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NSC

Technology and innovation

Jan/Feb 2014
Vol 22 No.1

New tower on City fringe

Steel frames science park

Irish energy goes green

Retail regenerates Swindon

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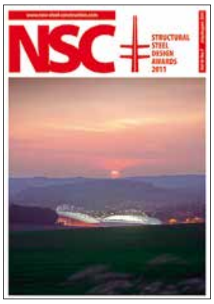

New Steel Construction keeps designers and contractors abreast of all major steel construction related developments and provides detailed technical information on key issues such as the introduction of the Eurocodes. NSC will be the first place most people hear about advances made by the extensive research and development efforts of the steel construction partners – Tata Steel, the British Constructional Steelwork Association, and the Steel Construction Institute, as well as other researchers.

Each issue of NSC is a blend of project reports and more in depth technical material. Taking up our free subscription offer is a guarantee that you will be alerted to significant developments in a sector that retains a commitment to continuous development in knowledge and techniques for timely delivery of cost-effective, quality projects across all sectors of construction.

Each issue of NSC is typically 44 pages and contains four pages of news, developments related to Eurocodes, cutting edge project reports from site, and the latest technical updates from the Steel Construction Institute in its Advisory Desk Note series. One of the most popular features is 50 Years Ago, looking at key projects of the past by revisiting the pages of 'Building With Steel'.

NSC is available free of charge every two months to subscribers living in the UK or Ireland by contacting us by email at *admin@newsteelconstruction.com*, or filling in the form below and faxing it to 020 7747 8199.

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or scan and email it to **admin@newsteelconstruction.com**

Name

Position

Company

Address

Postcode

Telephone

Email

Cover Image
Aldgate Tower, London
Main client: Aldgate Developments
Architects: Wilkinson Eyre Architects
Steelwork contractor:
Severfield Watson
Steel tonnage: 5,600t

January/February 2014 Vol 22 No 1

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

Thermal Mass in efficient buildings

Nick Barrett - Editor

Forecasts for the next year suggest that sectors like commercial building will be among the strongest growing as the UK's recession battered construction industry starts to get back on track. Recovery has been a long time coming, but even a slow train gets a warm welcome on arrival.

Steel frames continued to dominate the multi-storey offices market throughout the recession as the latest Market Shares Survey from independent researchers at Construction Markets shows (see News), and are expected to continue market leadership as the business cycle at last turns up. Other sectors like residential are also showing strong growth and steel is making inroads into those markets as well.

The market has obviously got the message that steel provides numerous advantages like cost, ease, speed and safety of use, a host of sustainability benefits and the ability to allow architects to see their design ideas fully expressed. One or two misperceptions about steel remain however and the steel sector is committed to ensuring that no architect, structural engineer or quantity surveyor makes a sub optimal choice because accurate advice and information was unavailable. Thermal mass is a case in point.

A new publication being distributed with this issue of NSC and other leading construction magazines aims to put to rest the old saw that taking advantage of the thermal mass properties of a building means designing a heavyweight structure, probably concrete framed with the consequent expense of deep foundations, slow construction programmes and other disadvantages, and with thick concrete floors.

This notion is plainly wrong, as has been well demonstrated by many studies in recent years. Waste money and ignore sustainability in creating overweight edifices if for some reason you must; but don't do it because you think you have to in order to capture thermal mass benefits is the message.

The new publication – *Steel Construction Thermal Mass* – is a sound introduction to how to use thermal mass to reduce operational energy use in non-domestic buildings, explaining how it can be used as part of a fabric energy storage (FES) strategy to achieve sustainable, energy efficient buildings.

The guide contains plenty of real life examples of how recently constructed steel framed buildings took full advantage of thermal mass to reduce carbon emissions to well below current national standards. Using steel frames cut costs and saved time on the construction programme and produced buildings with BREEAM 'Excellent' and EPC 'A' ratings.

Read it and you will learn that FES strategies are as effective in the structurally efficient steel framed buildings that the overwhelming bulk of the market prefers.

NSC

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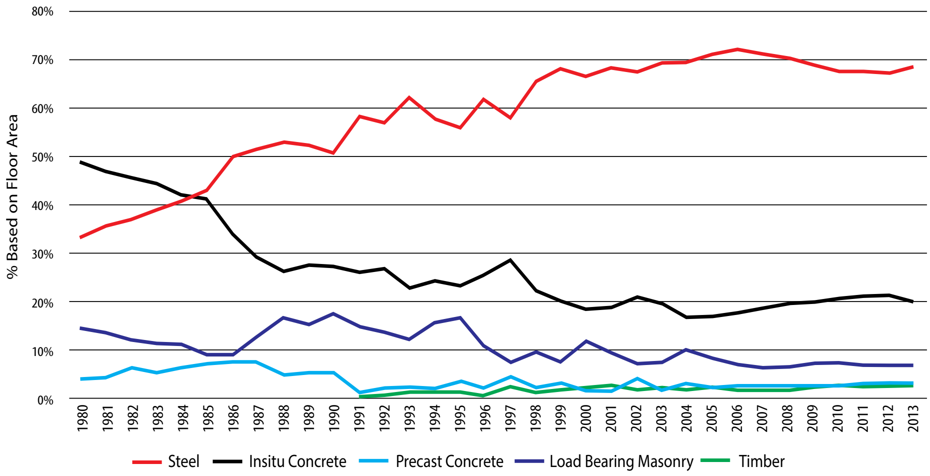
Steel increases market share in key multi-storey sector



Steel continues to be overwhelmingly the structural framing material of choice for multi-storey non-domestic buildings, according to the latest survey from independent market research consultants Construction Markets.

The 2013 survey, commissioned by Tata Steel and the BCSA, is the latest in a series going back to 1980 and is thought to be the biggest of its type in the UK, involving over 450 interviews with construction specifiers.

The survey shows that steel frames continue to dominate the multi-storey market with an increase in market share to 68.2%. The survey also shows that the market contracted by a further 10.1% in 2013, with overall floor area constructed in all multi-storey buildings reducing to 7,977,000m^2, which was only 52.4% of the size of the market at its peak of 2008, when it was 15,266,000m^2.

Insitu concrete had a market share of only 19.9%. Load bearing masonry had a 6.6% share, while precast concrete accounted for 2.8% and timber 2.5%.

Steel now has a 70.7% share of the multi-storey offices market. In the 'other multi-storey buildings' sector, which includes retail, education, leisure and health, steel has a 67.4% share.

Alan Todd, General Manager of Construction Services & Development in Tata Steel Europe said: 'These figures clearly show that the key multi-storey construction market continues to value steel above any other framing material. It is good to see that steel is the natural choice of framing material for the construction industry where factors like speed, cost, thermal mass, embodied carbon and wider sustainability performance are important.'

Flexible design for South Wales school

Work is under way on a new primary school in Barry, South Wales that is using ISG and Stride Treglown's highly flexible model design.

The £2.7M Nant Talwg project has the backing of the Vale of Glamorgan County Council and represents the first application of a model school template in the Principality.

ISG and architect Stride Treglown have previously completed five model school projects which all utilise a steel frame for maximum flexibility.

The Barry school will achieve a BREEAM 'Excellent' rating and accommodate 210 pupils and a nursery, with the single storey steel frame also incorporating a spacious central hub area, multi-use hall, office space and meeting rooms.

The Vale of Glamorgan Council's Cabinet Member for Children's Services, Councillor Chris Elmore said: "This represents a pioneering and innovative local authority project that is certain to be closely scrutinised by many Welsh councils.

"One of the most striking aspects of the model school is the degree of flexibility in-built within the design, as we will get high quality accommodation that addresses our current and future requirements."

Steelwork contractor for the project is Overdale Construction Services.

Work starts on Silverburn cinema extension

Steel erection has started for a 14 screen Cineworld cinema complex at the Silverburn shopping centre in south Glasgow.

The £20M extension will also include nine restaurants, a bingo hall and retail units. Steelwork contractor Walter Watson will erect approximately 1,600t of structural steelwork for the project during a 16 week programme.

Main contractor Graham Construction commenced work on site last year with the demolition of an old bingo hall.

Graham will also redesign and remodel a section of the internal winter gardens within the existing mall at Silverburn as well as creating a new taxi rank, extending the bus station canopy and installing new paving between the new extension and the Pollok Civic and Leisure Centres.

Silverburn opened in 2007 on the site of the former Pollok Centre and is one of the largest retail destinations in Scotland. Severfield-Watson Structures erected more than 10,000t of steel for this initial scheme.

Record number of attendees for steel seminars

Walter Swann of Tata Steel delivers the opening address at the Edinburgh seminar

The recently concluded series of Steel Essentials seminars attracted a record number of attendees across all four venues.

Last autumn's series of seminars were held in Cardiff, London, Leeds and Edinburgh. The London event was attended by more than 200, Leeds by 139, while both Cardiff and Edinburgh had more than 90 attendees.

Hosted by Tata Steel and the British Constructional Steelwork Association (BCSA), Steel Essentials provided an opportunity for designers to keep up-to-date with the latest developments on important steel construction related topics.

Experts from Tata Steel and the BCSA spoke at the seminars and topics included sustainability and steel construction, steel specification and design, practical EC3 design, steel grades, and design for fire.

Summing up the successful series, Dave Chapman of Tata Steel, who hosted the EC3 design presentations, said: "As CE Marking of structural steelwork will become mandatory in the UK on 1st July, this topic provoked the most interest and discussion."

Steel triumphs at Structural Awards


The First Direct Arena, Leeds


Emirates Air Line


The Cutty Sark

A number of UK steel projects were recognised at the prestigious Structural Awards 2013 during a ceremony held at the Brewery in London.

Organised each year by The Institution of Structural Engineers, the awards celebrate the world's most talented structural designers and their contribution to the built environment.

The award for infrastructure or transportation structure was the Emirates Air Line in London. Designed by Expedition Engineering, Buro Happold and URS, the steelwork was fabricated, supplied and erected by Severfield-Watson Structures.

The judges said: "The synergy between architecture and engineering has yielded a new landmark."

The First Direct Arena, Leeds won the award for sports and leisure structure. Designed by Arup and erected by Fisher Engineering, the judges commented that the project's sloping roof and overall fan shaped facade was visually stunning.

The structural heritage award went to The Cutty Sark project in Greenwich, London. The judges said it needed some very complex structural repairs to raise and re-support the vessel. Buro Happold designed the project and the steel contractor was S H Structures.

Guide to thermal mass published

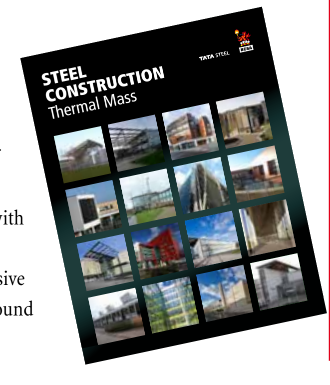
A new guide explaining how to make the best use of thermal mass in order to reduce operational energy use in non-domestic buildings has been published by Tata Steel and the British Constructional Steelwork Association.

The guide – *Steel Construction Thermal Mass* – is distributed with this issue of New Steel Construction and with a range of other leading construction magazines.

Using a series of projects from around the UK, the guide describes thermal mass and explains how it can be used to achieve sustainable and efficient buildings.

It also dispels the myth that use of thermal mass limits the choice of frame material or that it is only effective in heavyweight buildings with thick concrete floors.

The guide and more comprehensive information on the subject can be found at ***www.steelconstruction.info***



NEWS IN BRIEF

Mark Jones, Managing Director of **FICEP UK**, said: "In all my many years of experience in this industry, I have never known tougher times over the last three or more years, but recent trends have given me hope that we are at the start of a sustained and healthy economic recovery. Sales of our range of CNC steel processing machines have been buoyant over the last three months and future prospects look good."

20 Fenchurch Street (Walkie Talkie), London is the latest addition to the video case studies, **framed in steel**, to be found on the steel sector's free encyclopedia *www.steelconstruction.info*

Tata Steel has opened a major new profiling centre for steel plate in the West Midlands, increasing its plate processing capacity in the region by up to 50%. Located at Steelpark in Wednesfield, the facility will transform plate into a multitude of shaped and machined components, from high-volume production runs for off-road vehicle wheels and booms for earth-moving equipment, to large one-off components for construction projects and specialist engineering applications.

Tata Steel's app for steel section properties and member capacities for design to BS5950 and EC3 can be downloaded for free from the Apple App store.

The winner of the Public Choice Award at the **Tekla UK BIM Awards 2013** was the Kelpies project in Falkirk, Scotland. Steel for the project was fabricated and erected by S H Structures. The judges said: "The sheer complexity of the structure with its complex curves showcased what Tekla Structures is capable of."

AceCad Software has announced the release of StruM.I.S V9, its latest steel fabrication management system designed to meet needs of medium and larger sized steelwork contractors. The company said that StruM.I.S V9 includes many new features to operate steel fabrication sites more efficiently, with greater flexibility and offering enhanced user functionality.

AROUND THE PRESS

Construction News
10 January 2014
Giant car plant gears up for completion
[Jaguar Land Rover Engine Manufacturing Centre] – Both the machine hall and the assembly hall are steel framed buildings, with the machine hall based on a 30m by 15m grid and the assembly hall at 30m by 30m. "Because of those sorts of spans, steel was the only framing option," says Interserve Construction's Project Manager Mark Green

Construction News
13 December 2013
Skanska offers BIM lesson
[South Essex College] – The steel frame, installed by specialist contractor William Haley Engineering, is perfect for delivering these spans, with the advantage of being a lighter weight than other options considered.

New Civil Engineer
12 December 2013
Va-va booms
[Les Halles, Paris] – The steel framed buildings, which will house new shops, restaurants and cultural facilities when completed, will be used to transfer the loads from La Canopee onto the existing forum infrastructure.

Construction News
6 December 2013
Steel has all the angles covered
[Manchester Cancer Research Centre] - "Using a steel frame allowed us to create the desired structural shape," says Wilson Mason project architect James Potter. "While the hybrid [composite] design helped solve any vibration issues connected with the sensitive equipment which will be installed within the completed facility's laboratories."

Construction News
6 December 2013
Steel speeds laboratory project
[National Composite Centre] - With speed of construction a major factor, a steel framed structure was chosen for both buildings in Phase 2…. Furthermore the University of Bristol engaged in talks with steelwork contractor Billington Structures ahead of appointing a main contractor, so that steelwork design could get under way immediately.

Members out in force for SCI annual event

More than 90 steel construction professionals attended the Steel Construction Institute (SCI) annual event for members which was held at the Tower of London.

Graham Couchman (pictured), CEO of SCI, opened the members day by explaining the event's theme of design team integration.

He said that not many engineers are fortunate enough to experience at first hand all aspects of the research-design-fabricate-construct sequence during their careers, but they can certainly improve their contribution to part of that chain by better understanding the roles and aims of others.

George Oates, an Associate of Expedition Engineering, took up the baton and spoke about the London 2012 Velodrome. He said the numerous constraints on the project meant that design and construction teams working closely together was the only way it could be delivered on time and to budget.

Simon Bingham, Managing Director of Caunton Engineering, then explained a steelwork contractor's view of design integration, highlighting a number of issues associated with BIM and emphasising the very tight time constraints that his business must work within.

The final guest speaker was Gordon Deuce, Chief Engineer of Mace and he highlighted a number of examples where minor changes to the design could have greatly facilitated the construction of a given building. He repeated the mantra that lowest weight is not lowest cost if it results in extra work or restrictions.

