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NSC

Six schools for Outer Hebrides

March 2012
Vol 20 No. 3

Trusses support Leeds arena

New Director General looks ahead

Dudley regenerates with steel

Open plan in Victoria

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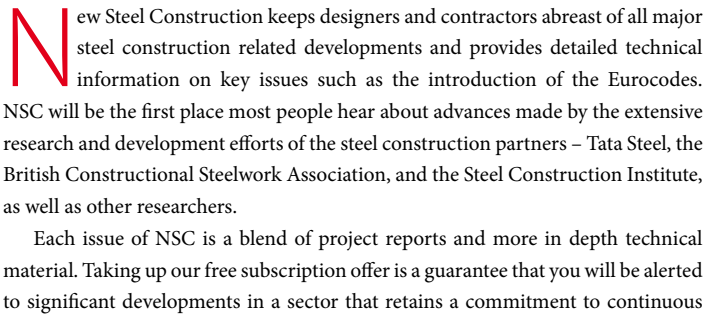

New Steel Construction keeps designers and contractors abreast of all major steel construction related developments and provides detailed technical information on key issues such as the introduction of the Eurocodes. NSC will be the first place most people hear about advances made by the extensive research 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 five 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. Popular features are 50 Years Ago and 20 Years Ago, looking at key projects of the past by revisiting the pages of 'Building With Steel' and 'Steel Construction'.

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Postcode

Telephone

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Cover Image
Leeds Arena, Leeds
Main Client: Leeds City Council
Architect: Populous
Steelwork contractor:
Fisher Engineering
Steel tonnage: 4,200t

NSC

March 2012 Vol 20 No 3

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Target Zero raises the bar

Nick Barrett - Editor

What do a Merseyside school, a warehouse in Stoke, a Stockton-on-Tees supermarket, an office block in Paddington and a hotel in Salford have in common? They are all steel framed of course, but their significance runs much deeper than that. They were the buildings used in the joint Tata Steel and BCSA Target Zero project which has just been completed, as a result of which structural engineers and architects have at their disposal, completely free of charge, what is surely the most comprehensive range of design guidance for low carbon buildings available anywhere.

Target Zero was an ambitious project from the outset, but one that was always going to justify its £1 million budget. The steel sector has a long track record of timely and substantial investment in providing the guidance that designers need, but Target Zero represents the single biggest project of its type in any construction sector.

It was launched against a background of credit crunch and recession in 2009, when the steel sector recognised that there was a lack of reliable data for designers to use to inform their decisions when trying to meet the challenge of hitting the government's ambitious emissions reduction target of zero carbon for buildings by 2019.

We have had a change of government since then but there has been no change in policy or the need for the steel sector's response to the challenge – Target Zero. Sustainability specialists from AECOM and cost consultants Sweett Group were drafted in to provide an independent perspective.

The team set out to research and cost the various options for improving operational energy consumption and reducing embodied energy in buildings, providing information to support designs that would achieve the three highest BREAM ratings and meet anticipated changes to Part L of the Building Regulations.

The schools study was first out of the blocks, and found cost savings of the equivalent of £22 per pupil, £165M a year nationally. A new method for calculating the embodied energy for steel sections that takes account of the multi-cycling capabilities of steel was developed early on by Tata Steel.

Many of the measures that can be adopted to reduce energy consumption and achieve improved BREEAM ratings were found to cost very little, but did require some thinking at the design stage – good design in other words. Target Zero helps make that good design possible and easy. As well as a mass of useful information for basing design decisions on, some surprising findings emerged about sustainability and buildings; you need to read the reports to get the full flavour of how useful and interesting the Target Zero studies are, and fortunately they are now all available as downloads and in hard copy versions (see News).

Highly sustainable steel framed buildings were being routinely produced for many years before the need for Target Zero arose, not least because steel has a wider range of sustainability benefits than other materials. The completion of the Target Zero project ensures that designers aiming for the highest sustainability performance have the most up to date guidance to help them keep raising the sustainability bar.

NSC

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Target Zero delivers final guidance

The complete series of Target Zero guidance reports covering five building types – schools, warehouses, supermarkets, offices and mixed-use developments are now freely available in hardcopy version.

Each report provides reliable, fully-costed feasibility level guidance on how much sustainability benefit can be achieved and at what cost.

By identifying the most cost effective combinations of materials and technologies needed to construct low and zero carbon structures, Target Zero provides designers with all the essential information they need to make the right decisions when designing cost effective sustainable buildings.

The guides inform construction professionals how they may meet the Government's ambitious targets to achieve zero carbon buildings. When these targets were initially set there was very little guidance available and engineers, in many cases, had to simply make assumptions as to which materials and technologies offered the best solution for particular projects.

The £1M Target Zero project was commissioned by the British Constructional Steelwork Association (BCSA) and Tata Steel and produced in partnership with AECOM, Sweett Group and the Steel Construction Institute.

