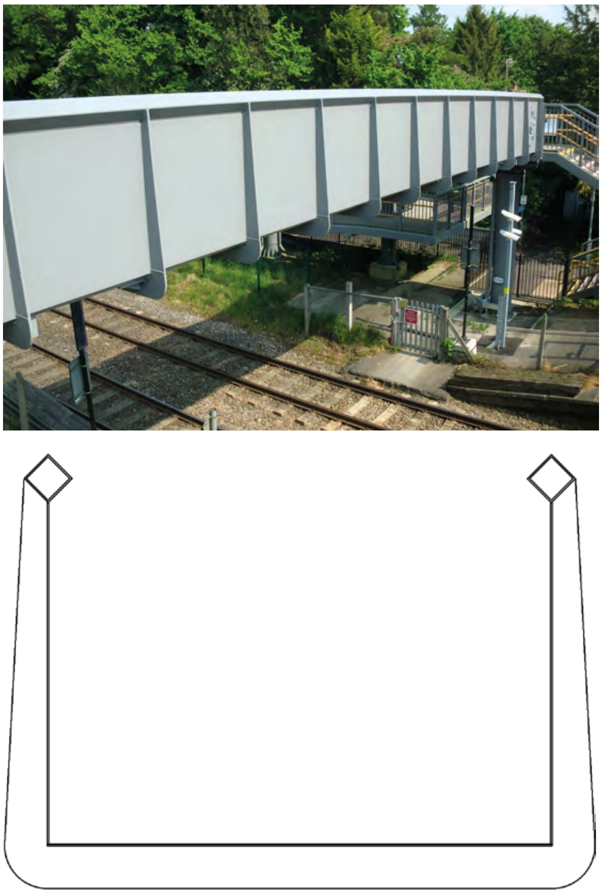


Figure 6: typical bracing to rafter

to provide restraint intersect with a node on the bracing (typically in the end bay). In the UK, there is no such requirement and our understanding is that the torsional restraint is effective because of the u-frame action.

A section along a building is shown in Figure 7, along the line of a purlin, with inner flange restraints to a number of rafters. The compression in the inside flange would ordinarily result in lateral torsional buckling, with the purlins providing restraint to the tension flange only. Figure 7 shows that the rafters are restrained with respect to the purlin, forming an inverted u-frame.

Design requirements in portal frames

Two obvious requirements are clear from Figure 7. Firstly the purlin (or rail) must be continuous to be effective. If there is a break in the member, there is no u-frame action. This situation arises when side rails are interrupted, for example by a roller shutter door. In this case, short side rails between door jambs should not be relied on to provide restraint.

Secondly, as discussed in the context of bridges, the members of the u-frame must have appropriate stiffness. A traditional rule of thumb was to provide a side rail or purlin of at least 25% of the depth of the member being restrained. Horne and Ajmani proposed a rule to determine the necessary stiffness in 1973[1]. It is sobering to reflect that this rule was based on tests using members with tapered flanges and hot-rolled side rails, not the members typically used some 45 years later.

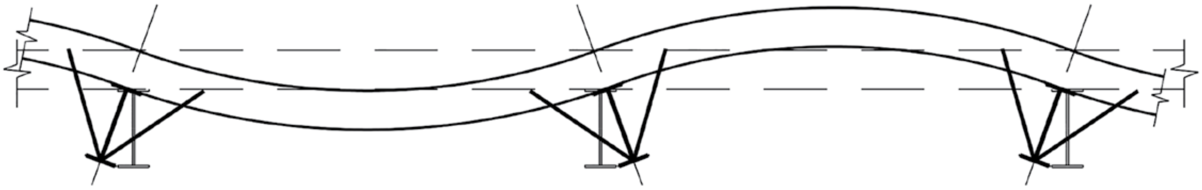


Figure 7: U-frame action in purlin restraint

The rule considered the necessary restraint at a plastic hinge and may be expressed as:

$$\frac{I_s}{I_f} \geq \frac{f_y}{190 \times 10^3} \frac{B(L_1+L_2)}{L_1 L_2}$$

where,

f_y is the design strength of the portal frame member

I_s is the second moment of area of the purlin or rail in its major axis

I_f is the second moment of area of the frame member

B is the span of the rail or purlin

L_1 and L_2 are the distances each side of the plastic hinge to the eaves or points of contraflexure, as shown in Figure 8.