Closing the event, David Brown, an Associate of SCI, highlighted the knowledge and experience at SCI, represented through its on-line technical information (Steelbiz) and telephone advisory service.

The event was recorded and is available from SCI's website ***www.steel-sci.com***.

Bridge lift ensures road improvement

A significant new steel bridge was lifted into place at the B1106 junction as part of the Highways Agency's £105M A11 dualling and improvement scheme near Thetford, Norfolk.

The bridge, fabricated, supplied and erected by Mabey Bridge, working on behalf of main contractor Balfour Beatty is constructed from two braced pairs of steel beams, each weighing 77t with a span of 37.5m.

Forming part of the construction of the new grade-separated junction, the bridge will carry the local road (B1106) over the new Elveden Bypass.

Paper mill expands with steel

Townsend Hook Paper Mill near Maidstone in Kent is currently undergoing a large scale upgrading programme which involves the construction of a 162m long steel framed manufacturing hall.

Site owner Smurfit Kappa says once the project is complete later this year the plant, which specialises in the production of recycled cardboard packaging, will increase output by 8% per annum.

Atlas Ward Structures is fabricating, supplying and erecting 2,200t of steelwork for the project. The majority of the tonnage is needed for the portal framed main hall, which features a 32.5m wide span and is constructed with a series of 22m high 914 UKC columns which are required to support crane beams for a pair of 50t capacity gantry cranes.

The steelwork contract also requires Atlas Ward to erect a 25m x 8m electrical room lean-to, three smaller buildings and supply and install 14 steel staircases and 14 steel stair towers.

Composites centre takes shape with steel

A multi million pound extension to the National Composites Centre (NCC) in Bristol is nearing completion due to steelwork's ease and speed of construction.

Phase one of the project opened in 2011 and due to its success a 11,500m^2 second phase was quickly decided on by the project's owner the University of Bristol.

Costing £25m, Phase 2 consists of a three-storey knowledge and innovation block and a single storey manufacturing and demonstration building.

Both buildings are steel framed and are scheduled for a completion date in June.

Paul Hayes, Billington Structures Project Manager said: "What makes the innovation block interesting is that for similar spans, there are varying beam sizes. This is because the university specified very different loading criteria for all the different areas.

"Rooms were designed to accommodate a wide range of activities from investigating the properties of a small diamond to testing part of a plane. There are different floor loadings for every area."

The NCC provides manufacturing facilities at an industrial scale for the testing of a wide of range of prototypes. The site also brings together academics and companies in order to develop new technologies for the design and manufacture of composite products.

Hollo-bolts support Stonehenge experience

Lindapter's high clamping force (HCF) Hollo-bolts have been used extensively on the new Stonehenge exhibition and visitor centre that opened in December (see NSC May/June 2013).

A range of M16 and M20 Hollo-bolts were used to connect structural glass fins to the primary steelwork of the café and shop, which are housed within one of two pods that combine to make up the visitor centre.

A feature undulating steel roof supported by more than 200 columns covers both pods.

The Stonehenge centre forms the first phase of English Heritage's £27M project to transform the visitor experience to the world renowned historic site.

Steelwork contractor for the project was S H Structures.

College heralds beginning of Highlands campus construction

The initial construction phase of the ambitious Inverness Campus project is taking shape as steel erection for a new College is nearing completion.

Inverness College will move into a state-of-the-art facility in time for the 2015 autumn term. Replacing two existing sites, the new college consists of a curved three-level structure topped with roof top plant pods.

Working on behalf of main contractor Miller Construction, BHC will erect approximately 1,400t of structural steelwork for the project.

Overall the Inverness Campus will also include student accommodation blocks, leisure and sports facilities as well as office and research space.

The campus is linked to Inverness town centre via a recently completed steel composite bridge that spans the A9. Cleveland Bridge fabricated, supplied and erected the bridge last year.

Diary

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

SCI Steel Knowledge
Tuesday 11 February 2014
Members in Bending
1 hour lunchtime webinar free to BCSA and SCI members, offering an overview on members in bending.

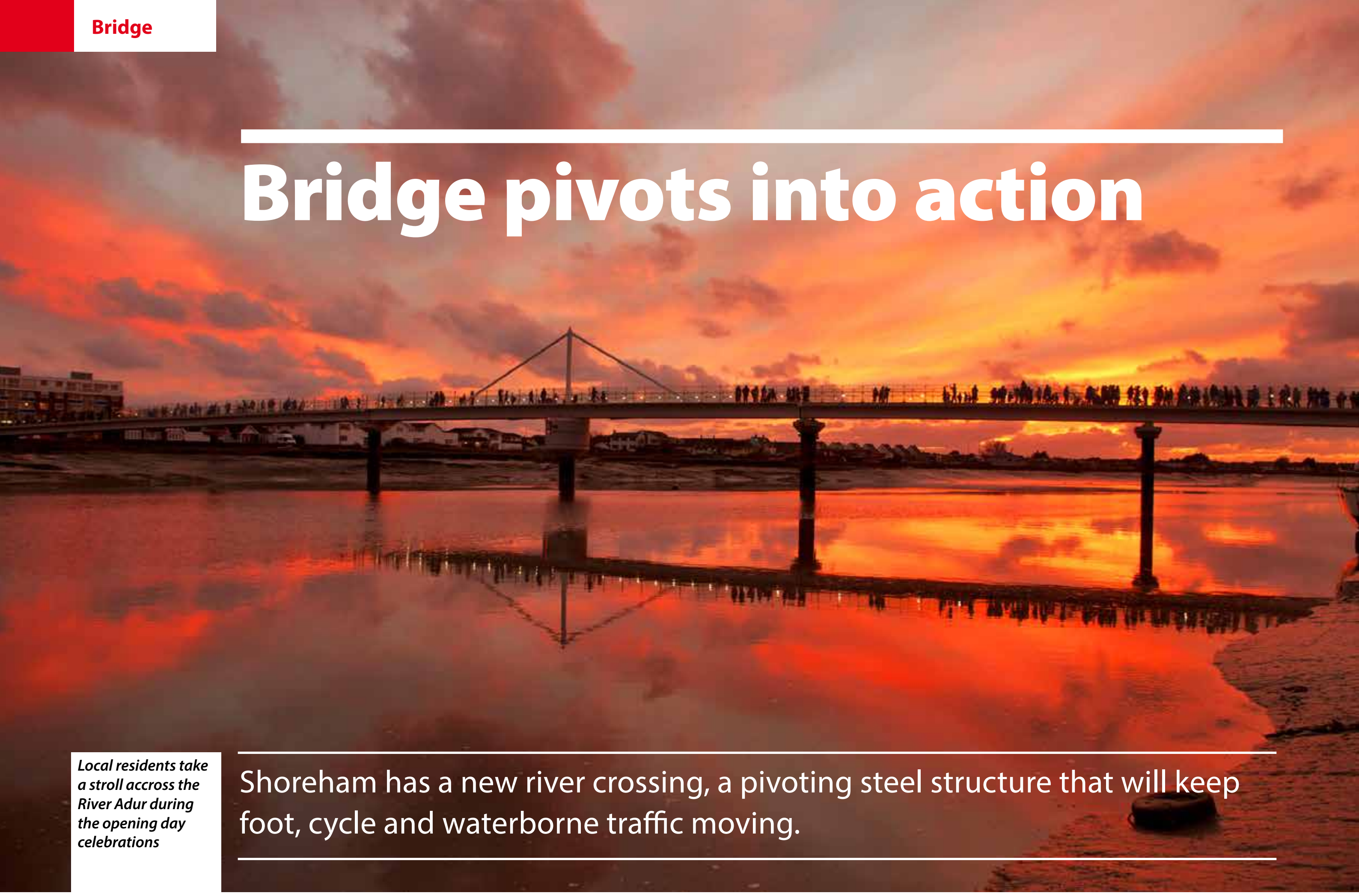
SCI Steel Knowledge
Thursday 13 February 2014
Portal Frame Design
This course provides in-depth coverage of the major issues surrounding the analysis, design and detailing of portal frames.
(1 day course) Leicestershire

SCI Steel Knowledge
Tuesday 25 February 2014
Steel Frame Stability
This course provides guidance on, braced frames, continuous frames and portal frames.
(1 day course) Leeds

SCI Steel Knowledge
Wed12 & Thu 13 March 2014
Essential Steelwork Design
This course introduces the concepts and principles of steel building design to EC3.
(2 day course) Sheffield

SCI Steel Knowledge
Tuesday 18 March 2014
Connection Design
1 hour lunchtime webinar free to BCSA and SCI members, offering an overview of connection design.

SCI Steel Knowledge
Tuesday 1 April 2014
Steel Connection Design
This course is for designers and technicians wanting practical tuition in steel connection design.
(1 day course) Birmingham



Bridge pivots into action

Local residents take a stroll accross the River Adur during the opening day celebrations

Shoreham has a new river crossing, a pivoting steel structure that will keep foot, cycle and waterborne traffic moving.

FACT FILE
Adur Ferry Bridge, Shoreham-by-Sea, West Sussex
Main client: West Sussex County Council
Main contractor: Osborne
Structural engineer: Cass Hayward
Steelwork contractor: Mabey Bridge
Steel tonnage: 195t

Local journeys by pedestrians and cyclists in Shoreham-by-Sea have become significantly more enjoyable since the opening of a new swing bridge across the River Adur.

Known as the Adur Ferry Bridge, it forms a vital component of the Sustrans National Cycle Network Route 2, which will eventually connect communities along the south coast from Dover to Cornwall. The project, commissioned by West Sussex County Council in partnership with Adur District Council, also received a £770,000 grant from Sustrans and the Big Lottery Fund.

Replacing an old narrow drawbridge built in the 1920s, the new pedestrian and cycle crossing provides a better and more direct link between Shoreham Beach, the town centre and the railway station.

The bridge deck is between 4m and 6m wide throughout its 214m length, which is considerably wider than the old bridge, therefore providing more space for cyclists and walkers alike.

Another highlight and benefit of the bridge is that both sides are enclosed by 1.6m-tall glass parapets, supported by stainless steel posts, this allows users to have unobstructed views across the river.

The most striking element of the structure is a pivoting 50m long central span that allows boats to pass up and down the river.

"Having a moveable span to keep the river open to vessels was one of the main design criteria," explains Alan Monnickendam, Cass Hayward Project Engineer. "The old bridge had a moving span and this needed to be retained in the new bridge as there is an Act of Parliament preserving the river's use."

The entire span pivots via a mechanism housed within a central pier. Operated fully automatically, either from an operations room on the south shore or via a hand held device, the span is able to pivot once horizontal pins are released and retracted into the nose of the swing span. It opens, in just three minutes, to a final position that is 70 degrees to the main structure.

As well as having a navigable central channel, this part of the River Adur experiences an extremely high tidal range, greater than seven metres at times. This had an impact on the works and meant some of the installation of bridge sections had to be

1

2

3

During construction of the new bridge, the old crossing (left) was used for access and transporting materials across the river

Steel bridge design

As well as including a moving span the bridge's design brief required simplicity, buildability and cost effectiveness.

"The bridge needed to be as light as possible due to the moving element as well as easy to construct," says Mr Monnickendam. "Bearing in mind the location and function, a steel design was the only viable option for this bridge."

The structure is supported on seven piers founded on mono piled foundations. The central pier is the largest with a 4.5m diameter upper section that houses the pivoting mechanism.

The central pivoting span has a rigid stayed design with an 8m high CHS 508mm diameter mast supporting and connected to a pair of 273mm diameter 14.5m long CHS stays. This configuration gives the span rigidity and support during operation.

coordinated around high tide.

The bridge has seven spans in total, three on either side of the large 50m long central portion. Initially steelwork contractor Mabey Bridge installed the three spans forming the southern approach, the last of which (closest to the centre) was erected using a 110t crawler crane mounted on a barge.

"Main contractor Osborne had constructed a temporary causeway out into the river as a working platform for a crawler crane and allowed us to erect the first two spans," said Chris Reynolds, Mabey Bridge Senior Site Manager. "The third span had to be installed using a barge as this part of the river was too deep to construct a temporary causeway."

A similar method was used for the northern approach, with the first span erected by a 100t capacity telescopic crawler crane using a temporary causeway constructed into the river, and two spans installed using the same barge mounted crane.

One pair of 26m long braced girders, weighing 17t, form each of the six approach spans. These were fully assembled and painted at Mabey Bridge's facility before being delivered to site.

When working from the temporary causeways steelwork was delivered direct to the crane by road. However, for the central spans, braced girders had to be floated up stream and delivered by a flatbed barge, a job that was high tide dependent.

Finally, with the approaches erected and the pivoting mechanism installed, the central moving span was lifted into place.

A large jack-up barge carrying a 180t capacity crane was floated into position and anchored to the riverbed for this final piece of the steelwork programme. Getting the steelwork to the crane was again reliant on barges that could only reach the bridge site during high tide.

Mabey Bridge delivered the girders for the central span to a holding yard at nearby Shoreham Docks. This was where the nine sections were welded into three sections, two outer 19m long pieces weighing 24t each and a central 12m long piece weighing 24t that fitted over the pivoting mechanism. Once assembled these sections were then lifted onto a barge, floated upstream and erected.

Prior to the main event, the central span complete with its 10m high mast and two stays was trial erected at the docks.

"The trial erection gave us peace of mind that everything would fit exactly. Once the steelwork was out in the river there was no room for error," explains Paul Reader, Osborne Project Director.

Shoreham's pedestrian and cycle bridge has already become a local landmark and an indispensable link since it was officially opened on 13 November by HRH The Duke of Gloucester.

"This has been an extremely complex project involving both land and marine based construction," sums up Mr Reader. "All the team worked extremely hard to erect this important addition to the local landscape."

Top left 1: One of the bridge spans is lifted into place
2 & 3: The new bridge connects both parts of Shoreham and affords views over the River Adur

Research centre chooses steel

Long spans and the ease of internal reconfiguration over the life of the building were key reasons for choosing a steel solution for a research facility in Glasgow. Martin Cooper reports.

FACT FILE
Technology and Innovation Centre, University of Strathclyde, Glasgow
Main client: University of Strathclyde
Architect: BDP
Main contractor: Lend Lease
Structural engineer: Struer
Steelwork contractor: Fisher Engineering
Steel tonnage: 2,600t

To help boost economic development, top researchers, engineers and project managers from academia and industry are being brought together to work in a state-of-the-art building at the University of Strathclyde in Glasgow.

Known as the Technology and Innovation Centre (TIC), it will provide office, conference facilities and laboratory space for students, academics and industry experts to work jointly on solutions to challenges in sectors as diverse as power and energy, renewable technologies, photonics and sensors, advanced engineering, pharmaceutical manufacturing and bio-nano systems.

The TIC has already attracted major industrial partners and at £89M, the project is the University's single biggest investment in its research capacity. It is anticipated it will become the cornerstone of Scottish Enterprise's new International Technology and Renewable Energy Zone – a global economic hub bringing innovative businesses into the heart of Glasgow.

The building is a nine-storey, steel framed wedge shaped structure occupying a sloping brownfield site. Conditions proved to be challenging at first, due to the topography and the water environment which included run off from excavations and some localised perched water. This lengthened the groundworks programme and also meant the steelwork erection had to be sequenced accordingly.

"Initially we had to concentrate on erecting steelwork on the western elevation where groundworks had been completed," says Alistair Forsyth, Lend Lease Structural & Civils Package Manager. "Once this preliminary work had been completed however, we were then able to bring both sides of the structure together and erect steel in a more traditional floor-by-floor method."