During the initial research actual buildings were used for each of the guides. These projects were then theoretically 'stripped back' to make them more 'typical' and to meet the minimum requirements for the 2006 Part L of the Building Regulations. These changes to the fabric and services of the actual buildings created the base case buildings which were used as benchmarks for the study.

Target Zero investigated three key areas of sustainable construction and the research for each building type involved producing a report that considered operational carbon and how this can be reduced; BREEAM assessments and how to achieve the three highest ratings; and the embodied carbon of buildings and how this can be measured for different forms of construction.

Many of the recommended measures to reduce energy consumption and increase BREEAM ratings require very little outlay in cash terms, but just require some forethought during the design stage.

The reports can be downloaded at www.targetzero.info , or to receive a hard copy of any of the five guides, please call 0207 747 8131.

Raising awareness

An event was held in mid February to promote the recently completed Target Zero guidance. Over 100 senior figureheads from industry gathered in central London to hear about the study and other aspects of sustainable low carbon design.

Speaking at the event keynote speaker Liz Peace (pictured), of the British Property Federation, said: "It is a difficult time for the property industry but we must ensure that 'green' construction remains at the top of the agenda. In order for this to happen, there must be an industry led drive to provide quality information on achieving green construction that applies to refurbishment of existing stock, as well as new builds. The suite of Target Zero guidance is a big step in that direction – an independent, freely available resource for the whole industry."

The guides

Schools

The Target Zero schools guidance is based on the Christ the King Centre for Learning secondary school in Knowsley, Merseyside.

Warehouses

The warehouse guidance report was modelled on the DC3 distribution warehouse at Prologis Park, Stoke.

Supermarkets

The supermarket guidance report was based on the Asda food store in Stockton-on-Tees.

Offices

The offices (commercial) Target Zero guidance report is based on One Kingdom Street, a steel framed office development in Paddington, London.

Mixed-use

The Target Zero Mixed use guidance report is based on the Holiday Inn tower located in MediaCityUK, Salford.

Call for quality backing

BCSA President Ivor Roberts addresses the National Dinner

Derek Tordoff (right), former BCSA Director General receives his Fellowship from BCSA President Ivor Roberts.

Guest tables at the National Dinner

The BCSA has launched a campaign calling for the constructional steelwork supply chain on all government funded or endorsed and Private Finance Initiative infrastructure projects to be procured using a registered quality scheme.

Speaking at the BCSA's National Dinner President Ivor Roberts said: "We want Government and its project teams to understand the benefits of using the BCSA's quality schemes. Whether it is BCSA membership for buildings or the Register of Qualified Steelwork Contractors for Bridgeworks, we believe they should be specified right from the start of the procurement process."

Mr Roberts said the Highways Agency is an exemplar in this regard, requiring all steelwork contractors for bridgeworks to be on the RQSC, a requirement that has paid dividends in terms of quality and project delivery.

"With over £30-billion of proposed investment in UK infrastructure as part of the Government's Infrastructure Growth Plan, it seems incongruous that this much needed infrastructure investment designed to kick-start the economy could leave the country via foreign contractors who may not operate as responsibly as UK and Irish based companies."

Mr Roberts highlighted the steel construction sector's continued commitment to its high health and safety, quality and sustainability standards despite the economic downturn, as well as investment in continuous improvement. The industry is mobilising for the imminent introduction of CE Marking of structural steelwork.

Mr Roberts said he was impressed as he travelled the country meeting other BCSA members by the resilience of the steel construction industry in the face of the economic downturn. "If I had been told at the start of the downturn that it was going to drag on for four years, I would not have expected to have seen so many survivors. The reason is that members have invested wisely to improve processes and their products."

Mr Roberts said BCSA members were head and shoulders above others in their investment in quality assurance. The association was making sure that all members were ready for the introduction of CE marking in 2014. "It can take between nine and 24 months to get it in place, so be careful not to delay the start of implementation too long."

At the dinner recently retired Director General Dr Derek Tordoff was made a Fellow of the Association in recognition of his 35 years service.

Guest Speaker Major David Blow of the Royal Engineers described the complexities of the infrastructure construction task involved in creating Camp Bastion, the main UK base in Afghanistan, which is the logistics hub of operations in Helmand province. Started in 2005, Camp Bastion houses 21,000 troops and is the fifth busiest UK controlled airport, with a 2,350 metre long runway that was built from scratch in the desert location.

Guest Speaker, Major David Blow

AROUND THE PRESS

Construction News
23 February 2012
A focus on quality
I'd like to see BCSA members widely acknowledged as the best steelwork contractors in the world,' enthuses Ms McCann-Bartlett (BCSA Director General). "I'd like to see contracts awarded across the public and private sector on a level playing field, based on high standards of quality assurance, health and safety and sustainability."

Construction News
26 January 2012
Crossrail offers BIM training
Crossrail is to offer all its contractors and their subcontractors training in building information modelling in return for full access to the data they use in the models. The training is part of a BIM academy set up by Crossrail and software provider Bentley Systems.

The Structural Engineer
February 2012
Emirates Air Line lands on iconic Tube map
Each tower will be made up of approximately 6,500 steel pieces that measure between 30-50mm with each steel block weighing approximately 30 tonnes on average.