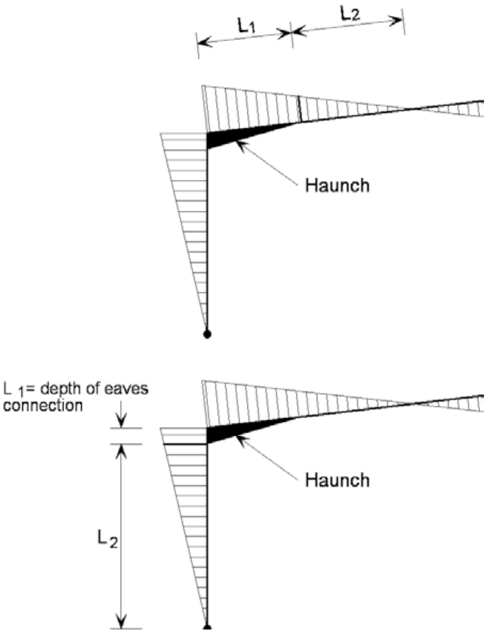


Figure 8: Lengths L_1 and L_2 used to check restraint member stiffness

As an illustration, for a rafter (Figure 8), and a span of 35 m, a reasonable assumption is that L_1 = 3.5 m and L_2 = 4 m

Assuming the member is a 457 × 191 × 67 UB, then I_f = 29400 cm^4. If the rafter is S355 and the span of the purlin is 7 m, the stiffness requirement for the purlin becomes:

$$I_s \geq \frac{29400 \times 10^4 \times 355 \times 7000 \times (3500 + 4000)}{190 \times 10^3 \times 3500 \times 4000 \times 10^4} = 206\text{cm}^4$$

This order of inertia is provided by a 170 mm deep purlin, so normal frame arrangements appear to be adequate.

Unorthodox situations

The selection of purlins and side rails is normally made based on the span and loading on the member without any recourse to the check illustrated above. For orthodox construction, the relationship between the selected member and the stiffness necessary to provide u-frame action appears to be satisfactory. An issue can arise if the portal frames are long span, but nevertheless spaced at typical centres. Since the purlin (or rail) selection is based on the span and spacing of the secondary members, the purlins and rails selected for a long span frame may be the same as would be chosen for an orthodox span, but clearly the demands on stiffness are much higher.

The general advice is that orthodox frames with usual member sizes function satisfactorily with the 'normal' sizes and spacing of secondary steelwork. Situations where more care is needed are long span frames, and where the secondary steelwork is not continuous.

References

1 Horne, M, R and Ajmani, J,L.
Failure of columns laterally supported on one flange: Discussion
The Structural Engineer, Vol 50, No. 7, July 1973

AD 419: Composite beams with different positions of web openings

SCI publication P355 is widely used to design beams with large web openings. It is adopted in the development of software to design hot rolled and fabricated steel sections with openings of various shapes and sizes.

The purpose of this Advisory Desk note is to address some common practical problems related to adjacent openings of different heights and positions.

1. Unequal adjacent opening heights

In P355 and in the AD 418, the buckling length of the web post for buckling between closely spaced openings on the same horizontal axis is given by:

$\ell_w = 0.7(h_o^2 + s_o^2)^{0.5} \leq h_o$ for rectangular openings (1)

$\ell_w = 0.5(h_o^2 + s_o^2)^{0.5} \leq 0.7h_o$ for circular or elongated openings (2)

where:

h_o is the opening height (or average height, as defined below)

s_o is the edge-to-edge distance between the openings

For unequal adjacent opening heights, it is proposed that the average height of the openings, $h_{o,eff}$, may be used to determine the slenderness for web post buckling with a lower limit of 0.75 of the larger opening height. This corresponds to the smaller opening height being taken as not less than half the larger opening height. Therefore, the effective opening height, $h_{o,eff}$ replaces h_o in the above equations and is taken as:

$h_{o,eff} = 0.5\,(h_{o,1} + h_{o,2}) \geq 0.75\,h_{o,1}$ (3)

where:

$h_{o,1}$ is the height of the larger opening

$h_{o,2}$ is the height of the smaller opening

2. Different eccentricities of adjacent openings

The eccentricity of the opening, e_o, is defined as positive when the centre line of the opening is above the centre line of the beam and negative when it is below. For the checks on web-post buckling, the effective opening height in the above equations for web-post buckling should include the worst case of the difference in eccentricities, which is as follows:

$h_{o,eff} = 0.5\,(h_{o,1} + h_{o,2}) + |\,e_{o,1} - e_{o,2}\,| \geq\ 0.75\,h_{o,1} + |\,e_{o,1} - e_{o,2}\,|$ (4)

where:

$|\,e_{o,1} - e_{o,2}\,|$ is taken as its absolute value, in which $e_{o,1}$ and e_{o2} can have different signs depending on the position of adjacent openings relative to the centre line of the beam and the heights of the adjacent openings are defined as above.