The steel erection programme is being carried out using a combination of two tower cranes, supplemented by a couple of 70t capacity mobile cranes. Mobile elevating work platforms (MEWPs) are also used by the erectors and, to give these machines a safe working surface, halfway up the building the sixth floor slab has been reinforced to accept extra loadings.

"Working off of this slab, MEWP operators will have the reach to erect most of the upper steelwork," says Mr Forsyth. "However one part of the uppermost ninth level will require the MEWPs to be positioned on runners fitted to the seventh floor."

> *"Steel's flexibility and adaptability has allowed us to make changes to the design at a very late stage."*

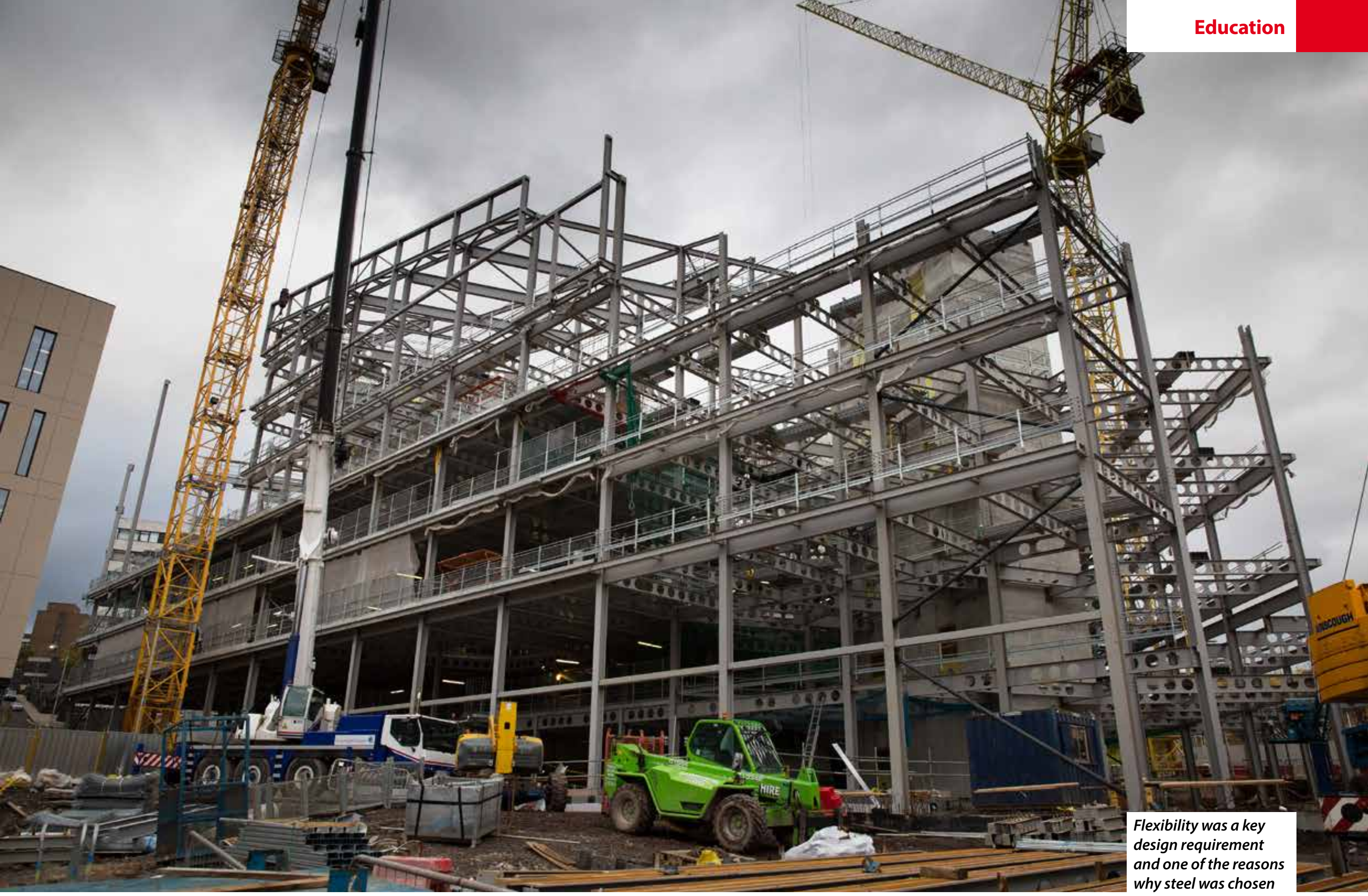
Using three cores for stability, the steel frame is generally based around a 9.5m × 6m grid pattern in laboratory areas and a 12.7m × 6m grid in office areas. Cellular beams have been used throughout the floor plate in order to integrate all of the ducting in what will be a heavily serviced building.

The northern or top third of the wedge shaped building is nine levels high, but the structure slopes down towards the south and the pointed tip tops out at seven floors.

The north block of the TIC will house most of the facility's laboratories on levels 4, 5, 6 and 7. The steel frame and precast slab in this area has been stiffened as far as is practically possible in order to achieve the very onerous vibration requirements specified for the laboratories. The slab is thicker at 300mm, compared to 150mm elsewhere within the building and additional secondary beams have been employed at 2m centres.

"Heavier steel sections and a thicker slab have been used in this area to make this part of the floor plate approximately six times stiffer than would be normally required for static loadings," explains Angus Macdonald, Struer Project Engineer. "This additional mass and stiffness has been provided in order to support a reasonable standard of instrument performance. The current design will generally deliver a floor response factor of 1.0 at mid span locations and a response

Visualisation of the completed TIC



Flexibility was a key design requirement and one of the reasons why steel was chosen

factor of 0.5 or better at column and core locations."

The central portion of the structure contains a 450-seat auditorium located at level two. Allowing the auditorium to be column free, a pair of 25m long double height trusses have been installed at levels 4 and 7. The two trusses were bolted together during the installation process to form one large five-storey element.

"We had to bring the main booms of the trusses to site in 20m and 5m lengths, which were temporarily supported by props during the erection process," explains Robin Hamill, Fisher Engineering Project Manager. "Only when the adjoining floors were complete could we remove these props."

The large truss is supported by fabricated plate columns, brought to site in 16m lengths weighing close to 6.5t.

A large open space above the auditorium's roof will have a glazed roof to form a central atrium allowing natural daylight to penetrate the building's interior.

Either side of the central void the side elevations of the structure will house the building's offices. With a similar steel grid pattern to the laboratory zone of the building, many of the office spaces also feature clear spans in the order of 12.7m.

"Flexibility as well as the required long spans were two of the main reasons for choosing a steel frame solution for this project," says Mr Macdonald. "The TIC's requirements may change in time and so laboratories and offices may need to be enlarged or service risers may require to be reconfigured and this is much easier to do with a steel frame."

Both of the elevations accommodating the offices culminate at the wedge's tip that overhangs a double height open space in front of the TIC's main entrance. This same double height space then extends internally from the entrance all the way along the ground floor western elevation.

Summing up Mr MacDonald adds "Steel's flexibility and adaptability has allowed us to make changes to the design at a very late stage. For example riser positions are still being finalised late into the programme and changing the design to suit these changes would not have been anywhere near as easy with a concrete frame."

The TIC is due to be handed over to the client near the end of August 2014.

The centrally positioned 450 seat auditorium

What's in the basement

Because of the sloping site the basement covers approximately half of the building's footprint. Steelwork starts at this subterranean level and the frame also supports a retaining wall that surrounds the three elevations.

The basement will house some plant equipment (the majority is accommodated at rooftop level) a 150-seat auditorium and a series of secure laboratories.

The nature of the research to be undertaken in these laboratories requires them to have 400mm thick reinforced shielding walls and a moveable lead roof to ensure the environment remains sterile at critical times. An overhead gantry crane will be installed above the shielding walls in order to allow equipment to be installed and moved.

A bespoke steel frame will allow the client to get maximum flexibility from the building

Science park provides economic boost

A flexible and cost-effective steel framed building forms the first phase of a large regeneration scheme at a former military base in Northern Ireland.

FACT FILE
North West Regional Science Park, Derry-Londonderry
Main client: Northern Ireland Science Park
Architect: McAdam Design
Main contractor: Heron Bros.
Structural engineer: McAdam Design
Steelwork contractor: Walter Watson
Steel tonnage: 430t

A number of significant changes have occurred in Derry-Londonderry since the signing of the Good Friday Agreement and the ending of the Troubles in Northern Ireland.

Over the last decade a riverside setting and an historic city wall have helped turn a troubled city into a regional tourist destination, something which was further boosted as Derry-Londonderry was UK City of Culture 2013.

One of the major focal points for last year's cultural events was Ebrington, the former military base that is now linked to the city centre by the award winning Peace Bridge (NSC July/August 2012). The Ebrington site has been turned into a large public domain including a number of art galleries housed within some of the site's many historic and listed buildings.

The redevelopment of the Province's military establishments is a sign of the times and about a mile or so down the River Foyle from the Peace Bridge another base, formerly known as Fort George, is the location for the construction of the Northern Ireland Science Park – Innovation Centre, Derry-Londonderry (which, together with a facility at Letterkenny, forms the North West Regional Science Park).

Once complete later this year, the Centre will act as a catalyst for innovation in science and technology in the local area by offering bespoke research and office space.

The project will be another building of the highly successful Northern Ireland Science Park, based at the Titanic Quarter in Belfast, which steelwork contractor Walter Watson erected last year.

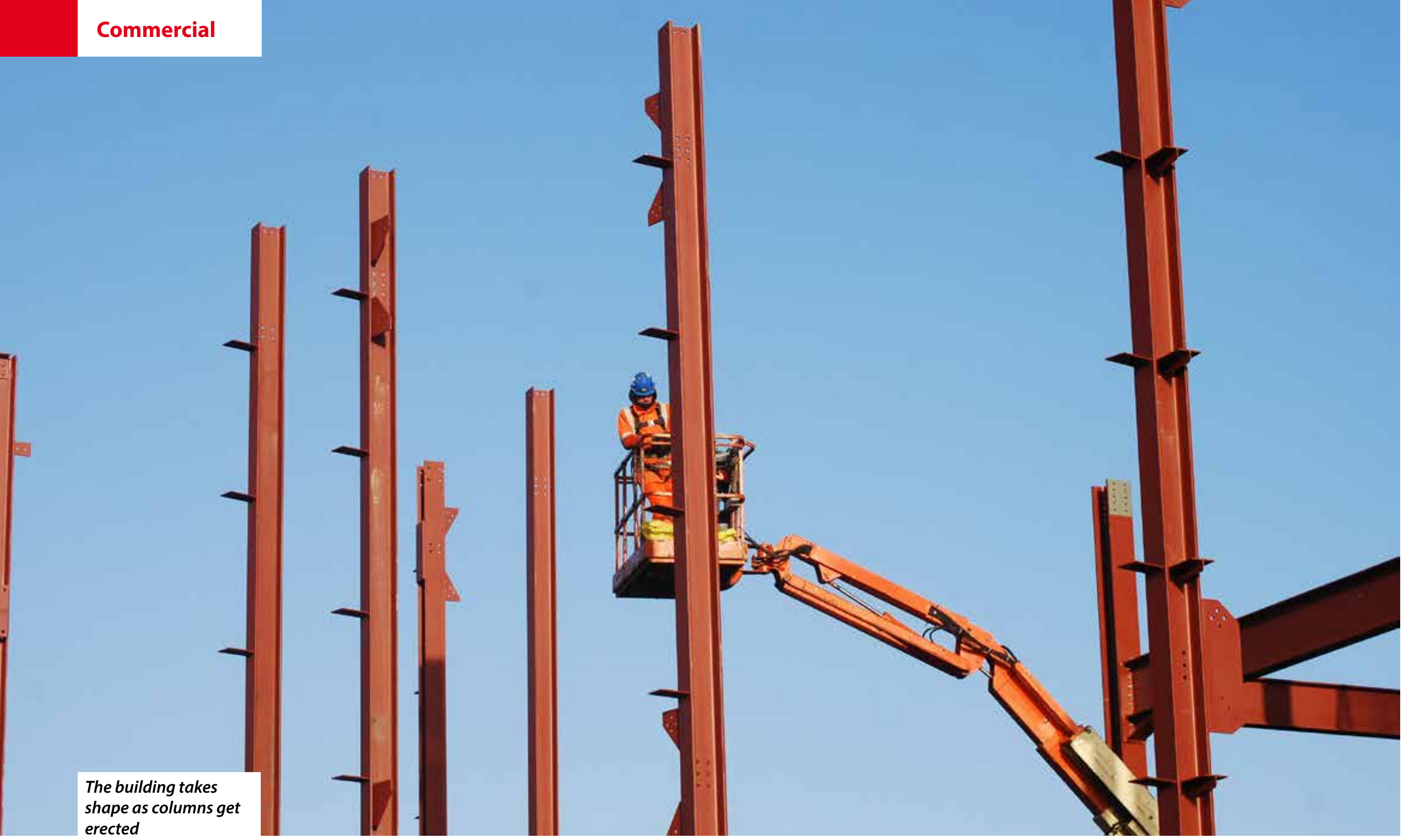
The client thought the five-storey steel framed Belfast project was completed so efficiently that the steelwork contractor was in a prime, and then ultimately successful position to undertake the similar Derry-Londonderry project.

Fort George was vacated by the military in 2001 and, because of its riverfront setting and proximity to the city centre, it has always been earmarked as a prime redevelopment plot.

Once the 14 acre site had been acquired from the military a lengthy remediation programme was required as significant amounts of pollutants such as heavy oils and diesels, as well as heavy metals needed to be removed. Heron Bros. started the construction of the 4,600m^2 four-storey commercial and research building in early 2013.

Founded on driven steel bearing piles, the building has a bespoke steel frame design, combining both portalised and braced bays.

16



The building takes shape as columns get erected

◀ 14

The majority of the building is formed with a twin span portalised frame, with moment connections adding stiffness to the structure. Further stability is provided by the building's braced end bays that house the lift shafts and stairwells.

Getting maximum flexibility from the building was one of the main client wishes for the project and a reason for its hybrid design says Sharon Dickenson, McAdam Design Project Engineer.

"With just one line of internal columns separating two 11m wide clear spans we've maximised the space and designed a building that can also be reconfigured to suit the occupants."

The main building is essentially rectangular in shape, with the exception of a lean-to structure that accommodates the main entrance and staircase. Situated halfway along the riverside elevation, the main entrance is housed within an 11m long x 8m wide four-storey high lean-to steel frame, that connects back to the main steelwork.

Early in the design process a number of framing solutions were evaluated prior to steel being chosen because of its speed and cost benefits.

"Internally it's a very economical building," comments Nigel Barton, McAdam Design Project Architect. "While externally, because of its prominent position, it will be finished with high-spec natural stone and high quality metal cladding."

The cladding will be held in place by being attached to a series of steel grillages that have been bolted to many of the structure's columns. The grillages, which were fully welded prior to being delivered to site, are fabricated from 100mm × 100mm box sections and measure up to 3m long × 2m wide.