Building Magazine
27 January 2012
Steel Insight - Section sizes and availability
Early discussions with a steelwork contractor will identify any products or systems where availability may be an issue and enable this to be fed back to the design team or incorporated in cost estimates through adjusted allowances.

Transportation Professional
March 2012
Paddington advance works set the stage for Crossrail
A series of 22 steel tree columns, with two and four branches, will support the taxi deck's roof. These columns have complicated castings, designed by Rowecord, and are being brought to site in sections, welded up on the deck before being erected.

CE Marking of fabricated steelwork extended

Following pressure from European steelwork contractor groups, the co-existence period for CE Marking of fabricated steelwork, EN 1090-1, has been extended by two years from 1 July 2012 to 1 July 2014.

This extended timing will mean that CE Marking of fabricated steelwork covered by EN 1090-1 will not be a legal requirement in member states, including the UK and the Republic of Ireland (RoI) until this later date.

The CE Marking standards for open sections (BS EN 10025-1), closed sections (tubes) (BS EN 10210-1 and BS EN 10219-1) and structural bolts (BS EN 15048-1 and BS EN 14399-1) are already in force and CE Marking for these products will be a legal requirement in all member states from 1 July 2013.

Also from 1 July 2013 CE Marking will be a legal requirement for proprietary construction products that are covered by a European Technical Assessment (ETA). To comply with the law, the BCSA would advise steelwork contractors to change their purchasing requirements and buy either CE Marked construction products after 1st July 2013 or in the case of non-CE marked products to buy only those products that were placed on the market prior to the 1st July 2013.

"Most steelwork contractors have already put systems in place for CE Marking and we strongly recommend that all BCSA members continue with these plans regardless of the extension," said BCSA Director of Engineering Dr David Moore.

Construction starts on new Avonmouth distribution centre

More than 1,500t of structural steelwork is being erected for a huge new £20M regional distribution centre for The Co-operative Group in Avonmouth.

Caunton Engineering is carrying out the steelwork fabrication, supply and erection, working on behalf of main contractor Volker Fitzpatrick on a design and supply contract.

The 40,282m^2 depot is 17m high and measures 280m long × 132m wide, and comprises of 35 × 8m bays with three 44m wide portal spans. The overall structure also includes an energy centre and an operations office block.

Located at Cabot Park, the warehouse will incorporate 16,400m^2 of cold storage and a 20,560m^2 racking zone for non perishable goods. When it opens later this year The Co-operative Group will be able to despatch approximately 1.4M cases of food each week to around 450 stores in the south west and South Wales.

Mark Leonard, The Co-operative Group Regional Head of Logistics, said: "The new distribution centre will provide a state of the art facility that will help us provide a first class service to our enlarged store estate."

The structure will incorporate the highest standards of energy efficiency and is expected to achieve an 'Excellent' BREEAM rating.

Cumbrian bridge replacement gets underway

The replacement of Workington's Northside Bridge took a significant step last month (February) as the first steel girders were lifted into place.

Mabey Bridge is installing and fabricating the steelwork for the project which will see a new bridge constructed over the A596 and River Derwent. The new structure is being constructed on the site of Workington's original Northside Bridge which was swept away during the devastating floods in 2009.

The new bridge is 152m-long and has three spans supported by two concrete piers. Steelwork is being erected in three phases with the initial stage involving the installation of the north side of the structure, comprising of six pairs of braced girders.

Three pairs of girders are 30m long and the other three are 23m long; as the shorter girders feature a haunch, all of the pairs weigh 63t.

"During April we then plan to install the south side of the bridge, which is a mirror of the north," said Mabey Bridge Project Manager Andy Hosking. "We'll then lift the mid section, which will have been assembled on site into three 46m long pairs, into place."

Main contractor for the project is Birse Civils and the bridge is due to open in the autumn.

Steel construction ready for BIM

Structural steelwork is well placed to rise to the challenges of the government's drive towards using Business Information Modelling on all its construction projects by 2016, the BCSA National Meeting heard (see page 28).

Tekla Managing Director Andrew Bellerby, a member of the Government Working Group on BIM, said that BIM is already in use and steelwork contractors were already taking part on BIM led collaborations on projects.

BIM is not just 3D modelling or just clash checking or prevention, he said, but was a process. He defined BIM as, in its simplest form, effective communication and collaboration of geometry and information through the design, construction and operation of a building in collaborative and open workflows and processes.

Mr Bellerby said BIM is an opportunity for steelwork construction to lead the field as it already has all the experience of building models.

Software developer CSC's Business Development Manager Kevin Lea said structural engineers have a pivotal role in the BIM process. Most engineering firms already have all the software they need but are not using it effectively. For example, Fastrak is a good design tool that has BIM capability and Tekla provides a good detailing tool that has BIM capability, but many did not realise this.

The success of BIM depended on software solutions being able to communicate with each other and on a full appreciation of internal and external BIM processes.