The use of the absolute value of $|\,e_{o,1} - e_{o,2}\,|$ is the worst case for checking web-post buckling. A more precise treatment that takes account of the buckling length is given below.

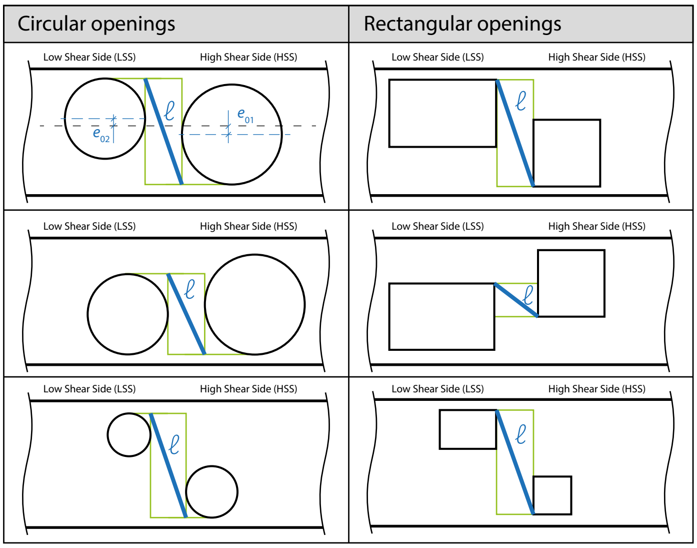


Figure 1:
Treatment of the diagonal distance for web-post buckling between adjacent openings

3. More precise treatment of eccentricities or unequal adjacent opening heights

For unequal adjacent opening heights and positions, the buckling length should be calculated from the dimension, ℓ which is the diagonal distance from the low edge of the opening in the High Shear Side (HSS) to the high edge of the opening at the Low Shear Side (LSS). Various cases are shown in Figure 1. The buckling length for web-post buckling is taken as:

For circular or elongated openings: $\ell_w = 0.5\ell$

For rectangular openings: $\ell_w = 0.7\ell$

For adjacent circular and rectangular openings: $\ell_w = 0.6\ell$

The dimension ℓ should be calculated by taking $h_{o,2} \geq 0.5h_{o,1}$ to be consistent with the limit in equation (4).

For adjacent rectangular openings, it is also necessary to check the in plane bending resistance of the web-post due to the horizontal force acting at the mid height of the beam. The position of the critical section will depend on the relative position of the openings in the beam depth. For simplicity, the in plane moment in the case of symmetric steel sections is determined from:

$M_{wp,Ed} = 0.5\,(0.5(h_{o,1} + h_{o,2}) + e_{o,1} + e_{o,2}\,)\,V_{wp,Ed}$

where:

$V_{wp,Ed}$ is the horizontal shear force acting at the mid height of the beam

This moment should not exceed the elastic bending resistance of the web post which is given by:

$M_{wp,Ed} = t_w\,s_o^{\,2}\,f_y\,/(6\gamma_{M0})$

where:

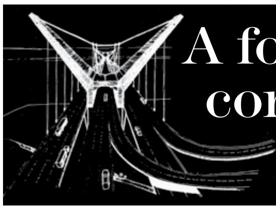
s_o is the edge to edge spacing of the openings

t_w is the web thickness

f_y is the yield strength of the steel

Contact: **Prof Mark Lawson**
Tel: **01344 636555**
Email: **advisory@steel-sci.com**

BUILDING WITH STEEL



A forward looking concept in bridge design

The problem is not an unfamiliar one: an interharbour bridge is to be built as part of an interchange between interstate highways in the United States – in Baltimore, Maryland, to be precise. Considerable investigation has been carried out and unusual thoughts have been forthcoming. The bridge envisaged consists of three decks at approximately the same level: two decks each with five lanes, the third having four lanes. Pedestrians would have rights of way through this third deck.

All decks would be of orthrotropic design, constructed of steel and be equipped with resilient asphalt driving surfaces: the decks to be supported by steel cables similar to suspension bridges, but in a very different manner. The design allows for criss-crossing cables in various planes, supported by Y-shaped abutments at each end of the bridge. Considerably less steel per sq ft is required than for a conventional bridge, bringing desirable economies. The decks are approximately 800 ft long terminating at the first concrete supports of the approaches.

The Y-shaped abutments are narrow and straddle only the middle deck: they are more economical to build than the more usual vertical towers but are less bulky than four towers situated at the faces of the three decks. Since they do not obstruct the view of the bridge at its entrance, not only does the approach to the bridge become more convenient but the abutments also add lightness and grace.