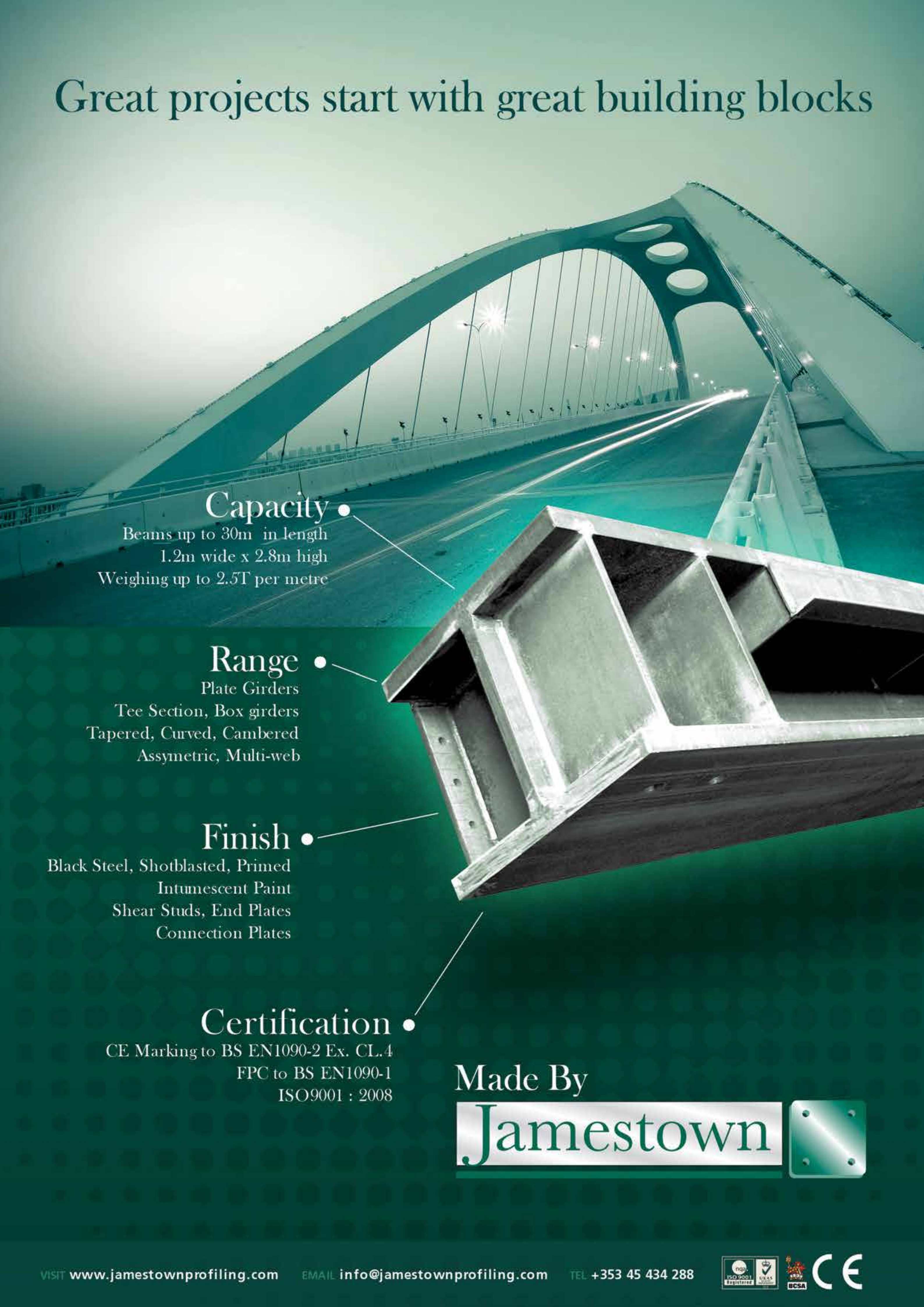
The steelwork programme is due to be completed later this month (January) and the Centre will open in September.

Future plans for historic Fort George

Owned by the Department for Social Development (DSD) the Fort George site has a long and distinguished history having served as a shipbuilding yard from the 1830s, a ship repair yard for Allied Forces' vessels during World War II, a naval yard and then a military base from 1970.

It now forms an important part of the One Plan regeneration scheme, which aims to revitalise large areas of Derry-Londonderry. The site is located on the main arterial route into the city centre from the north and this prime plot will accommodate a prestigious technology park, the first phase of which is the Innovation Centre building.

According to the DSD, an eight phase scheme to be completed by 2023, could include a mix of office, education, research, residential and leisure buildings. Other developments will include a multi-storey car park, a new pubic realm and infrastructure improvements to roads and the waterfront.


Great projects start with great building blocks
Capacity
Beams up to 30m in length
1.2m wide x 2.8m high
Weighing up to 2.5T per metre
Range
Plate Girders
Tee Section, Box girders
Tapered, Curved, Cambered
Assymetric, Multi-web
Finish
Black Steel, Shotblasted, Primed
Intumescent Paint
Shear Studs, End Plates
Connection Plates
Certification
CE Marking to BS EN1090-2 Ex. CL.4
FPC to BS EN1090-1
ISO9001 : 2008
Made By
Jamestown
VISIT www.jamestownprofiling.com
EMAIL info@jamestownprofiling.com
TEL +353 45 434 288
ISO 9001 Registered
UKAS
BCSA
CE

Safety first for Scottish bridges

Barriers installed on Kessock Bridge

Two bridge projects in Scotland highlight the safety performance and ease of installation of the Tata Steel vehicle restraint systems.

Thousands of miles of Tata Steel safety barriers have been installed on the UK's highways and bridges during the last 50 years.

The company has an established reputation within the industry for producing a comprehensive, economic and high performance range of traditional vehicle restraint systems.

Tata Steel's range consists of a number of barrier system designs including high and normal impact options. Both of these options are being installed on the Erskine and Kessock bridges.

Erskine Bridge

Erskine Bridge

Spanning the River Clyde, the 1321m-long Erskine Bridge is a cable stayed steel box girder structure opened in 1971. It connects the M898 motorway in Renfrewshire on the south side of the river to the A82 in West Dunbartonshire on the northern shore.

Flint & Neill, the structural engineers responsible for the design of the barrier replacement scheme, identified a high risk of an HGV impact with either the support cables or towers, which could potentially cause a collapse. They suggested installing a new HGV containment barrier system.

The Tata Steel 365 barrier system was selected after it was demonstrated that it would fit the requirements of the project.

"The requirement was for barriers with posts at 4.3m centres to allow them to fit onto strong points on the bridge's superstructure and so reduce bridge strengthening work," says Trevor Mustard, Tata Steel Manager, Customer Technical Services & New Product Development, Structural Tubes. "This is something our system could easily accommodate."

During the first half of 2011 Tata Steel designed the barriers and then prepared materials for full scale impact testing.

"We carried out the barrier impact testing in July 2011 with complete success". says Mr Mustard. The barriers met the specification requirements at Erskine and hence were chosen as the preferred installation.

A further area of risk was also identified and this required the verge barriers on Erskine Bridge to be replaced with 30t HGV (H4a) barrier.

In total Tata Steel is supplying approximately 5,300m of high impact barriers for the project, installed between October 2013 and May 2014. To produce the barriers more than 500t of Tata Steel Celsius tubular steel needed to be sourced from mills at Corby and Hartlepool along with 345t of base and deck plates from Scunthorpe.

Kessock Bridge

Carrying the A9 over the Beauly Firth north of Inverness, the Kessock Bridge is another important transport link in Scotland.

Opened in 1982, the 1,056m long cable

Research tests ensure the barriers can perform to all modern scenarios

stayed bridge has an orthotropic steel deck incorporating a main span of 240m.

Mouchel, the designer for the scheme, had identified similar risks as on Erskine, requiring a quantity of the H4a barriers to protect cables and towers.

"There was a problem with a lack of space for central reserve barriers, however a version of our high performance Protect 365 N2 system met the specification requirements," says Mr Mustard. "Their requirement became 2,100m of N2 barrier and 2,100m of H4a barrier, similar to Erskine, but with 4m post centres."

The barrier installation programme was eventually combined with a complete refurbishment of the bridge that also included resurfacing, deck joint replacement and new lighting.

Work on Kessock has been divided into two phases. Phase one for the northbound carriageway was completed between February and June 2013, while phase two (southbound carriageway) will start in February with completion set for early in the summer.

The Kessock Bridge contract includes approximately 110t of Celsius tubular steel from Corby and a further 190t of Celsius from Hartlepool along with 60t of base plates from Scunthorpe.

High containment

All Tata Steel highway products offer lifetime value and have been developed to perform with modern day vehicles and scenarios. Rigorous research and development ensures that every aspect of the systems design is extensively tested to meet or exceed the latest industry standards. In depth product testing undertaken by MIRA has proven that all Tata highways products are engineered to withstand a gruelling range of impact testing.

All tests are carried out with cars less than five years old. The company's computer modelling and subsequent dynamic tests showed that cars with modern rigid passenger cell designs require the barrier system to have more energy adsorption than older vehicles. This is where Tata Steel's rectangular hollow section steel parapet restraint system is said to really come into its own. The steel provides a uniform and repeatable high impact resistance and affords excellent ductility. This is claimed to ensure post and rail sections yield optimum performance to give the systems a high energy absorption performance and maximum occupant protection.

By absorbing energy in a controlled way, Tata says its barrier systems not only reduce the level of injuries in crashes but also reduce anchorage forces acting on the bridge structure.

With increased vehicle speed, together with volume and weight on UK roads, the company recognises the importance on passive safety performance and developed an industry leading product that has undergone extensive testing and development for the UK's roads and bridges.

Tata Steel's systems are renowned for their high performance

The Manufacturing facility takes shape

Seven up for seafront campus

An additional campus for Swansea University that includes seven steel framed buildings is under construction on the eastern approaches into the Welsh city.

FACT FILE
Swansea University, Bay Campus
Main client: Swansea University
Developer: St. Modwen
Concept architect: Porphyrios Associates/ Hopkins Architects
Main contractor: Vinci Construction
Structural engineer: Rodgers Leask, Bay Associates
Steelwork contractor: Caunton Engineering
Steel tonnage: 1,800t

Being built to complement Swansea University's existing facilities, Bay Campus is a 65 acre development that includes a library and lecture theatres, as well as facilities such as an Innovation hub and a Manufacturing building that will provide laboratory space, not only for students but also for local businesses.

Developer St. Modwen bought the seafront site, formerly owned by BP, in 2007. A lengthy remediation programme was carried out together with the site's sea wall being modified and extended, prior to construction work on the campus kicking off earlier this year.

Steel construction is playing a major role in the scheme, as seven buildings are steel framed.

"Economics, value and flexibility were all reasons for choosing steelwork for our research, teaching and manufacturing facilities," says Richard Powell, St. Modwen Construction Project Manager.

"Maximum adaptability is important for these structures as during their lifetime the usages are quite likely to change."

Working on a design and build contract for main contractor Vinci Construction, Caunton Engineering is responsible for five of the steel framed structures.

These consist of the £32M Manufacturing facility, the School of Management, the Great Hall, a Library, and the Institute of Structural Materials.

All of the structures are unique due to their individual uses, and vary in degrees of complexity. Below ground they also differ due to the site's changing landscape, with the buildings either built on pad foundations or driven piles.

The largest of the buildings and the first to be erected is the 95m long x 87m wide Manufacturing facility. This three-storey structure is divided in half by a 9.5m wide street, which will be glazed at either end and spanned by a tensile fabric roof.

"Both sides of this facility are temporarily independent structures that will be linked by footbridges spanning the street," says Matthew Shimwell, Caunton Engineering Senior Structural Engineer.

"Controlling differential movement, which could potentially damage the tensile roof, was a challenge. The bridges bring the two parts of the building together, and maintain a constant distance between them."

The two braced frames are also held together by large box section horizontal glazing restraints situated at either end of the street.

The Manufacturing facility will provide laboratory and teaching spaces for industrial and manufacturing research, so the steel frame is based around a regular 9m x 9m grid, which is sufficient to provide the structure with the required classroom sizes

The only exception to the grid pattern is an open plan lean-to that is attached to the western elevation. This is a long column free space to be used as a manufacturing and testing area, served by an overhead crane supported by the main steelwork.

Adjacent to the Manufacturing facility sits the Institute of Structural Materials which is a 72m long x 26m wide portal frame with a 10m wide lean-to structure positioned along either side.

This building will provide a large testing facility for existing materials that are used in the aerospace and aero-engine industries. The structure will also house a data centre for the campus.

Caunton says this was the simplest structure out of the five to erect, and was completed by September last year.

A large open column free space was required for this building's research area and a steel portal frame offered the quickest and most economical solution," says Jerry Williams, Vinci Construction Project Director.

Possibly the site's most distinctive building is the Great Hall, a large 26m high two-storey structure that contains lecture halls on the ground floor with an assembly hall above.

In recognition of Swansea's industrial heritage the building will be clad with

Site plan of campus

reconstituted stone panels.

The panels weigh approximately 10t each and are hung from heavy duty brackets bolted to the columns.

In order to stabilise the structure and deal with any potential deflection issues, a series of full height UKC cross bracing and moment frames have been integrated into the building at end bays.

"Controlling lateral deflections on this building was particularly challenging given the site's landscape. In addition to this, the building's column free spaces and height combine to present a complex design.

"The joints between the stone panels could accommodate only a few millimetres deflection when under lateral load, which resulted in the building having to be designed to very small deflection limits," says Mr Shimwell.

Forming the assembly hall's 21m wide column free space, as well as supporting roof top plant equipment, is a series of Vierendeel trusses.

Throughout the steel programme Caunton has had one erection gang working sequentially around the site, a plan that has worked well with Vinci's overall works.

"This was one of the reasons we contracted a steelwork company that could do a design and build job," explains Mr Williams. "They've been able to do one structure straight after another seamlessly without any design or erection hold-ups."

With the first three structures erected Caunton finished off its programme with the construction of the School of Management and the Library.

The School of Management is 53m long x 38m wide four-storey structure with braced steel frame built around a central full height atrium.

A series of transfer structures located in corridors allow the building to have varying classroom sizes from floor-to-floor by supporting columns that do not extend the full height of the building.

The Library is a single-storey building, the main body of which fronts onto an internal courtyard with two arms extending out and almost completely encircling the open space.

The Institute of Structural Materials is a large portal framed building

The Manufacturing facility is divided in two by a covered street

University expansion

Under a separate contract, Leadbitter is constructing two further steel framed buildings as part of the overall St. Modwen Bay Campus development.

The company is building the Innovation Hub and the Energy Safety Research Institute (ESRI), both of which are three-storey structures.

Elsewhere on the site 899 student rooms are being built within precast concrete residential blocks varying in height from three storeys to a maximum of eight storeys. The centrepiece of this part of the campus development will be a 13-storey high clock tower.

FACT FILE
Aldgate Tower, London
Main client: Aldgate Developments
Architect: Wilkinson Eyre Architects
Main contractor: Brookfield Multiplex
Project manager: Ftsquared
Structural engineer: Arup
Steelwork contractor: Severfield-Watson Structures
Steel tonnage: 5,600t
Project Value: £78M

Part of the building is positioned over an entrance to Aldgate East Underground Station

Aldgate rising

A steel solution has allowed the construction of an 18-storey commercial development to be built on top of an existing raft foundation originally designed to support a smaller building. Martin Cooper reports from east London.

Perched on the City of London's eastern boundary, Aldgate has for a long time been overshadowed by the square mile's many ultra modern steel and glass high rise buildings.

However in recent times a number of developments have helped to regenerate this part of east London and, combined with its proximity to the City, Aldgate is now a desirable place to live and work.

Adding to the area's future stock of commercial office space is an 18-storey structure known as Aldgate Tower currently being developed by Aldgate Developments and built by Brookfield Multiplex.