National Meeting Chairman Ian Hoppe said some questions had been answered by the presentations but questions remained about how BIM was going to be implemented. He said the steel construction sector would continue to support the government's drive towards greater efficiency.

Steelwork creates a new town centre for Gateshead

More than 10,000t of structural steelwork will eventually be erected for the Trinity Square development in Gateshead, creating a regenerated town centre on the south bank of the River Tyne.

Working on behalf of main contractor Bowmer & Kirkland, William Hare is fabricating, supplying and erecting the steelwork. The project comprises of a 16,258m^2 Tesco Extra store with 1,000 student residential units in five blocks mounted on its roof.

The £150M plus development by Spenhill, the regeneration subsidiary of Tesco, also includes 2,787m^2 of office space, 45 retail units of various sizes and a primary care trust.

Project completion is scheduled for mid 2013.

Sustainable pavilion for Olympic site

Construction work is due to start soon on the BMW Group's Olympic Park Pavilion, a two-storey steel structure designed to reflect the company's heritage in environmental innovation.

BMW's pavilion will have a floor space of 800m^2 and is to be built on an elevated site between the Olympic Stadium and the Aquatics Centre. Designed by architectural firm Serie, the design will use river water to provide a sustainable source of cooling.

Serie co-founder and Principal Architect Christopher Lee said: "The design takes the idea of the pavilion in the park - the Victorian bandstand - but instead of one pavilion we envision nine pavilions clustered together to form a family."

The top floor of the structure will house a number of standalone pavilions which will be used to highlight BMW's vehicle innovations. The lower floor will have a range of interactive exhibitis articulating the company's vision for sustainable mobility and support for Team GB.

NEWS IN BRIEF

The **BCSA** website *www.steelconstruction.org* now contains a new page on bolting competency. The page can be found under 'Technical Resources' and features information on the BCSA competence in pre-loadable bolting scheme and how to obtain the necessary training.

New technical guidance on the design of steel sections used in light steel framing applications to Eurocode 3 design standards has been prepared by senior **SCI** Engineers Andrew Way and Martin Heywood. The report is freely available to corporate SCI members from *www.steelbiz.org*. Non-members can purchase a pdf of the technical report for £40 + VAT. Telephone: 01344 636500 or Email: *publications@steel-sci.com* to place an order.

SCI has upgraded and revised **ASD Westok**'s cellular beam design software making it compatible with the latest Windows technologies and platforms and providing an improved user interface for design engineers. The new software Cellbeam 8, which is written in accordance to BS5950 and the latest Eurocode design standards with both UK and Irish annexes, enables designers to add multiple Cellular beams into one project whilst providing multiple design capability, improved reporting and graphical feedback through a refreshed interface. To request a copy of the ASDWestok Design Suite CD, use the following link: *http://www.asdwestok.co.uk/Technical+Support/Software.html*

CSC, a structural engineering software developer, has formed a new industry business relationship with Autodesk's Architecture, Engineering and Construction (AEC) division to promote the adoption of Building Information Modelling (BIM) within the structural engineering community. The relationship will see CSC and Autodesk provide customers with more closely integrated solutions that support a more efficient structural engineering workflow for BIM.

Following on from its National Federation of Roofing and Cladding Contractors Safety in Roofing Gold Award 2010, **Border Steelwork Structures** has won the UK Best Entry in the Safety in Roofing Awards for Industrial Roofing and Cladding 2011 from the NFRC.

Arts centre set to reinvigorate waterfront

A new £7.8M arts centre is under construction on the banks of the River Clyde at Greenock. Part of a wider redevelopment of former industrial land along the town's waterfront, the project is due to be completed this summer.

Known as the Beacon Arts Centre Theatre, it will include a 500-seat main auditorium, a smaller 130 seat studio theatre, dressing rooms, rehearsal room and a cafe with views across the river.

Approximately 375t of structural steelwork has been erected for the project by Walter Watson. Predominantly a steel framed structure, the theatre walls are made of in-situ concrete, so acoustic isolation between the materials has been one of the project's main design challenges.

"The job required us to design 100 complex acoustic structural steel to concrete connections requiring 800 individual acoustic units," said Trevor Irvine, Walter Watson General Manager Structural Division.

Main contractor for the job is Graham Construction and the arts centre is jointly funded by Greenock Arts Guild, together with its project partners the Scottish Arts Council, Inverclyde Council, Riverside Inverclyde and the Big Lottery Fund.

Delivering a complete solution for schools

Metsec is delivering the steel framing systems for a Building Schools for the Future programme being undertaken by main contractor Balfour Beatty.

The projects, in the Stoke-on-Trent and Derby areas, comprise a mixture of designs, with a total value of £145M.

From the early days of the scheme, Metsec said it was working with structural engineers, architects and structural steel contractors to ensure a quick and speedy programme. Metsec's designers attended meetings and workshops aimed at developing design solutions which would streamline the construction process to maximise efficiency and, where possible, make cost savings.