New and revised codes & standards

From BSI Updates May 2018

BS EN PUBLICATIONS

BS EN ISO 2081:2018
Metallic and other inorganic coatings. Electroplated coatings of zinc with supplementary treatments on iron or steel
Supersedes BS EN ISO 2081:2008

BS EN ISO 4545-1:2018
Metallic materials. Knoop hardness test. Test method
Supersedes BS EN ISO 4545-1:2005

BS EN ISO 4545-2:2017
Metallic materials. Knoop hardness test. Verification and calibration of testing machines
Supersedes BS EN ISO 4545-2:2005

BS EN ISO 4545-3:2017
Metallic materials. Knoop hardness test. Calibration of reference blocks
Supersedes BS EN ISO 4545-3:2005

BS EN ISO 6507-1:2018
Metallic materials. Vickers hardness test. Test method
Supersedes BS EN ISO 6507-1:2005

BS EN ISO 6507-2:2018
Metallic materials. Vickers hardness test. Verification and calibration of testing machines
Supersedes BS EN ISO 6507-2:2005

BS EN ISO 6507-3:2018
Metallic materials. Vickers hardness test. Calibration and reference blocks.
Supersedes BS EN ISO 6507-3:2005

BS EN ISO 7345:2018
Thermal performance of buildings and building components. Physical quantities and definitions
Supersedes BS EN ISO 7345:1996

BS EN ISO 7500-1:2018
Metallic materials. Calibration and verification of static uniaxial testing machines. Tension/compression testing machines. Calibration and verification of the force-measuring system
Supersedes BS EN ISO 7500-1:2015

BS EN ISO 11130:2018
Corrosion of metals and alloys. Alternate immersion test in salt solution
Supersedes BS EN ISO 11130:2010

BS EN ISO 26203-1:2018
Metallic materials. Tensile testing at high strain rates. Elastic-bar-type systems
Supersedes BS EN ISO 26203-1:2010

CORRIGENDA TO BRITISH STANDARDS

BS EN 1090-5:2017
Execution of steel structures and aluminium structures. Technical requirements for cold-formed structural aluminium elements and cold-formed structures for roof, ceiling, floor and wall applications.
CORRIGENDUM, March 2018

BRITISH STANDARDS REVIEWED AND CONFIRMED

BS EN ISO 3059:2012
Non-destructive testing. Penetrant testing and magnetic particle testing. Viewing conditions

BRITISH STANDARDS WITHDRAWN

BS EN ISO 2081:2008
Metallic and other inorganic coatings. Electroplated coatings of zinc with supplementary treatments on iron or steel
Superseded by BS EN ISO 2081:2018

BS EN ISO 4545-1:2005
Metallic materials. Knoop hardness test. Test method
Superseded by BS EN ISO 4545-1:2018

BS EN ISO 4545-2:2005
Metallic materials. Knoop hardness test. Verification and calibration of testing machines
Superseded by BS EN ISO 4545-2:2017

BS EN ISO 4545-3:2005
Metallic materials. Knoop hardness test. Calibration of reference blocks.
Superseded by BS EN ISO 4545-3:2017

BS EN ISO 6507-1:2005
Metallic materials. Vickers hardness test. Test method
Superseded by BS EN ISO 6507-1:2018

BS EN ISO 6507-2:2005
Metallic materials. Vickers hardness test. Verification and calibration of testing machines
Superseded by BS EN ISO 6507-2:2018

BS EN ISO 6507-3:2005
Metallic materials. Vickers hardness test. Calibration of reference blocks
Superseded by BS EN ISO 6507-3:2018

BS EN ISO 7345:1996
Thermal insulation. Physical quantities and definitions
Superseded by BS EN ISO 7345:2018

BS EN ISO 7500-1:2015
Metallic materials. Calibration and verification of static uniaxial testing machines. Tension/compression testing machines. Calibration and verification of the force-measuring system
Superseded by BS EN ISO 7500-1:2018

BS EN ISO 11130:2010
Corrosion of metals and alloys. Alternate immersion test in salt solution
Superseded by BS EN ISO 11130:2018

BRITISH STANDARDS CONFIRMED

BS EN ISO 26203-1:2010
Metallic materials. Tensile testing at high strain rates. Elastic-bar-type systems
Superseded by BS EN ISO 26203-1:2018