Designed to achieve a BREEAM 'Excellent' rating, the building will provide 16 floors of Grade A office space, plus two upper levels for plant equipment. Below ground the structure is founded on an existing three level reinforced concrete basement raft, a feature that has had an overwhelming impact on the design and construction of the tower.

The raft was constructed in 1982 for a previous development, and RBS the project's neighbour uses the majority of the lower two floors of the basement for its canteen and office storage.

"As the raft is in use it had to be retained and incorporated into our design," explains George Amy, Brookfield Multiplex Project Manager. "This meant we had to use a framing material for the new building that could be safely and quickly erected above functioning office space."

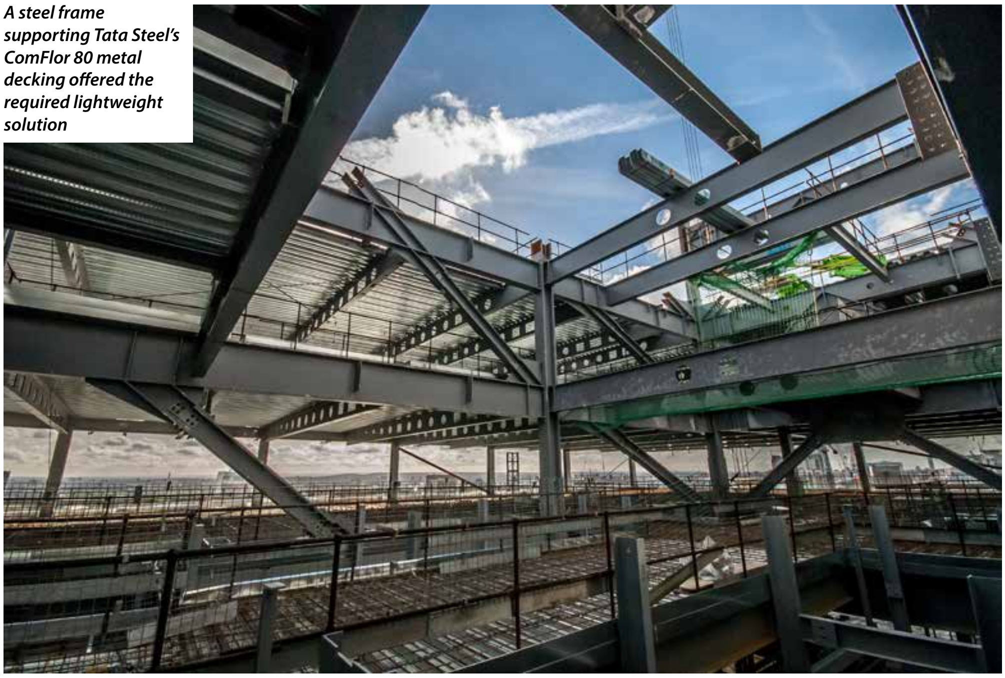
A steelwork solution was the answer, as the material not only helped the contractor to build over RBS's subterranean facilities, it also allowed the new structure to be considerably higher than the originally proposed structure.

Steelwork's lightweight attributes consequently allowed the construction project to achieve its aim of increasing the lettable office space, while incorporating an existing basement.

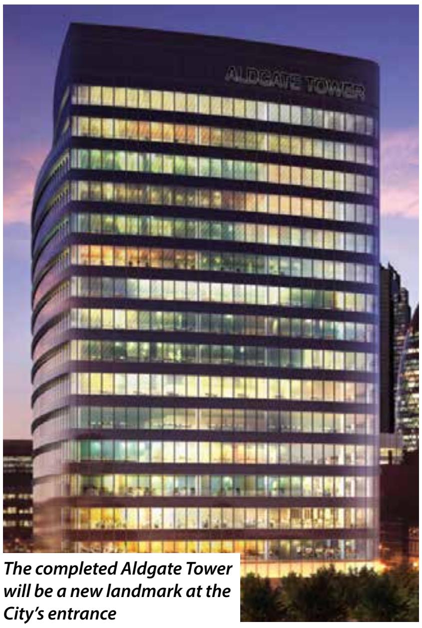
"A steel frame supporting metal decking offered us the lightweight solution we required," explains Ben Tricklebank,

A transfer structure forms the level 15 terrace

A steel frame supporting Tata Steel's ComFlor 80 metal decking offered the required lightweight solution



A steel braced core is positioned above the existing raft



The completed Aldgate Tower will be a new landmark at the City's entrance

Arup Project Engineer. "However, just as important was the fact that steel trusses could be quickly erected over the RBS delivery road at night without disrupting its use."

However, building on top of the raft meant a traditional concrete core in the middle of the tower was not feasible. The answer was steel yet again, and the installation of a 9m x 20m braced core to stabilise the overall frame. This was erected at the same time as the rest of the steelwork, allowing a faster erection programme.

The steel core starts at ground floor and sits on a transfer structure, comprising of 47t beams that distribute the loads to the raft's concrete columns. At ground level the core frame's columns are offset to allow the upper floors of the new building to have a larger grid than the existing raft.

The amount of load that could be accommodated by the existing basement was another important consideration, and consequently the 750t capacity mobile crane needed to install the steelwork for the lower part of the core could not be positioned on the raft. ▶ 24


Long clear spans are always a requirement for modern offices

◄ 23

"For the duration of the project we've been allowed to use an adjacent park to position craneage and for storing materials," explains Mr Amy.

By positioning a large mobile crane in the park the steel erection team had the capacity and reach to install not only the core's transfer beams, but also the 18t core plate girders columns.

An even larger crane, with a 1,200t capacity, was required to install a steel transfer structure at ground floor level. Formed by a series of plate girders, this steelwork bridges over part of the RBS delivery road and forms a mezzanine plant floor. With space at a premium in and around the site, and the crane too heavy to be positioned on the raft, it was also positioned in the park.

"Apart from these areas the rest of the steelwork was erected by the site's tower crane," says Alex Harper, Severfield-Watson Structures Contracts Director.

Due to the heavier loads at the base of the new structure, columns up to level 5 are fabricated plate sections, while above this floor UKBs take over. All floors are formed with 750mm deep Fabsec beams, with the longest clear spans being 18m.

At level 15 the building steps in to form a terrace and here a further transfer structure using 900mm plate girders had to be installed.

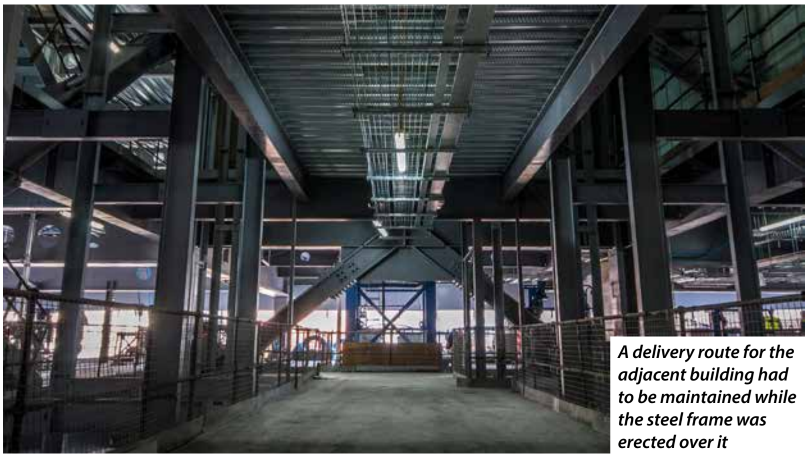
The 150mm disparity between the plate girder depth and the Fabsec floor beams had to be absorbed within the concrete topping, to maintain a uniform floor-to-ceiling height for all levels.

Externally, the building's main façades will be clad with a fully glazed, full height aluminium framed curtain wall system. Two 11KVA ring main units will provide electricity to the building supplemented by a roof and façade mounted photovoltaic (PV) cell generation system. A solar thermal heating system will be provided to preheat the water supply.

In addition to the PV cells, the roof will incorporate a brown roof system that will utilise recycled products and create a natural habitat to attract and support wildlife.

Aldgate Tower is due for completion in late 2014.

Steel's lightweight attributes consequently allowed the construction project to achieve its aim of increasing lettable office space, while incorporating an existing basement.


A delivery route for the adjacent building had to be maintained while the steel frame was erected over it

The need for lightweight construction

Dr Richard Henderson (SCI)

Dr Richard Henderson of the SCI considers the benefits of choosing structural steel over reinforced concrete in terms of building weight.

Building over existing foundations clearly imposes constraints on the new structure, involving both the arrangement of the vertical load-carrying structure and the magnitude of the loads which are to be carried. The building developer will be keen to maximise the floor area of any new building, but the means of achieving this are restricted where the freedom to choose the capacity and position of individual foundations is absent. It is normal to choose the lightest superstructure when building over difficult ground but this choice is more emphatically made where the position and capacity of foundations are pre-defined.

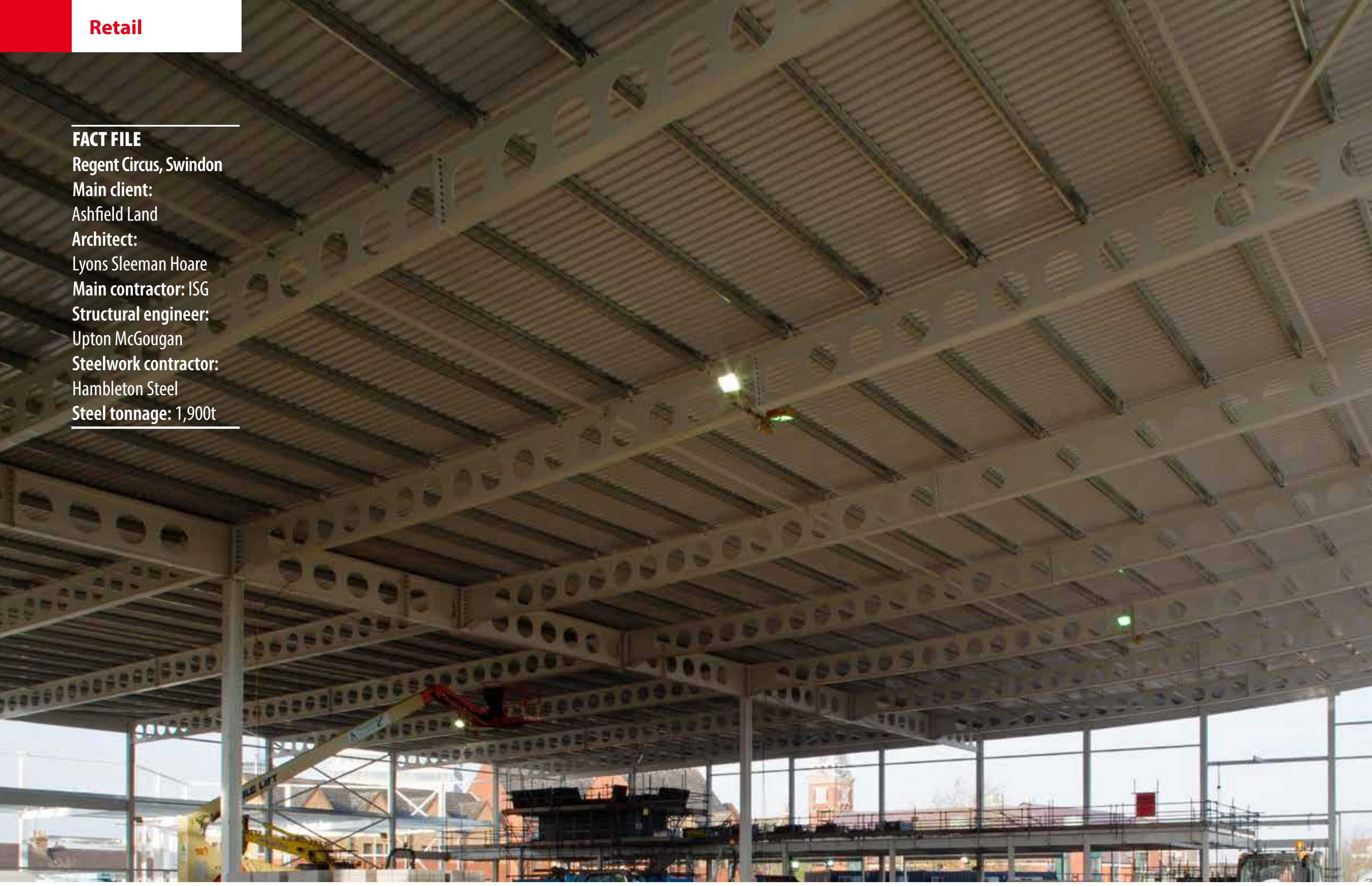
Structural steelwork in buildings essentially involves linear elements and connecting them together, whereas concrete buildings involve more two-dimensional, plate elements: not only in floors but also in vertical elements providing lateral stability. A floor in structural steel acting compositely with concrete on metal decking is likely to be about half the weight of a post-tensioned concrete floor. Core structures in concrete involving solid walls are likely to be between a half and two thirds of the weight of a braced core in structural steelwork.

Comparisons of the structural efficiency of steel and concrete can be made in terms of their specific strength and stiffness. These values are easy to define in structural steelwork but more difficult in reinforced concrete because of its composite nature. The specific strength of structural steelwork as defined in [(1)] with yield strength of 355 N/mm^2 is 45.2 MN/m^2; in compression, assuming a design strength allowing for buckling of 275 N/mm^2, the specific strength is about 35 MN/m^2. The specific strength of grade 50 concrete with 3% reinforcement is about 26.1 MN/m^2 so the benefit of choosing structural steel is a weight reduction of about 26.1/35 or 74% in the columns.

Equivalent measures in terms of tension or bending are more difficult to define because only the reinforcement is acting in the tension zone of bending elements and concrete tension elements are rarely used. Measures of specific stiffness of concrete are also difficult to define, because of the composite nature of the material and the approximate relationship between the strength of concrete and its elastic modulus

(1) *The New Science of Strong Materials, J. E. Gordon, Pelican Books, 2nd Edition, 1976*

Plated columns are used up to level 5 for their extra load bearing qualities



FACT FILE
Regent Circus, Swindon
Main client:
Ashfield Land
Architect:
Lyons Sleeman Hoare
Main contractor: ISG
Structural engineer:
Upton McGougan
Steelwork contractor:
Hambleton Steel
Steel tonnage: 1,900t

Steel supports retail development

A major retail led regeneration scheme is set to revitalise a five acre former college campus site in Swindon town centre.

Wiltshire's largest town is poised to receive a retail and entertainment boost with the construction of the £16.5M Regent Circus scheme.

Anchored by a 4,600m^2 Morrisons store, the development occupies a former college campus site and also includes eight smaller retail outlets, a six screen Cineworld complex and a 450 space three level car park.

As well as regenerating the town centre site, the scheme will dramatically alter and improve the local streetscape as main contractor ISG's programme also includes the realignment of surrounding roads.

"This is the biggest project to take place in Swindon town centre for a long time," says Gareth Davies, ISG Project Director. "It will have a huge impact on the local economy."

Structural steelwork is playing a major role in the scheme as all of the buildings are formed from two large interconnected steel frames.

Before steelwork contractor Hambleton Steel could deliver and erect any of the project's 1,900t of steel, a large earthmoving programme had to first get under way.

The site had already been cleared of buildings when ISG started on its contract as the old college had been demolished under a separate contract. With demolition completed ISG had to begin levelling a site that sloped down as much as 10m from the south boundary.

"We have installed a retaining wall that is 25m high in places and once the steel frame is complete it will support some of it," explains Mr Davies.