Colin Harper, Project Director at Balfour Beatty Construction, said, "As with any project, it is vital to assure accuracy, risk reduction and cost control as well as delivering value for money for the client. Getting Metsec involved at the earliest stages of conceptualisation made them a key part of the design team and has already paid dividends in these crucial areas."

British Museum expands with steel

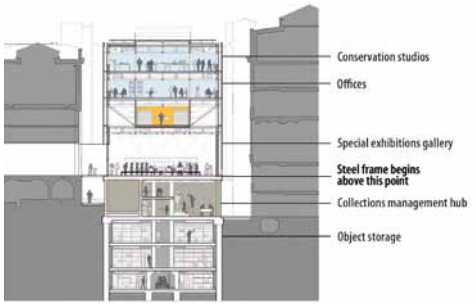
Steelwork erection will begin this summer for a new World Conservation and Exhibitions Centre at the British Museum in London.

Rowecord Engineering will erect approximately 1,500t of structural steelwork for this prestigious project, constructing the frame for the exhibition and office spaces which sit above the concrete basement levels.

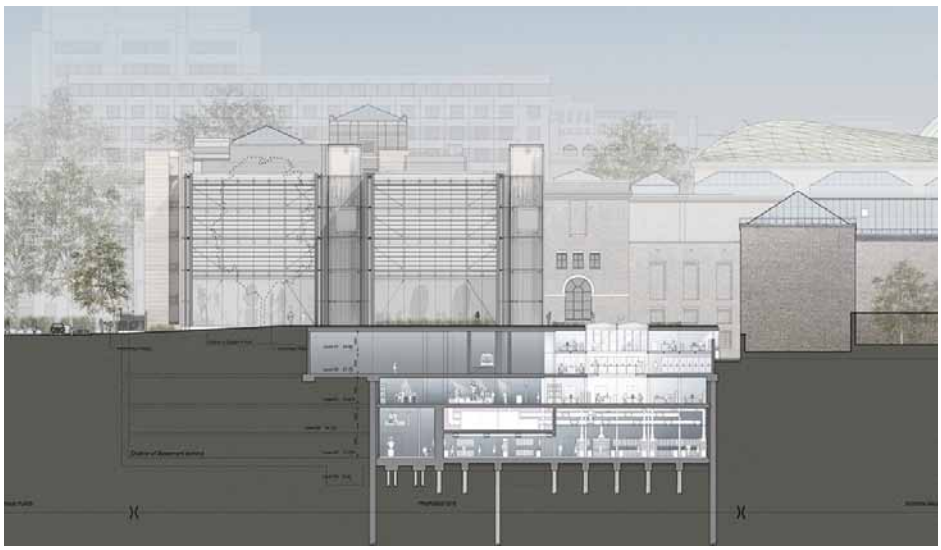
To create the necessary open plan areas required for the exhibition areas, Rowecord will install a series of 16m long vierendeel trusses.

Paul Bryant, Projects Director for Rowecord said: "The confined nature of the site and close proximity of the surrounding buildings which house exhibits demands that special attention is given to the construction of the steelwork.

"All of the steel will be left exposed and therefore requires a high quality finish to both connections and the fire protected steelwork."



Due to open in 2013, the new exhibition spaces will mean the Museum will be able to bring back many of its important collections which presently cannot be accommodated.



Diary

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15 March 2012
Compression Members
1 hour webinar

19 & 20 March 2012
BCSA RWC Training Course
Thorpe Park Hotel, Leeds

21 & 22 March 2012
Design of Steel Bridges
Leeds

19 April 2012
Members in Bending
1 hour webinar

24 & 25 April 2012
BCSA RWC Training Course
Thorpe Park Hotel, Leeds

26 April 2012
Steel Building Design to EC3
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ONE STEP AHEAD.

Looking to the future

The worst of the downturn in construction demand is hopefully behind us, and new BCSA Director General Sarah McCann-Bartlett is looking ahead to future challenges, as she tells Nick Barrett.

BCSA's new Director General formally took over her new job only from January but has become a familiar face to many members in a relatively short time, shadowing Derek Tordoff since September as Director General Designate. Becoming familiar with the detail of how steelwork contractors work and what their main strengths and concerns are is a steep learning curve, but one which a background in the Australian construction industry helps with.

"I was Deputy Commissioner of the Building and Plumbing Commissions so I appreciate the sorts of issues that contractors have to grapple with, as well as a good understanding of how regulatory systems can affect them,' Sarah says. "It has been fascinating though learning the detail of the contribution that steel construction makes to the UK economy.

'We really have a first class steel construction sector in the UK and it is no surprise that steel has a 70% market share of multi storey building and almost all single storey industrial buildings are built in steel.

"I knew of the UK's reputation as having the world's leading steel construction sector but it has still been a surprise to learn from BCSA members about the scale of the investment they have made over the years in things like the machinery needed to manufacture to the high quality standards that they routinely achieve, and the big advances in design thanks to research and development and other cooperation across the steel sector between BCSA, Tata Steel and the Steel Construction Institute.