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February1968

As the inclined planes of cables are attached to the outer decks only, the middle deck will be connected to the outer decks through the 16-ft space between them, with shallow struts at approximately 36ft on centres.
The bridge as envisioned solves two problems: extreme width (650 ft between abutments), and a 65 ft clearance underneath for almost the entire width. This maximum clearance is being achieved by utilising the system of cables incorporated which does not require stiffening trusses and permits the use of an extremely thin deck only 4 ft deep: this compares with 15ft in the case of a conventional bridge and 8 ft for a suspension bridge requiring stiffening trusses.
Many recent technological advances are embodied in the design. The basket suspension system is extremely rigid in all directions. An unusual feature is the concave cables which will be anchored to the ground. They pull down on the convex cables and provide rigidity to the bridge in all directions as well as stabilising it against vibration.
There have been very few innovations in structural systems of bridges in the last four decades. Any improvements have been confined to site construction or in variations of conventional structural systems. Of all the schemes studied and developed for this particular project, and there have been many including horizontal girders, arches, steel frames, shells and cable suspensions with concrete, prestressed concrete and structural steelwork, the one submitted has come nearest to satisfying the required criteria. Most others because of the significant depth of structural members did not offset the desired clearance under the bridge or clear sight view from the bridge. The only possible alternative design, other than cable suspension, that might satisfy the two requirements would be a thin concrete shell above the bridge from which the decks would be supported by vertical hangers. The shell would be structurally unique and aesthetically exciting but would be substantially more expensive than the design submitted.
The structural system for the bridge as described consists of components that have been widely applied in construction in recent years. An overriding consideration is that this bridge would employ one third of the weight of steelwork that would be required for the same span using conventional construction.

Steelwork contractors for buildings

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

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

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

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

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

Notes

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A & J Stead Ltd	01653 693742			●	●					●	●			●	●		3			Up to £400,000
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
A&J Fabtech Ltd	01924 439614	●					●		●	●	●		●	●		✔	3			Up to £400,000
Access Design & Engineering	01642 245151					●				●	●			●	●	✔	2			Up to £4,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3	✔	Silver	Up to £4,000,000
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 £3,000,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4			Up to £1,400,000*
Apex Steel Structures Ltd	01268 660828					●	●			●	●			●	●		2			Up to £2,000,000
Arc Fabrication Services Ltd	01709 557654			●	●	●	●	●	●	●	●			●	●		3			Up to £40,000
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2			Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●		●	●		2			Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●	✔	4			Up to £800,000
ASME Engineering Ltd	020 8966 7150				●	●	●	●		●	●			●	●	✔	4		Gold	Up to £4,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●			●	●			●	●	✔	2			Up to £1,400,000
Austin-Divall Fabrications Ltd	01903 721950			●	●		●	●		●	●			●	●	✔	2			Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●	●	✔	2		Silver	Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✔	4			Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £1,400,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●		●	●	✔	4		Silver	Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	Gold	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		4			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 £6,000,000
Builders Beams Ltd	01227 863770			●	●	●	●			●	●			●	●	✔	3	✔		Up to £3,000,000*
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●				●	●	✔	4		Silver	Up to £4,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	Gold	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●			●			●		●		●	✔	3		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			●	●	●	●		●	●	●			●	●	✔	4			Up to £1,400,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £40,000
D Hughes Welding & Fabrication Ltd	01248 421104				●	●	●	●		●	●		●	●	●	✔	4			Up to £800,000
Duggan Steel	00 353 29 70072		●	●	●	●	●	●	●	●	●	●			●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	3			Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✔	4	✔	Gold	Up to £6,000,000
ESL (GB) Ltd	01482 787986	●					●	●	●	●	●	●	●	●	●	✔	4			Up to £400,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●			●	✔	3		Gold	Up to £3,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●		●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●											●	●	●	✔	3		Member	Up to £2,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**FPC**	**BIM**	**SCM**	**Guide Contract Value (1)**