Because of the site's differing ground conditions, the retaining wall has been constructed with contiguous piles (which are self supporting) where the ground is rocky and sheet piles where it is softer.

The portion of the wall constructed with sheet piles has been restrained by the steel frame through a series of beams that form the walings and span between the columns.

"The part of the steel frame which adjoins the sheet piled wall contains the car park and cinema," explains Thomas Fitzpatrick, Upton McGougan Engineer. "In these areas the steel frame supporting the car park was stiffened by inserting horizontal bracing, which diverts the extra load from the wall to the frame and then to the piled foundations."

Designing the steel frame for these areas required a lot of cooperation between the various trades as Mr Fitzpatrick continues. "It was a very challenging overall design which used all the advantages of the latest 3D modelling programmes. The horizontal load on the wailings from the sheet piles was calculated by the sheet piling contractor. These were then used in the design of the steel frame. The horizontal reaction at the column base of the steel frame were then used by the foundation contractor to design the piles."

The design of the project's steel frame has also undergone a value engineering process in order to make it as cost-effective and efficient as possible.

Hambleton Steel's design team used Westok cellular beams throughout the project, not only for service integration, but also to keep the overall steel tonnage down and make the frame more economic. The decking contractor recommended the thinnest possible topping for the metal decked composite floors, again to make the

The supermarket is topped by a curved roof

> *"This is the biggest project to take place in Swindon town centre for a long time. It will have a huge impact on the local economy."*

frame as economic as possible.

Levelling the site has meant that a huge amount of overburden has and is still being removed from the site. Mr Davies explains that much of the material leaving the site is being reused and a large percentage has already been used to reform a local golf course.

"In areas where the earthmoving has been completed the steel erection is ongoing, while on other parts of the site we still have excavation to do. Having so many different trades on site has been a significant logistical challenge," says Mr Davies.

With space at a premium and little or no room for material storage all deliveries to site, including steelwork, are on a just-in-time basis.

The steel frame is being completed sequentially as various parts of the project have different scheduled completion dates. The Morrisons supermarket was the first part of the project to be erected and it will be handed over to the tenant in April. The following month Cineworld will take possession of its complex and the entire development will then be completed in July.

Two steel frames

The project includes a 60m long x 63m wide portal framed Morrisons supermarket. This has been designed as a three span braced frame with added moment frames to reduce the weight and size of the main steel members.

The store features a one span wide internal mezzanine level along one elevation while a distinctive curving roof, formed from faceted steelwork, tops the frame.

Unlike the supermarket the second frame consists of a number of floor levels, ground floor being the lowest level of the car park, level one accommodating a covered internal retail street and the second car park level, and the third floor which again accommodates car parking as well as the main part of the cinema complex.

The ground floor car parking zone will be solely for the use of Morrisons' shoppers and the store will consequently have direct access to the car park.

The car park is based around a 16m x 11m grid and where necessary, cellular beams have been used to accommodate numerous services from the various mixed use tenants. Both the car park and the cinema floor plates are formed using composite beams and a composite metal deck system. Stability is provided by a combination of braced bays and moment frames

The six screen cinema complex features a double height upper level to accommodate the individual theatres and the raking seating terraces. A series of plate girders, up to 16m long, forms the cinema's clear column free areas.

The two individual frames abut one another and a double row of columns, between the supermarket and car park, give the impression that in fact the project is just one large frame.

The cinema and car park structure takes shape

Inclement weather has not hindered the construction project

Steel powers energy design

A power station under construction at Great Island County Wexford will provide electricity to approximately 220,000 houses in south eastern Ireland.

FACT FILE
Great Island Power Station, Wexford, Republic of Ireland
Main client: SSE
Architect: Initec
Main contractor: Dragados-Cobra-Initec (Joint Venture)
Structural engineer: Initec Energia
Steelwork contractor: Kiernan Structural Steel
Steel tonnage: 3,300t

One of the largest building projects currently under way in the Republic of Ireland is the construction of a replacement 460MW combined cycle gas turbine (CCGT) power station located adjacent to the confluence of the River Suir and River Barrow near Waterford..

Project client SSE says by replacing the site's existing 240MW fuel oil unit this modern natural gas fired power station will significantly reduce the locality's carbon emissions.

CCGT power generation is said to be the most energy efficient and cleanest method of fossil fuel generation. It involves burning natural gas, which turns a gas turbine with the heat generated used to power a steam turbine.

Structural steelwork is playing a leading role in the construction of the project's turbine building and electrical building, as they need to be large open column free spaces, in order to accommodate large pieces of generating equipment.

Both of these two main structures are founded on reinforced shallow pad foundations, while deep piled foundations have been used for the other structures due to poor ground conditions.

"The choice of steel as the main framing material is based on both economy and versatility," says Santiago Paje, Initec Energia Chief Designer for Civil Engineering.

Long span economic structures were required for this job and steelwork provided the solution. Steelwork's flexibility also came to the fore as the design developed even after the erection started.

"Steel has the ability to be quickly and economically erected with large spans which can absorb big loads. Steel frames are also versatile enough to be continually redesigned, which is what happened on this project as the frame design was altered and modified while it was being constructed," adds Mr Paje.

The inherent flexibility of bolted structural steelwork has been key to the design of the turbine building. Mr Paje says this will allow certain bays of the steelwork frame to be removed if large pieces of equipment need to be removed and replaced.

Standing 25m high the turbine building is the largest building on the site and has been formed with a series of fabricated columns.

"Each of the columns weighs in excess of 9t as they also support crane beams running the length of the structure," explains John Kiernan of Kiernan Structural Steel. "Consequently these plate columns have large 40mm flanges and 60mm thick baseplates that have full penetration butt welds."

To accept the crane beams the columns have welded stubs at a height of 22m. The crane beams measure 1,400mm deep × 400mm wide and were brought to site in 13.5m lengths, which corresponds with the width of the building's bays.

The columns also support 29m long roof trusses, which in turn create the large open column free space needed for the turbine hall. The 3m deep trusses were brought to site in two pieces (one 10m long section and one 20m long section), bolted together on the ground before being lifted into place as a complete unit.

The project has included improvements to the site's waterfront defences

The turbine building has been designed as a portalised frame with the addition of bracing in some bays. Fixed supports were required in both directions as wind and crane loads are expected be very substantial.

Inside the turbine building there is an internal mezzanine level running alongside three elevations while a lean-to storage structure is attached to two façades of the building.

The steel erection process saw Kiernan Structural Steel use a combination of 200t and 80t capacity mobile cranes. The programme lasted nearly one year and Kiernan Structural Steel had to be flexible with its programme schedule.

"Steel has the ability to be quickly and economically erected with large spans which can absorb big loads."

"When we erected the turbine hall we had to leave out one gable end section so the turbines could be installed," says Mr Kiernan. "Only after this large scale mechanical equipment installation operation had been completed could we finish erecting the final parts of the turbine hall's frame."

Prior to in-filling the gable end of the turbine hall and while the turbines were being installed Kiernan Structural Steel erected the electrical building and various other smaller buildings and pipe racks located around the site.

"It's been a very challenging project," sums up Mr Kiernan. "We've had to schedule our deliveries and erection programme, including working night shifts, in order to accommodate a number of other trades and professions. Access and space around the site was very confined and challenging."

The Great Island power plant is due to be commissioned later this year.

One of the steel frames supports a flue

The electrical building being erected

The steelwork for the turbine hall was completed around equipment installation

Cladding systems are installed to the turbine hall

Partitions: Dead or Alive?

Alastair Hughes explores the relationship between partitions and partial factors.

Introduction

Partition allowances make a significant contribution to the design load on a modern office floor. Although open plan offices are currently popular, there is always a demand for at least some partitioned office and acoustically isolated meeting spaces, and occupants expect to be free to plan (or replan) these wherever they might want them. The standard response is to add a partition allowance, commonly 1kPa, to the imposed load. In Eurocode terms, the partitions are 'movable' (or 'moveable' – both spellings are used) and the allowance is a 'defined' uniformly distributed load (UDL) per square metre.

When partitions are lumped with the occupancy loading and given 'variable action' status, they qualify for live load reduction (LLR). Although the immediate supporting structure must carry the full load, influence on columns several floors down can be reduced by as much as 50%.

If, on the other hand, the partitions are shown on the plans, each wall's weight can be individually evaluated as a 'permanent' action. In this case the load factor is smaller but LLR is not applicable, and nor are combination factors.

Quantifying the weight of partitions

The term 'partition' implies a non-structural internal wall that divides one space from another. We generally have in mind demountable metal and glass systems. Non-structural masonry can also be used to subdivide building floors, but is usually reserved for permanent walls that are shown on the plans. Timber and plasterboard also have their place.

EN 1991-1-1 distinguishes between 'movable' and 'heavier' partitions. 'Heavier' means heavier than 3 kN/m (e g 2.5m height at 120 kg/m^2). Heavier partitions, at least those on suspended slabs, need to be shown on the plans because their locations and directions 'should be considered' in the design of the floor, according to EN 1991-1-1 6.3.1.2 (9).

'Movable' partitions of 3kN/m or less do not need to be planned out in advance, as they are allowed for by a 'defined' uniformly distributed load which is added to the regular occupancy load q_k. As such they are treated as a variable action (live load).

In EN 1991-1-1 partitions are classed (by weight) as ≤1, ≤2 and ≤3 kN/m. The corresponding 'defined' UDLs are respectively 0.5, 0.8 and 1.2 kPa. On the face of it this implies quite large cells, averaging just 4 or 5m length of partition per 10 m^2 of floor area. Presumably however the numbers have been derived from realistic layouts with core and perimeter walls assumed to be separately accounted for.

Despite the Standard's classification levels, designers may decide to retain the 1kPa allowance that is so familiar in the property marketplace. This is half way between the second and third class, which would imply that the weight of the partitions must not exceed 2.5 kN/m.

Partitions as dead load (permanent action)

When partitions are individually calculated, they are treated as permanent (dead) load, just like the structure itself, the floor finishes and the ceiling/services allowance. Their load factor is 1.35, or 1.25 if Expression 6.10b from EN 1990 is used, and there are no alternative load patterns to consider. In theory at least, the effect of each wall's line load is separately calculated. If it is a beam we are designing the critical section may not be at midspan, as a result of an asymmetric layout, but at least that layout is immutable – it is shown on the plans – and the calculation only has to be done once. In practice, designers tend to make conservative simplifications, assessing a suitably generous allowance where the layout is at its densest and applying this as if uniformly distributed over the floor in question. This, of course, has much in common with the approach the Standard authorizes for lighter, 'movable', partitions.

Partitions as live load (variable action)

There are three main differences if partitions are considered as 'movable' (live) as opposed to 'heavier' (dead):

- Live load is not always present (hence pattern loading)
- Live load is differently factored
- Live load is subject to reduction (LLR)

Pattern Loading
Pattern loading exerts a significant influence on the design of continuous members, in which multiple design situations involving load on alternate and adjacent spans extend the design bending moment envelope. Its effect is exaggerated by the load factor, as well as the customary assumption that 100% of the load on one side of a support steps down to zero on the other. Incredibly, the first UK code for factored design (CP110 in 1972) went even further, requiring permanent action on the unloaded spans to be factored **down** by 0.9! Such is the respect we pay to our codes that this requirement survived for 13 years.

Fortunately most steel beams are not designed as continuous.

Different load factors
For a 'heavier' partition (one shown on the plans) a partial factor of 1.25 may be used while for a partition considered as 'movable' a partial factor of 1.5 is prescribed. The difference in 'level of protection' is even larger for those (non-UK) designs that adopt Expression 6.10b in EN 1990 with its recommended ξ value of 0.85 which results in a partial factor of 1.15 for permanent actions.

Live load reduction
LLR is routinely applied in multi-storey column design, and may also be useful for beams supporting large areas of floor. Up to 50% reduction is available, which reflects the improbability that floor load averaged over a large area will be more than half that to which an individual slab might locally be subject. But is this true of partitions, or the allowance that is 'defined' to represent them? Yes, but to a lesser degree, perhaps? It is improbable that the full area at every level will be partitioned at the density represented by the 'defined' allowance, but not impossible for an individual column to find itself supporting a denser than average layout repeated at several levels.

LLR is not compulsory, and conservatively inclined designers are free to exercise self-denial, but others would argue that the principle is valid and it is wasteful not to take advantage. The Standard makes no distinction between occupancy loading and 'defined' partition allowance where LLR is concerned.

Review and conclusions
It is apparent that Standard-prescribed 'levels of protection' can and do vary significantly between 'movable' and 'heavier' partitions. It is not possible to declare that one approach is advantageous versus the other. While 'movable' partitions are (probably) more generously assessed, and certainly attract higher partial factors, LLR can turn the tables by reducing design loads for columns and foundations lower down the same building.

Another point to consider is that 'smeared' partition allowances can, for slabs, understate the reality they are intended to represent. For example consider the situation where a partition takes a line midway between two parallel beams. The bending moment at midspan is given by the familiar expression WL/4 (W in kN/m). If the same partition is considered as a UDL and 'smeared' over the slab the bending moment at mid span is given by $wL^2/8$ (w in kPa). For the heaviest of the European movable partition classes a 3kN/m partition at the middle of a 3m span will result in a bending moment of 3 x 3/4 = 2.25 kNm/m. However, EN1991-1-1 6.3.1.2 defines a UDL of 1.2 kPa for this class of 'movable' partition, which will develop a bending moment at midspan of $1.2 \times 3^2/8 = 1.35$ kNm/m. This is only 60% of the actual bending moment and its equivalence seems questionable.

From the perspective of the supporting beam 'smearing' the partition loads is more satisfactory. The slab subject to 1.2kPa will transmit 3.6kN/m to the beam, which seems ample and will allow for a partition running directly above.

In practice, designers are not always in a position to choose whether partitions are 'movable' or 'heavier', but there will be buildings for which the decision could go either way. Strictly speaking, it is impossible to comply with the Standard's requirement for 'heavier' (than 3 kN/m) partitions to be 'considered in the design taking account of… the locations and directions of the partitions' unless they are shown on the plans.

It is all too easy to point out inconsistencies that result from well intended provisions of the Standard. It is more difficult to suggest how they could be ironed out in practice. A good part of the problem would go away if both live and dead load in buildings shared the same partial factor, say 1.45. That suggestion has considerable merit, and would simplify much else besides, but it may be optimistic to expect such a radical move any time soon. Meanwhile, conscious of the issues discussed above, the prudent designer might opt to set a partition allowance on the generous side (relative to Standard prescriptions) and to treat it as part of the variable action, subject to LLR in the normal way. Of course generosity in the declared occupancy loading (such as 4 kPa when the Standard only demands 2.5) could provide much the same reassurance. In any structural design situation, what really matters is the overall safety factor. Any local partition 'overload' is much diluted by occupancy loading (people, furniture etc), and there could also be some negative correlation between them if cellular offices tend to be more thinly populated than open plan.

AD 379
Tying resistances of full depth end plates

An SCI member has pointed out some inconsistencies in the tying resistances for full depth end plates given in P358 *Joints in steel construction; Simple joints to Eurocode 3 (2011)*. The tying resistance of standard full depth end plates are given on Pages T-42 to T-57, and follows the procedure laid out in check 11 (pages 79 and 80 of P358).

After some investigation, it has been found that the problem originates in the calculation of the alpha factor, for the bolts near the bottom flange. The alpha factor depends on the position of the bolt with respect to the flange and web and is taken from an "alpha chart" given in BS EN 1993-1-8:2005. This same chart is more commonly used in the calculation of moment resisting connections.