'I am also impressed by their determination to make things even better, continuing to invest even in the teeth of the worst recession any of us have ever experienced. When the turn comes BCSA members and their clients will be able to steal a considerable lead as a result."

Securing wider acknowledgement for that effort and the quality of the steel construction performance that results is one of Sarah's main aims. "Providing quality steelwork at a competitive price is only possible if the playing field is level, but our

BCSA's Charter is proudly displayed in its London office

members are competing at times against fabricated steel from overseas which is not necessarily fabricated to the same quality standards as that from the UK. Overseas contractors who come into the UK have to be made to operate to the same very high standards in terms of health & safety, sustainability and product quality. We're proud that the steelwork sector's safety performance is the envy of other sectors of the UK construction industry and sets a benchmark for others."

Procurement can sometimes be a tick box process, but the BCSA wants to see a more transparent process to identify the best suppliers of all types. "BCSA members belong to legitimate quality schemes that have rigorous assessments, such as the Register of Qualified Steelwork Contractors, and have proven commitments to health & safety and environmental policies. Clients should ensure that overseas competitors coming into the UK market also invest in these processes or the UK based suppliers will be at a disadvantage.

"We need to see procurement standards rigorously applied to suppliers regardless of where they come from. Fair procurement is all we are insisting on, not any special treatment or concessions."

Other important issues facing BCSA's members include attempts by main contractors to impose difficult contractual and payment terms on specialist contractors. Pay when paid clauses, although outlawed by legislation, are still finding their way onto contracts and the practice of retentions has been growing. "These practices are detrimental to a healthy construction industry,' says Sarah, ' and we are working with our members and partners in the Specialist Engineering Contractors Group to bring them to an end."

Some hopes for the future are pinned on the government's infrastructure investment led growth plan. "Our members are local companies from across the UK, employing local labour in fabricating facilities, so supporting their workloads is an excellent way for the government to achieve their economic stimulus objectives."

An eye for quality

After graduating in International Politics and Economics from the University of Melbourne, rated in the world's top ten in employer surveys, Sarah's first job combined both subjects, analysing and forecasting demand in China and India for woollen products for the Australian Wool Corporation. Wool is a key industry in Australia and the product is world renowned, party thanks to the Woolmark brand name.

After three years she relocated to its UK office in Ilkley, where she focussed on the European market, later taking over the global market research function. This work included measuring the effectiveness of advertising and marketing campaigns promoting Woolmark.

Sarah says: "Woolmark is regarded as a mark of quality, just as constructional steelwork produced by a member of the BCSA is. Ensuring that quality message about steel is heard in the market is a key aim of the joint marketing initiative that we have with Tata Steel. Being a BCSA member differentiates steelwork contractors from those that may have less commitment to quality and sustainability."

After Ilkley Sarah took a posting to New York for three years before going back to Australia where she joined the Building and Plumbing Commissions, working on the introduction of the country's first sustainable building regulations for housing and ensuring that the State's building and plumbing industry professionals registered for quality assurance. By the time Sarah was ready to come back to the UK her job title was Deputy Commissioner.

"I knew of the UK's reputation as having the world's leading steel construction sector but it has still been a surprise to learn from BCSA members about the scale of investment they have made over the years…"

Town centre evolves with education

The retained façade is supported by the new steel frame

FACT FILE
Dudley Evolve, West Midlands
Main client: Dudley College
Architect: Pick Everard
Main contractor: ISG
Structural engineer: Pick Everard
Steelwork contractor: Hambleton Steel
Steel tonnage: 460t

A four-storey steel frame, incorporating a retained listed fire station façade, will house a new vocational college in Dudley.

Big changes are afoot in Dudley town centre, changes that are being spearheaded by the education sector. Forming part of a regeneration scheme, Dudley College has begun a ten year project to create an inspirational learning quarter in the town.

Three new buildings will be developed, all on land close to the college's existing campus. The first job to get started is known as Dudley Evolve, a four-storey structure which will incorporate a sports hall, gym, public performance auditorium and dance studios.

Long trusses form the roof of the sports hall

The second phase of the scheme involves the construction of Dudley Sixth (see box story) and a soon to start third phase will see a new high specification technology centre constructed.

The largest of the three schemes, Dudley Evolve is aiming for a BREEAM 'Excellent' rating and in keeping with its central, conservation area location, the building combines contemporary steel framed design along with a retained facade from the town's former fire station.

A number of factors swayed the design team to choose steel as the project's framing material. Tim Clayton, Pick Everard Project Engineer explains: "A sloping site, an irregular grid, a large cantilever and a number of clear open spans all suited a steel frame.

"The material also gave us the lightest solution, which was important as the site may have some deep mine workings beneath it, and although the project is piled, we wanted to keep the piles as shallow as possible."

Early project works included the demolition of most of the fire station's structure and this was completed early last year. Main contractor ISG then had to install a retaining wall to compensate for a 4m slope that stretches across the site. Because of the slope, the building's level one is actually a partial basement level and only covers approximately 50% of the structure's overall footprint.