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●		●	●				●		2			Up to £2,000,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	2			Up to £1,400,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●		●		✔	3			Up to £3,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●		●	●			●	●	✔	2		● (green)	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✔	4		● (grey)	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●			●	●				●	✔	2			Up to £1,400,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●		●			●	●	●	✔	3			Up to £2,000,000
J & A Plant Ltd	01942 713511				●	●									●		4			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●		●			4			Up to £6,000,000*
John Reid & Sons (Strucsteel) Ltd	01202 483333		●	●	●	●	●	●	●	●	●	●		●	●	✔	4		● (grey)	Up to £6,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✔	4		● (orange)	Up to £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4			Up to £6,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		● (grey)	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		● (green)	Up to £2,000,000
M J Patch Structures Ltd	01275 333431				●					●	●				●	✔	2			Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £1,400,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £1,400,000
Maldon Marine Ltd	01621 859000				●	●		●	●	●	●			●	●	✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						3			Up to £3,000,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £1,400,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●	●		●	●		●	●	✔	4		● (grey)	Up to £2,000,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		● (orange)	Up to £4,000,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		2			Up to £400,000
Painter Brothers Ltd	01432 374400								●		●			●	●	✔	3			Up to £6,000,000*
Pencro Structural Engineering Ltd	028 9335 2886			●	●	●	●	●	●		●			●	●	✔	2			Up to £2,000,000
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £800,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
Rippin Ltd	01383 518610			●	●	●	●	●						●	●		2			Up to £1,400,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●			●	●	✔	3			Up to £3,000,000
S H Structures Ltd	01977 681931	●			●		●	●	●	●	●	●			●	✔	4	✔	● (orange)	Up to £2,000,000
SAH Engineering Ltd	01582 584220			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Sean Brady Construction Engineering Ltd	00 353 49 436 4144			●	●	●	●			●	●			●	●		2			Up to £800,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4		● (orange)	Above £6,000,000
SGC Steel Fabrication	01704 531286				●					●				●	●	✔	2			Up to £800,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●		●			●	●			●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		2			Up to £1,400,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £800,000
Steel & Roofing Systems	00 353 56 444 1855			●	●	●	●					●		●	●	✔	4			Up to £3,000,000
Structural Fabrications Ltd	01332 747400	●							●	●						✔	3		● (grey)	Up to £1,400,000
Taunton Fabrications Ltd	01823 324266				●					●				●	●	✔	2		● (green)	Up to £2,000,000
Taziker Industrial Ltd	01204 468080									●				●	●	✔	3			Above £6,000,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●			●	●	✔	2			Up to £400,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●			●	●	✔	3	✔	● (grey)	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●	●			●			●			2	✔		Up to £2,000,000
Underhill Engineering Ltd	01752 752483				●		●	●	●	●	●			●	●	✔	4	✔		Up to £3,000,000
W I G Engineering Ltd	01869 320515				●					●					●	✔	2			Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	4			Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●		●	●	●	●	●	●	●	●				●	✔	4		● (green)	Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●	●				●					✔	4		● (orange)	Up to £4,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	● (orange)	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)

RQSC
The Register of Qualified Steelwork Contractors Scheme

Steelwork contractors for bridgeworks

BCSA

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

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

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

Notes

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

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

BCSA steelwork contractor member	Tel	FB	CF	SG	PG	TW	BA	CM	MB	RF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
A&J Fabtech Ltd	01924 439614	●			●	●	●				●	✓	3					Up to £400,000
AJ Engineering & Construction Services Ltd	01309 671919	●			●	●	●	●	●	●	●	✓	4					Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666	●			●	●				●	●	✓	4	✓		✓	Gold	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	●	●	✓	4			✓		Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●	●	●	●		●	●	✓	4			✓	Silver	Up to £4,000,000
Cementation Fabrications	0300 105 0135	●			●						●	✓	3			✓	Gold	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Above £6,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●		●			●	●	●	✓	4			✓		Up to £800,000
Donyal Engineering Ltd	01207 270909	●		●						●	●	✓	3			✓	Member	Up to £1,400,000
ECS Engineering Ltd	01773 860001	●			●	●	●		●		●	✓	3					Up to £3,000,000
ESL (GB) Ltd	01428 787986									●	●	✓	4			✓		Up to £400,000
Four-Tees Engineers Ltd	01489 885899	●			●	●	●		●	●	●	✓	3			✓	Member	Up to £2,000,000
Had Fab Ltd	01875 611711									●	●	✓	4					Up to £3,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●				●				●	●	✓	4			✓	Gold	Up to £6,000,000
M Hasson & Sons Ltd	028 2957 1281	●	●	●	●	●	●	●			●	✓	4			✓	Member	Up to £2,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●						●		●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●			●	●	●				●	✓	4			✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Up to £4,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●	●	●	●	●	✓	4	✓		✓	Gold	Up to £2,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Gold	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499									●	●	✓	3			✓		Up to £800,000
Structural Fabrications Ltd	01332 747400	●		●	●	●	●			●	●	✓	3				Silver	Up to £1,400,000
Taziker Industrial Ltd	01204 468080	●			●	●	●			●	●	✓	3		✓	✓		Above £6,000,000
Underhill Engineering Ltd	01752 752483	●			●	●	●			●	●	✓	4	✓		✓		Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	✓	4	✓	✓	✓	Gold	Above £6,000,000
Non-BCSA member																		
Allerton Steel Ltd	01609 774471	●		●	●	●	●			●	●	✓	4			✓	Silver	Up to £4,000,000
Centregreat Engineering Ltd	029 2046 5683	●		●	●	●	●	●	●	●	●	✓	4					Up to £1,400,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓		Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●	●	●	●	●	✓	4			✓	Member	Up to £1,400,000
Ekspan Ltd	0114 261 1126	●				●			●	●	●	✓	2					Up to £400,000
Francis & Lewis International Ltd	01452 722200									●	●	✓	4			✓	Gold	Up to £2,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●	●	●		●	●	✓	3					Up to £2,000,000
Hollandia Infra BV	00 31 180 540 540	●	●	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000*
HS Carlsteel Engineering Ltd	020 8312 1879									●	●	✓	3			✓		Up to £200,000
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		✓	✓	Gold	Up to £2,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●		●				●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	●	●	✓	4		✓	✓	Silver	Above £6,000,000