The several curves in the "alpha chart" may be represented by expressions. To calculate alpha for use in P358, SCI used the expressions given in P207 *Joints in Steel Construction: Moment Connections, 1995* (which covered connections designed in accordance with BS 5950-1). Whilst those expressions provide a good solution within the scope illustrated in P207, namely a maximum value of λ_2 of 1.4, unfortunately when λ_2 exceeds 1.4, the alpha value given by the expressions bears little resemblance to the correct value.

A more comprehensive expression for alpha can be found in P398 *Joints in steel construction: Moment-resisting joints to Eurocode 3, 2013* (The Eurocode version of P207). It is strongly recommended that designers use this expression in their own calculations, rather than those from P207.

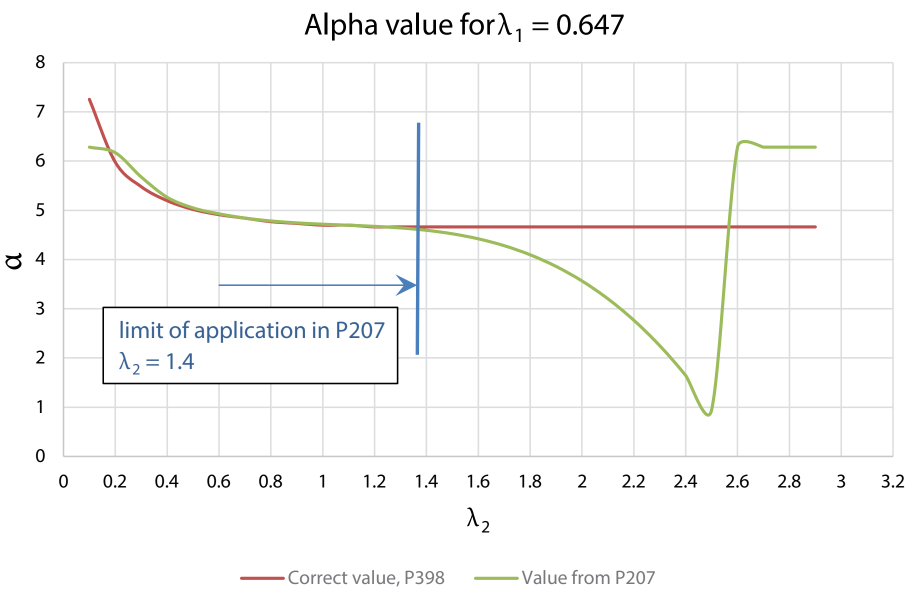


***Figure 1** α, as calculated from P207 and P398*

For interest, Figure 1 shows the relationship between the values calculated by the P207 expressions and the correct value from P398, for a particular value of λ_1.

Using the improved expression for alpha from P398 reduces the tying resistance for full depth end plates, in some cases, for beams deeper than 610mm. The reduction tends to occur with fewer bolt rows, when the lower bolt row becomes further from the bottom flange and λ_2 increases.

Revised pages T-42, 43, 44 and T-50, 51, 52 are available on Steelbiz (Search for the file 'P358 Tying Corrections January 2014'). The version of P358 on Steelbiz has also been updated. In calculating the revised values, for simplicity alpha was limited to 2π (6.28) rather than the maximum value of 8 presented in the alpha charts in P358 and P398.

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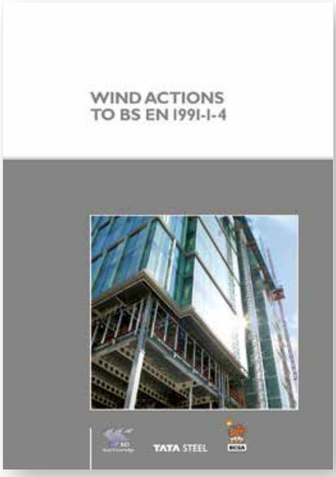
Email: **advisory@steel-sci.com**

Wind Actions to BS EN 1991-1-4



For most buildings in the UK, wind action is an important influence on structural design. BS EN 1991-1-4:2005+A1:2010 (the UK implementation of Eurocode 1 Part 1-4) provides a design standard which is up to date, authoritative and, in many respects, a significant evolutionary advance.

This design guide has been prepared to guide structural engineers through the process of establishing design wind actions for orthodox steel framed buildings in the UK, in accordance with the Eurocodes, UK National Annexes and other authoritative information.

This design guide sets out a straight forward procedure by which wind actions (both overall forces and local pressures) can be evaluated in accordance with the new standard. A comprehensive worked example demonstrates the procedure for a typical steel framed building.

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BS EN PUBLICATIONS

BS EN ISO 9017:2013
Destructive tests on welds in metallic materials. Fracture test
Supersedes BS EN 1320:1997

BS EN ISO 9606-1:2013
Qualification testing of welders. Fusion welding. Steels
Supersedes BS EN 287-1:2011

BS EN ISO 9692-1:2013
Welding and allied processes. Types of joint preparation. Manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding and beam welding of steels
Supersedes BS EN ISO 9692-1:2003

BS EN 10149-1:2013
Hot rolled flat products made of high yield strength steels for cold forming. General technical delivery conditions
Supersedes BS EN 10149-1:1996

BS EN 10149-2:2013
Hot rolled flat products made of high yield strength steels for cold forming. Technical delivery conditions for thermomechanically rolled steels
Supersedes BS EN 10149-2:1996

BS EN 10149-3:2013
Hot rolled flat products made of high yield strength steels for cold forming. Technical delivery conditions for normalized or normalized rolled steels
Supersedes BS EN 10149-3:1996

BS EN 10269:2013
Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties
Supersedes BS EN 10269:1999+A1:2006

BS EN ISO 10675-1:2013
Non-destructive testing of welds. Acceptance levels for radiographic testing. Steel, nickel, titanium and their alloys
Supersedes BS EN 12517-1:2006

BS EN ISO 15626:2013
Non-destructive testing of welds. Time-of-flight diffraction technique (TOFD). Acceptance levels
Supersedes BS EN 15617:2009

BS EN ISO 17639:2013
Destructive tests on welds in metallic materials. Macroscopic and microscopic examination of welds
Supersedes BS EN 1321:1997

UPDATED BRITISH STANDARDS

BS EN 10268:2006+A1:2013
Cold rolled steel flat products with high yield strength for cold forming. Technical delivery conditions
AMENDMENT 1

BRITISH STANDARDS WITHDRAWN

BS 2569-2:1965
Specification for sprayed metal coatings. Protection of iron and steel against corrosion and oxidation at elevated temperatures
Superseded by BS EN ISO 17834:2003

BS EN 287-1:2011
Qualification test of welders. Fusion welding. Steels
Superseded by BS EN ISO 9606-1:2013

BS EN 1320:1997
Destructive tests on welds in metallic materials. Fracture tests
Superseded by BS EN ISO 9017:2013

BS EN 1321:1997
Destructive test on welds in metallic materials. Macroscopic and microscopic examination of welds
Superseded by BS EN ISO 17639:2013

BS EN 12517-1:2006
Non-destructive testing of welds. Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography. Acceptance levels
Superseded by BS EN ISO 10675-1:2013

BS EN 15617:2009
Non-destructive testing of welds. Time-of-flight diffraction technique (TOFD). Acceptance levels
Superseded by BS EN ISO 15625:2013

BRITISH STANDARDS UNDER REVIEW

BS EN ISO 2560:2009
Welding consumables. Covered electrodes for manual metal arc welding of non-alloy and fine grain steels. Classification

BS EN ISO 14343:2009
Welding consumables. Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels. Classification

BS ISO 14347:2008
Fatigue. Design procedure for welded hollow-section joints. Recommendations

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – ADOPTIONS

13/30252100 DC
BS ISO 4990 Steel castings. General technical delivery requirements

13/30252109 DC
BS ISO 9477 High strength cast steels for general engineering and structural purposes

13/30252115 DC
BS ISO 11972 Corrosion-resistant cast steels for general applications

13/30266359 DC
BS EN ISO 15614-1 Specification and qualification of welding procedures for metallic materials. Welding procedure test. Arc and gas welding of steels and arc welding of nickel and nickel alloys

13/30266377 DC
BS EN ISO 15614-7 Specification and qualification of welding procedures for metallic materials. Welding procedure test. Overlay welding

13/30286664 DC
BS EN 10139 Cold rolled uncoated mild steel narrow strip for cold forming. Technical delivery conditions

13/30287675 DC
BS EN ISO 636 Welding consumables. Rods, wires and deposits for tungsten inert gas welding of non-alloy and fine-grain steel. Classification

13/30287693 DC
BS EN ISO 17632 Welding consumables. Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non-alloy and fine grain steels. Classification

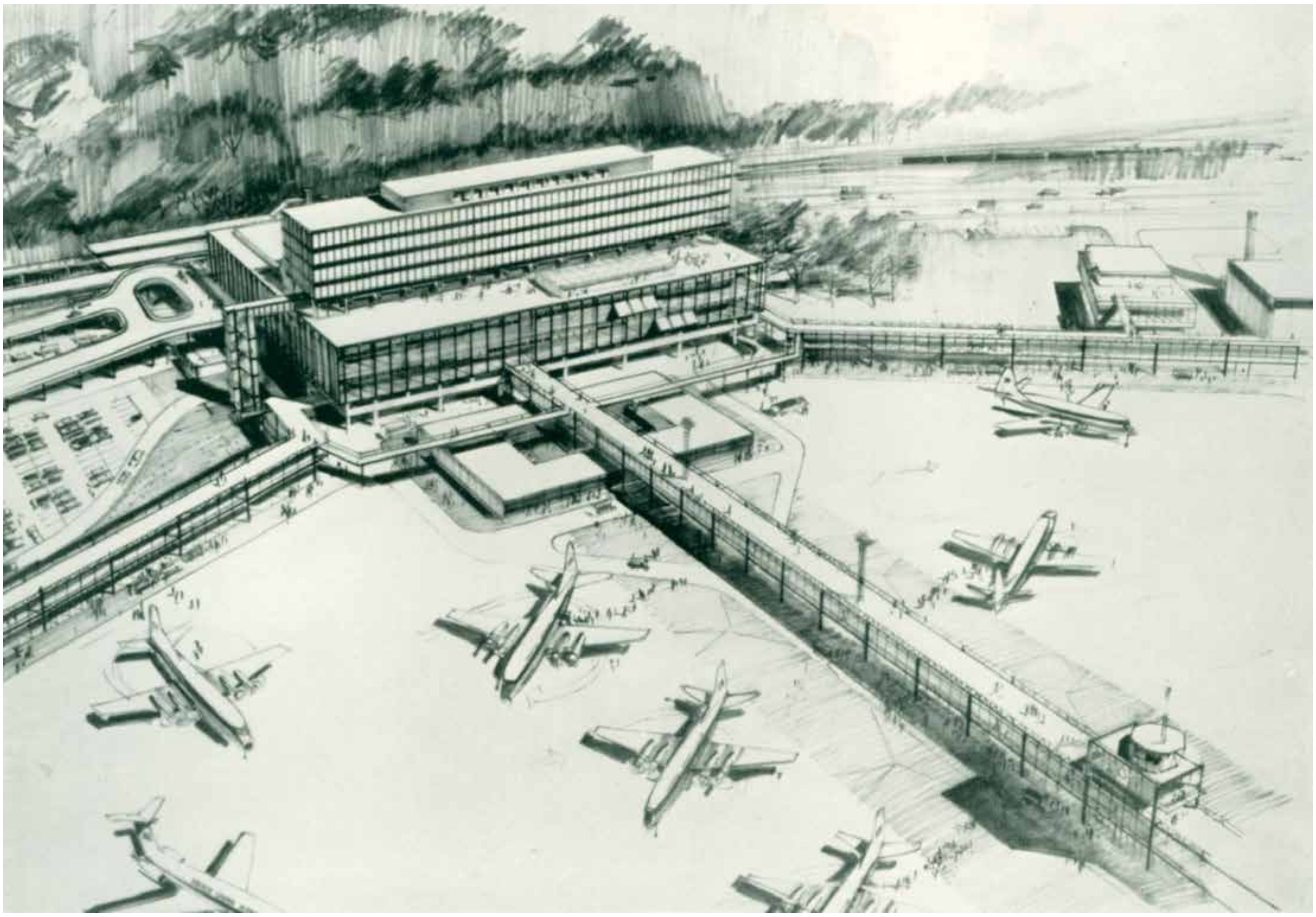
DRAFT FOR PUBLIC COMMENT

13/30286955 DC
BS EN 1991-1-3 A1 Eurocode 1. Actions on structures. General actions. Snow loads
Comments for the above document are required by 3 February 2014

CEN EUROPEAN STANDARDS

EN 10268:2006+A1:2013
Cold rolled steel flat products with high yield strength for cold forming. Technical delivery conditions

Extension of Gatwick Airport Facilities



FROM BUILDING WITH STEEL NOVEMBER 1963

Construction work which will more than double the size of the terminal building at London (Gatwick) Airport has started under a £2.5 million contract. Ancillary work includes the construction of a third pier and extensions to the operations block.

The airport was the first in Europe to use the pier system of passenger handling and the first in the world to combine air, road and rail transport in one unit.

Initially the airport's business was provided by services to the Channel islands, with high traffic peaks at summer week-ends, but the growth of inclusive tour activities has provided important and valuable increases in traffic.

Gatwick's passenger throughput in 1961 was over 800,000 and rose in 1962 to over a million. It is anticipated that by 1965 the figure will have risen to 1.6 million and to nearly 2.5 million by 1970. Thereafter the total is expected to continue to rise substantially. It is estimated that London's 1962 level of passenger traffic, approximately eight million, will more than double by 1970.

The work now started is due to be completed by the summer 1965. It is hoped also to start on an extension of the runway this year to enable Gatwick to handle the larger aircraft likely to come into use on short and medium-haul services as well as the largest jet aircraft on diversion from Heathrow. It is not intended, however, to make the Gatwick runway as long as the main runways at Heathrow.

In the phase of construction about to begin the terminal building will be increased in size on plan from 350 ft by 130 ft to 350 ft by 290 ft. To preserve continuity throughout the project the new section will employ the construction used in the existing building, a reinforced concrete frame with external glass cladding which will be supported by exposed steel joist mullions.

The new section will have mezzanine, concourse and restaurant floors, the main concourse being at first floor level.

The 6 ft deep steel beams supporting the section of the concourse above the A23 London-Brighton road will have a span of 67 ft while those supporting the concourse over the adjacent perimeter road will be 60 ft in length.

The spaces between these beams and the upper and lower concrete slabs will be utilised for the baggage conveyors and as ducts for the many services required in a building of this type.

It is possible that in the future a five-storey office block will be built above part of the roof of the terminal building and in this phase of the construction the first floor only will be completed. This will act as a roof to the various plant rooms and water tanks on top of the terminal building.

Over the double concourse area, steel trusses will be used to support the roof which will be of galvanized steel decking covered with insulation board and roofing felt. White chippings will provide the final service.

The southern pier will follow the type of construction used for the centre and northern piers and will have a main structure of exposed welded steelwork which will be painted black. It will be approximately 1,000 ft long. Portal frames at 40 ft centres will carry trusses and first floor and roof levels, in the form of tubular steel lattice girders, the top members of which will also form the handrails for the respective floors. The portal frames will be constructed of Universal beams pinned at the base.

Floor construction will be galvanized steel decking covered with asbestos cement tiles bonded to three layers of bituminous felt on the roof and composite galvanized steel decking and concrete with linoleum covering for the first floor.