Steelwork begins at level one, founded on the piled foundations and gaining its stability from strategically placed bracing. The majority of the steelwork design was done by Hambleton Steel; the company eventually fabricated, delivered and erected 460t of steel for this job, as well supplying and installing precast planks, precast stairs and terrace units for the theatre.

Level one will accommodate music rooms, workshops, kilns and a coffee shop. Level two - which is actually ground floor - will have the main entrance, a large indoor sports hall, a gym and an auditorium with seating for 180 people. Above this, levels three and four will both predominantly contain classrooms.

"Because of the site's layout and the position of the main vehicular entrance, it was decided that the theatre was the best area for Hambleton to start their steel erection from," explains ISG Project Manager Graham Hopewell. "They then worked their way back up the site finishing the sports centre last."

The theatre's seating area cantilevers out by 6m at one end of the structure. Supported on a raised floor, a level which does not correspond to any other floor in the structure and thereby adds to the overall

The rear elevation is at the bottom of the site's slope and features four floors

"A sloping site, an irregular grid, a large cantilever and a number of clear open spans all suited a steel frame. The material also gave us the lightest solution, which was important as the site may have some deep mine workings beneath it."

irregular grid pattern, the cantilever box has had to be braced back by three bays for stability.

The cantilevering box will be clad in copper panels as the facade has been designed as a feature element. Steelwork either side of, and which supports this cantilever, were the initial steel members to be installed by Hambleton and the cantilever was formed with 11.5m long beams.

The final steelwork elements to be erected were the sports hall - which is formed by a series of 27.1m long roof trusses - and the gym, which has the retained facade incorporated into one of its elevations.

"The steel frame ties into and now supports the retained facade, but during the erection process it had to be supported by buttresses positioned outside of the structure's footprint," explains Mr Hopewell.

The sports hall is adjacent to the gym and forms the majority of the overall structure which does not include a level one (basement). To form the column free space for this hall, Hambleton brought the roof trusses to site in three segments which were assembled into the required 27.1m-long sections before being lifted into place.

All of the steelwork was erected during a 14 week programme, helping to keep the project on target for its scheduled completion ahead of the start of the new academic year in September.

Steel examination

Structural steelwork is also playing a key role in the construction of Dudley College's other on-going project, the building of a new sixth form facility. Located a few hundred metres from the Evolve project, this multi-million pound job, known as Dudley Sixth, is being delivered in a fast track 41 week programme that will enable it to open for the new academic year this coming September.

The facility consists of a three-storey teaching block that will accommodate classrooms and laboratory facilities. The steel frame, erected by locally-based Traditional Structures, is founded on mass concrete pad footings and incorporates a beam and block ground floor slab as well as metal decking supporting in situ concrete floors for the upper two levels. The structure will also feature a rooftop plant zone.

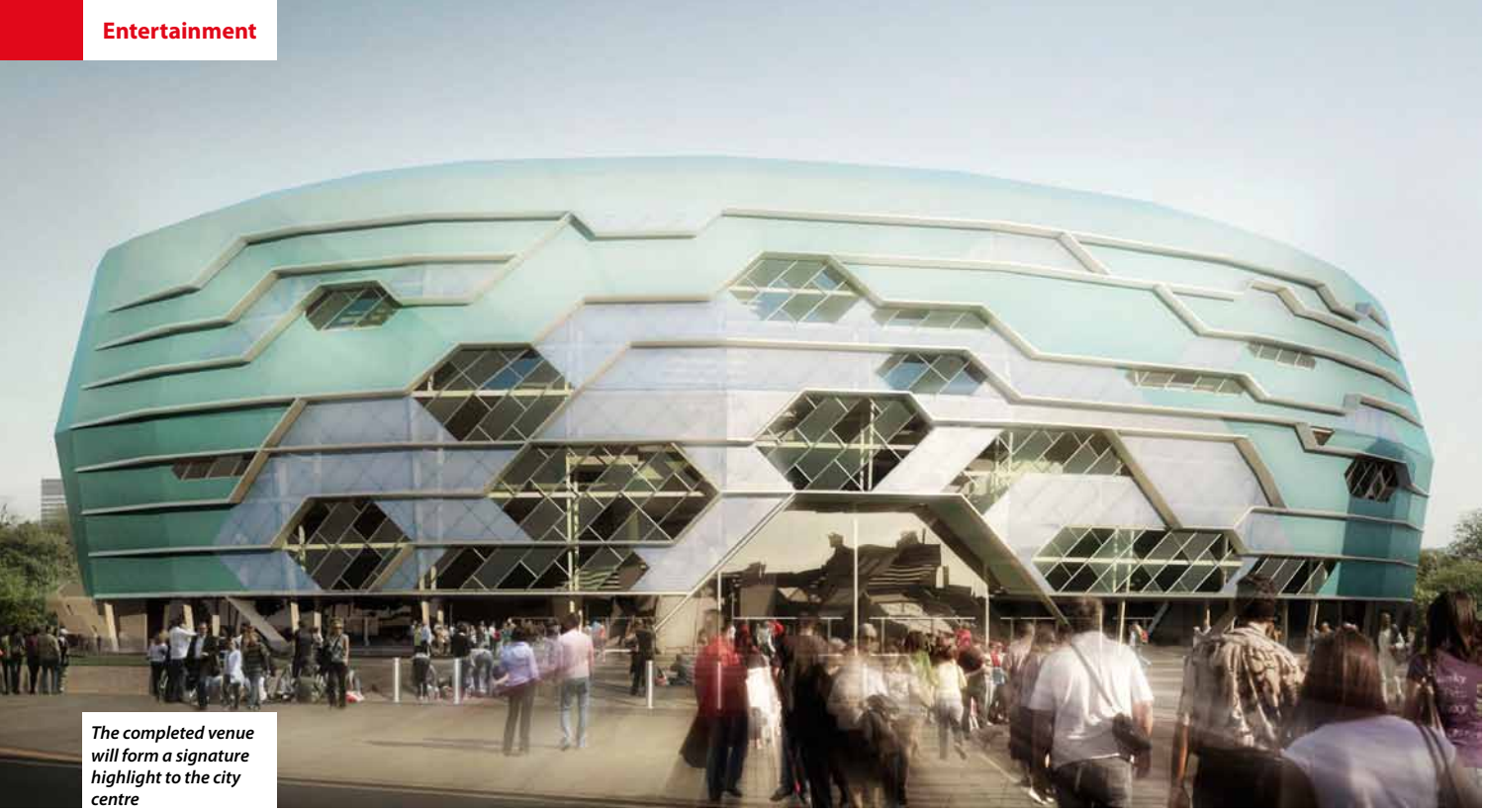
Steelwork has been erected around a fairly regimented 6.5m x 6.5m grid pattern as all of the classes are of a similar size. Bracing, located along internal walls and elevations, provides the frame with its stability.