BCSA

Corporate Members

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

Company name	Tel
Control Energy Costs Ltd	01737 556631
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	08457 504030
Kier Construction Ltd	01767 640111
McGee Group (Holdings) Ltd	020 8998 1101
PTS (TQM) Ltd	01785 250706
Sandberg LLP	020 7565 7000
Structural & Weld Testing Services Ltd	01795 420264
SUM Ltd	0113 242 7390

Industry Members

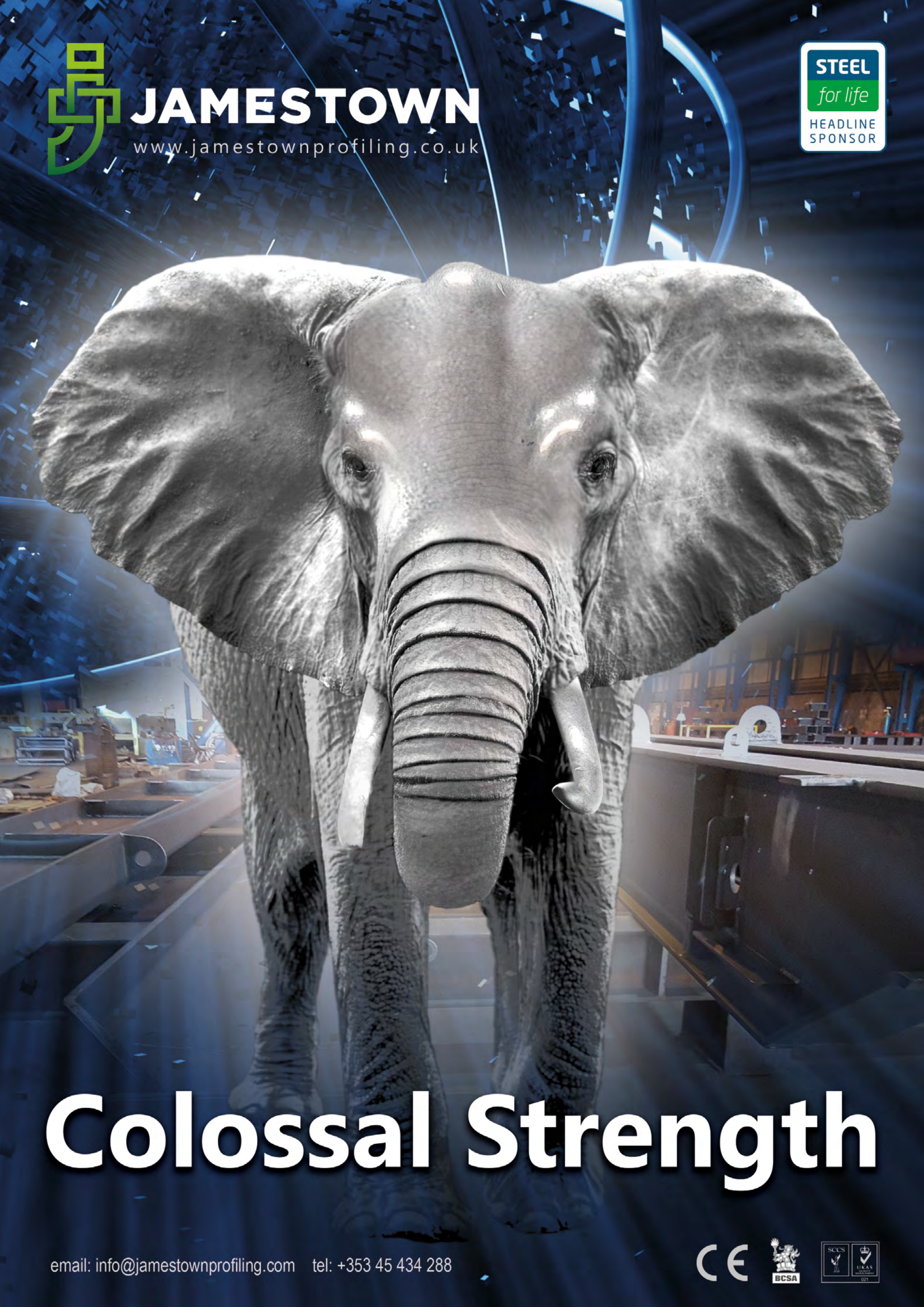
Industry Members are those principal companies involved in the direct supply to all or some Steelwork Contractor Members of components, materials or products. Industry member companies must have a registered office within the United Kingdom or Republic of Ireland.