Cladding will consist almost entirely of glazing, Burwell White Gault facing bricks being used for a few small areas at ground floor level.

Right: Work in progress on the North Pier extension. The main structure will be of exposed welded steelwork painted black. Portal frames of Universal beams at 40-ft centre, carry tubular steel lattice truss girders at first-floor and roof levels. Gatwick was the first airport in Europe to use the pier system for loading aircraft.

The existing operation block contains briefing rooms, flight information telecommunications and meteorological services and similar facilities of direct interest to air crews and airline operators and is situated beneath the central pier to the west of the terminal building. The frame consists of welded steel box-section stanchions supporting lattice girders fabricated from square-section mild steel tubes spanning 36 ft. Cladding for the building is prefabricated and is composition board in aluminium frames.

The roof is galvanized steel decking with three layers of roofing felt on insulation board with a top surface of asbestos tiles.

The extensions to this building will increase its size by approximately 30 per cent.

Although the existing passenger handling building is being modified it will remain in use until the extensions are virtually complete and able to handle passengers until the modifications are carried out. It is hoped to keep inconvenience to a minimum.

Three piers will be in use when the scheme is completed in 1965, and this will lead to the introduction of a new system of passenger flow. The northern and central piers will be used exclusively by international passengers while the southern pier will be partitioned to cope with domestic as well as international flights.

Among new amenities for passengers are two additional buffets and a call-order restaurant. Additional accommodation has been provided for the airport management, Customs, Health and Immigration authorities and for the airline operators. Accommodation for the reception of V.I.P.s is being provided in the North Pier.

The present central pier serves nine aircraft stands, augmented by parking areas away from the pier. The provision of the North and South Piers will bring the total number of pier-served stands to 26. These will be augmented by a small amount of parking area.

The architects were Yorke, Rosenberg and Mardall. Consulting engineers for the whole airport: Frederick S. Snow and Partners.

Steelwork contractors for buildings

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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
- **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	SCM	Guide Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●		●										2		Up to £2,000,000
A J Stead Ltd	01653 693742			●	●					●	●			●	●				Up to £100,000
Adey Steel Ltd	01509 556677				●	●	●	●		●	●			●	●	✔		Silver	Up to £2,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●									✔	2	Silver	Up to £3,000,000
Advanced Fabrications Poyle Ltd	01753 653617				●	●	●	●	●	●	●				●				Up to £800,000
AJ Engineering & Construction Services Ltd	01309 671919			●	●					●	●			●	●	✔			Up to £1,400,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4		Up to £1,400,000
Apex Steel Structures Ltd	01268 660828			●	●	●	●			●	●			●					Up to £1,400,000
Arminhall Engineering Ltd	01799 524510	●			●					●	●			●	●				Up to £200,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●		●	●		2		Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●				Up to £800,000
ASD Westok Ltd	0113 205 5270												●			✔	2		Up to £6,000,000
ASME Engineering Ltd	020 8966 7150				●	●				●	●			●	●			Member	Up to £800,000
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	Gold	Above £6,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●				●			●	●				Up to £1,400,000
Austin-Divall Fabrications Ltd	01903 721950			●	●		●	●		●	●			●	●				Up to £800,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●					Up to £400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✔	4		Up to £1,400,000
Barnshaw Section Benders Ltd	01902 880848												●			✔	4		Up to £800,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●		●	●	✔	2		Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●		✔	4	Gold	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●				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 £3,000,000
Builders Beams Ltd	01227 863770				●					●				●	●	✔	2		Up to £400,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●				●	●	✔	4	Gold	Up to £3,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	Gold	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●		✔	4	Silver	Above £6,000,000*
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✔			Up to £6,000,000
Cook Fabrications Ltd	01303 890040				●					●	●			●	●				Up to £800,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●	●	●	●	●			●	●				Up to £800,000
D H Structures Ltd	01785 246269			●	●		●				●			●					Up to £100,000
DGT Structures Ltd	01603 308200			●	●	●	●					●		●		✔	2		Up to £2,000,000
Discain Project Services Ltd	01604 787276				●					●	●				●	✔			Up to £1,400,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●			●					✔	4		Up to £4,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	3		Up to £2,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✔	4	Gold	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✔		Gold	Up to £3,000,000
Fisher Engineering Ltd	028 6638 8521		●	●	●	●	●	●	●	●	●	●				✔	4	Gold	Above £6,000,000
Fourbay Structures Ltd	01603 758141			●	●					●	●			●	●				Up to £1,400,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●			●								Up to £3,000,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●					Up to £800,000
Graham Wood Structural Ltd	01903 755991		●	●	●	●	●	●	●	●	●	●		●		✔		Silver	Up to £6,000,000
Grays Engineering (Contracts) Ltd	01375 372411	●			●					●	●			●	●				Up to £100,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●		●		✔			Up to £3,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●			●			●	●	✔	2	Silver	Up to £2,000,000

Company name | Tel | C | D | E | F | G | H | J | K | L | M | N | Q | R | S | QM | FPC | SCM | Guide Contract Value (1)

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	SCM	Guide Contract Value (1)
Had Fab Ltd	01875 611711				●				●	●	●				●	✔			Up to £2,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✔	4	○	Up to £1,400,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●			●	✔			Up to £1,400,000
Henry Smith (Constructional Engineers) Ltd	01606 592121			●	●	●	●	●											Up to £2,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔			Up to £2,000,000
Hills of Shoeburyness Ltd	01702 296321									●				●	●				Up to £800,000
J & A Plant Ltd	01942 713511				●	●									●				Up to £200,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●			4		Up to £6,000,000*
John Reid & Sons (Strucsteel) Ltd	01202 483333		●	●	●	●	●	●	●	●	●	●		●	●	✔	4		Up to £6,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✔		●	Up to £2,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2	○	Up to £2,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●				Up to £400,000
Luxtrade Ltd	01902 353182									●	●				●	✔			Up to £800,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	2		Up to £3,000,000
M J Patch Structures Ltd	01275 333431				●					●	●			●		✔			Up to £800,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●				Up to £1,400,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●	●	●		✔	4	●	Above £6,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4		Up to £800,000
Maldon Marine Ltd	01621 859000				●	●		●	●	●					●				Up to £1,400,000
Mifflin Construction Ltd	01568 613311		●	●	●	●	●				●								Up to £3,000,000
Newbridge Engineering Ltd	01429 866722			●	●	●	●								●	✔			Up to £1,400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●						✔	4		Up to £4,000,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●				Up to £400,000
Painter Brothers Ltd	01432 374400								●		●				●	✔		●	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									●					●	✔			Up to £800,000
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●	✔	2		Up to £1,400,000
R S Engineering SW Ltd	01579 383131				●					●	●			●	●				Up to £100,000
Remnant Plant Ltd	01594 841160				●		●	●	●	●	●				●	✔			Up to £400,000
Rippin Ltd	01383 518610			●	●	●	●	●						●	●				Up to £1,400,000
S H Structures Ltd	01977 681931						●	●	●	●		●				✔	4	○	Up to £3,000,000
SDM Fabrication Ltd	01354 660895			●	●	●	●				●			●	●	✔	4		Up to £800,000
Severfield-Watson Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499	●			●		●			●	●			●	●				Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●				Up to £1,400,000
Snashall Steel Fabrications Ltd	01300 345588			●	●	●	●	●			●				●				Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●				Up to £800,000
Southern Fabrications (Sussex) Ltd	01243 649000				●					●	●			●	●				Up to £800,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●			●	●	✔	2		Up to £200,000
Traditional Structures Ltd	01922 414172		●	●	●	●	●	●	●		●	●		●	●	✔	2	○	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●												Up to £1,400,000
Tubecon	01226 345261						●	●	●	●				●	●	✔	4	●	Above £6,000,000*
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●				Up to £2,000,000
W I G Engineering Ltd	01869 320515				●					●					●				Up to £200,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	2		Up to £6,000,000
Westbury Park Engineering Ltd	01373 825500	●			●		●	●	●	●	●				●	✔	4		Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●					✔	2	○	Up to £2,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●		✔	4	●	Above £6,000,000

Company name | Tel | C | D | E | F | G | H | J | K | L | M | N | Q | R | S | QM | FPC | SCM | Guide Contract Value (1)

Corporate Members

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

Company name	Tel
Balfour Beatty Utility Solutions Ltd	01332 661491
Griffiths & Armour	0151 236 5656
Highways Agency	08457 504030
Kier Construction Ltd	01767 640111

Company name	Tel
PTS (TQM) Ltd	01785 250706
Roger Pope Associates	01752 263636
Sandberg LLP	020 7565 7000
SUM Ltd	0113 242 7390

Associate Members

Associate Members are those principal companies involved in the direct supply to all or some Members of components, materials or products. Associate 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
AceCad Software Ltd	01332 545800		●								N/A	
Albion Sections Ltd	0121 553 1877	●									M	
Andrews Fasteners Ltd	0113 246 9992									●	M	
Arcelor Mittal Distribution - Scunthorpe	01724 810810								●		D/I	
ASD metal services	0113 254 0711								●		D/I	
Ayrshire Metal Products (Daventry) Ltd	01327 300990	●									M	
BAPP Group Ltd	01226 383824									●	M	
Barrett Steel Ltd	01274 682281								●		D/I	
BW Industries Ltd	01262 400088	●									M	
Cellbeam Ltd	01937 840600	●									M	
Cellshield Ltd	01937 840600							●			N/A	
Cleveland Steel & Tubes Ltd	01845 577789								●		M	
CMC (UK) Ltd	029 2089 5260								●		D/I	
Composite Profiles UK Ltd	01202 659237	●									D/I	
Cooper & Turner Ltd	0114 256 0057									●	M	
CSC (UK) Ltd	0113 239 3000		●								N/A	

Steelwork contractors for bridgeworks

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

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

- **FG** Footbridge and sign gantries
- **PG** Bridges made principally from plate girders
- **TW** Bridges made principally from trusswork
- **BA** Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
- **CM** Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
- **MB** Moving bridges
- **RF** Bridge refurbishment
- **AS** Ancilliary structures in steel associated with bridges, footbridges or sign gantries (eg grillages, purpose-made temporary works)
- **QM** Quality management certification to ISO 9001
- **FPC** Factory Production Control certification to BS EN 1090-1
  1 – Execution Class 1 2 – Execution Class 2
  3 – Execution Class 3 4 – Execution Class 4
- **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	FG	PG	TW	BA	CM	MB	RF	AS	QM	FPC	NHSS 19A	NHSS 20	SCM	Guide Contract Value [1]
Access Design & Engineering	01952 685162	●						●	●	✓					Up to £3,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	✓	4		✓		Up to £3,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●			●	●	✓	4			Gold	Up to £3,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	✓	4	✓	✓	Silver	Above £6,000,000*
Four-Tees Engineers Ltd	01489 885899	●	●	●	●		●	●	●	✓	3		✓	Member	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●	●	●	●			●	●	✓				Gold	Up to £2,000,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	✓	4	✓	✓	Gold	Above £6,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●						●	●	✓					Up to £800,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●	●	●	●	✓	4	✓	✓		Up to £4,000,000
Painter Brothers Ltd	01432 374400	●		●					●	✓				Gold	Up to £6,000,000
Remnant Plant Ltd	01594 841160	●	●	●					●	✓					Up to £400,000
S H Structures Ltd	01977 681931	●		●	●	●	●		●	✓	4		✓	Silver	Up to £3,000,000
Severfield-Watson Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	✓	4		✓	Gold	Above £6,000,000
Non-BCSA member															
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	✓					Up to £1,400,000
Cimolai SpA	01223 350876	●	●	●	●	●	●	●	●	✓					Above £6,000,000
Concrete & Timber Services Ltd	01484 606416	●	●	●	●	●	●		●	✓				Member	Up to £800,000
Donyal Engineering Ltd	01207 270909	●						●	●	✓			✓	Member	Up to £1,400,000
Francis & Lewis International Ltd	01452 722200							●	●	✓	2		✓	Gold	Up to £2,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●		●	●	✓					Up to £2,000,000
Hollandia BV	00 31 180 540540	●	●	●	●	●	●	●	●	✓					Above £6,000,000
IHC Engineering (UK) Ltd	01773 861734	●							●	✓			✓		Up to £400,000
Interserve Construction Ltd	0121 344 4888							●	●	✓					Above £6,000,000*
Interserve Construction Ltd	020 8311 5500	●	●	●	●		●	●	●	✓					Above £6,000,000*
Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	✓	4			Member	Up to £2,000,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓					Up to £3,000,000
Varley & Gulliver Ltd	0121 773 2441	●						●	●	✓			✓		Up to £3,000,000

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM
Cutmaster Machines (UK) Ltd	01226 707865					●					N/A	
Daver Steels Ltd	0114 261 1999	●									M	
Duggan Profiles & Steel Service Centre Ltd	00 353 56 7722485	●							●		M	
easi-edge Ltd	01777 870901							●			N/A	🟠
Fabsec Ltd	0845 094 2530	●									N/A	
FabTrol Systems UK Ltd	01274 590865		●								N/A	
Ficep (UK) Ltd	01942 223530					●					N/A	
FLI Structures	01452 722200	●									M	🟠
Forward Protective Coatings Ltd	01623 748323						●				N/A	
Goodwin Steel Castings Ltd	01782 220000	●									N/A	
Graitec UK Ltd	0844 543 8888		●								N/A	
Hadley Group Ltd	0121 555 1342	●									M	⚪
Hempel UK Ltd	01633 874024						●				N/A	
Highland Metals Ltd	01343 548855						●				N/A	
Hilti (GB) Ltd	0800 886100									●	M	
Hi-Span Ltd	01953 603081	●									M	🟢
International Paint Ltd	0191 469 6111						●				N/A	🟠
Jack Tighe Ltd	01302 880360						●				N/A	
Jamestown Cladding & Profiling Ltd	00 353 45 434288	●									M	
John Parker & Sons Ltd	01227 783200								●	●	D/I	
Jotun Paints (Europe) Ltd	01724 400000						●				N/A	
Kaltenbach Ltd	01234 213201					●					N/A	

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM
Kingspan Structural Products	01944 712000	●									M	🟠
Lindapter International	01274 521444									●	M	
Metsec Plc	0121 601 6000	●									M	🟠
MSW Structural Floor Systems	0115 946 2316	●									D/I	
Murray Plate Group Ltd	0161 866 0266								●		D/I	
National Tube Stockholders Ltd	01845 577440								●		D/I	
Peddinghaus Corporation UK Ltd	01952 200377					●					N/A	
PPG Performance Coatings UK Ltd	01773 814520						●				N/A	
Prodeck-Fixing Ltd	01278 780586	●									D/I	
Rainham Steel Co Ltd	01708 522311								●		D/I	
Sherwin-Williams Protective & Marine Coatings	01204 521771						●				M	⚪
Sika Ltd	01707 384444						●				M	
Structural Metal Decks Ltd	01202 718898	●									M	🟠
Tata Steel	01724 404040				●						M	
Tata Steel Distribution UK & Ireland	01902 484000								●		D/I	
Tata Steel Ireland Service Centre	028 9266 0747								●		D/I	
Tata Steel Service Centre Dublin	00 353 1 405 0300								●		D/I	
Tata Steel Tubes	01536 402121				●						M	
Tata Steel UK Panels & Profiles	0845 3088330	●									M	
Tekla (UK) Ltd	0113 307 1200		●								N/A	
Tension Control Bolts Ltd	01948 667700						●			●	M	
Wedge Group Galvanizing Ltd	01909 486384						●				N/A	