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

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM	BIM
AJN Steelstock Ltd	01638 555500								●		M		
Albion Sections Ltd	0121 553 1877	●									M		
Arcelor Mittal Distribution - Scunthorpe	01724 810810								●		D/I		
AVEVA Solutions Ltd	01223 556655		●								N/A		
Ayrshire Metals Ltd	01327 300990	●									M		✓
BAPP Group Ltd	01226 383824									●	M		
Barrett Steel Services Limited	01274 682281								●		M		
Behringer Ltd	01296 668259					●					N/A		
British Steel Ltd	01724 404040				●						M		
British Steel Distribution	01642 405040								●		D/I		
BW Industries Ltd	01262 400088	●									M		
Cellbeam Ltd	01937 840600	●									M		
Cleveland Steel & Tubes Ltd	01845 577789								●		M		
Composite Metal Flooring Ltd	01495 761080	●									M		
Composite Profiles UK Ltd	01202 659237	●									D/I		
Cooper & Turner Ltd	0114 256 0057									●	M		
Cutmaster Machines (UK) Ltd	01226 707865					●					N/A		
Daver Steels Ltd	0114 261 1999	●									M		
Daver Steels (Bar & Cable Systems) Ltd	01709 880550	●									M		
Dent Steel Services (Yorkshire) Ltd	01274 607070								●		M		
Duggan Profiles & Steel Service Centre Ltd	00 353 56 7722485	●							●		M		
easi-edge Ltd	01777 870901							●			N/A	● (Gold)	
Fabsec Ltd	01937 840641	●									N/A		
Ficep (UK) Ltd	01924 223530					●					N/A		
FLI Structures	01452 722200	●									M	● (Gold)	
Forward Protective Coatings Ltd	01623 748323						●				N/A		
Hadley Industries Plc	0121 555 1342	●									M	● (Silver)	
Hempel UK Ltd	01633 874024						●				N/A		
Highland Metals Ltd	01343 548855						●				N/A		
Hi-Span Ltd	01953 603081	●									M	● (Member)	
International Paint Ltd	0191 469 6111						●				N/A	● (Gold)	
Jack Tighe Ltd	01302 880360						●				N/A		
Jamestown Manufacturing Ltd	00 353 45 434288	●									M		
John Parker & Son Ltd	01227 783200								●	●	D/I		
Joseph Ash Galvanizing	01246 854650						●				N/A		
Jotun Paints (Europe) Ltd	01724 400000						●				N/A		
Kaltenbach Ltd	01234 213201					●					N/A		
Kingspan Structural Products	01944 712000	●									M	● (Gold)	
Kloeckner Metals UK	0113 254 0711								●		D/I		
Lincoln Electric (UK) Ltd	0114 287 2401					●					N/A		
Lindapter International	01274 521444									●	M		
MSW UK Ltd	0115 946 2316	●									D/I		
Murray Plate Group Ltd	0161 866 0266								●		D/I		
National Tube Stockholders Ltd	01845 577440								●		D/I		
Peddinghaus Corporation UK Ltd	01952 200377					●					N/A		
Pipe and Piling Supplies Ltd	01592 770312	●									M		
PPG Architectural Coatings UK & Ireland	01924 354233						●				N/A		
Prodeck-Fixing Ltd	01278 780586	●									D/I		
Rainham Steel Co Ltd	01708 522311								●		D/I		
Sherwin-Williams Protective & Marine Coatings	01204 521771						●				N/A	● (Silver)	
Structural Metal Decks Ltd	01202 718898	●									M		
StruMIS Ltd	01332 545800		●								N/A		
Stud-Deck Services Ltd	01335 390069	●									D/I		
Tata Steel – Tubes	01536 402121				●						M		
Tata Steel – ComFlor	01244 892199	●									M		
Tension Control Bolts Ltd	01948 667700						●			●	M		
Trimble Solutions (UK) Ltd	0113 887 9790		●								N/A		
voestalpine Metsec plc	0121 601 6000	●									M	● (Gold)	
Wedge Group Galvanizing Ltd	01909 486384						●				N/A		
Yamazaki Mazak UK Ltd	01905 755755					●					N/A		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HEADLINE
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Colossal Strength
email: info@jamestownprofiling.com
tel: +353 45 434 288
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