External finishes to Dudley Sixth's facade include brickwork, copper cladding and curtain walling. To highlight the building's main entrance, the structural steel frame will accommodate a feature galvanised canopy.

The steelwork erection programme, including the installation of metal decking, was completed in just three weeks. Traditional Structures used one 50t capacity mobile crane for the job as well as three cherrypickers. A larger 100t capacity mobile crane was also brought to site by Traditional Structures for the installation of the building's concrete stairs.

In addition to the main construction programme, the project also involves minor refurbishment and extension works to Priory Villa, an existing on site Victorian building and extensive external works, including the creation of a new plaza and lawned area.

FACT FILE
Dudley Sixth
Main client: Dudley College
Architect: Pick Everard
Main contractor: ISG
Structural engineer: Pick Everard
Steelwork contractor: Traditional Structures
Steel tonnage: 140t



The completed venue will form a signature highlight to the city centre

Trusses take centre stage

A series of long span trusses form the roof and stage for a spectacular new arena under construction in Leeds. Martin Cooper reports.

Many cities and towns in the UK have entertainment venues, but a new arena being built in Leeds is far from being run of the mill as it will be a focal point for regeneration as well as acting as a commanding gateway to the city centre.

With a seated capacity of 12,500, Leeds Arena has already been described as having one of the most striking and unique designs in Europe, satisfying the local populace's and client's desire for a building that is distinctive to the city.

The main façades are rounded and form a domed effect which ends with a flat roof. Formed with two columns, one sloping outwards and a second member spliced to the top and cranked inwards, these curving elevations will be clad with a honeycomb design of glazed panels which will feature a changing kaleidoscope of coloured lights.

The city council says that in the evening, the front of the building will change colour or pattern dependent on the show or mood of the arena at the time. The venue may be pink for a Pink show, purple for Prince, or green for Green Day! The options are endless and the completed project will certainly add to the night time cityscape.

Creating a large indoor arena with spans of up to 70m will invariably mean a structure built with steel. "Entertainment venues need large column free spaces and steel offers the best and most cost effective method of achieving these requirements," says Gordon Alexander, BAM Construction Manager.

Work on site began early last year with some major earthworks needed to prepare the site in readiness for the construction phase which kicked off in May. Two concrete cores and a couple of shear walls were then built, providing the stability for the steelwork which was then able to begin its erection programme.

Along with the perimeter curving walls and the initial terracing zones, one of the first parts of the steel frame to be erected, by Fisher Engineering, was also the largest single component and the most time consuming element on the project. The steelwork erection sequence dictated that the 54m long × 10.5m deep proscenium arch truss (spanning the arena's stage) would have to be lifted into place early, as it would then allow the roof trusses, many of which connect to this 180t truss, to be lifted into place.

Fabricating such a large truss and then getting it to site required a lot of planning and design work from Fisher, as well as the entire project team.

"We had to deliver the truss to site in

Cranked columns form the venue's exterior shape

The longest roof truss is 72m long

32 separate sections as the local authority has a maximum axle weight restriction of 12t per axle," explains Robin Hamill, Fisher Engineering Project Manager. "This meant the entire truss was delivered in nine trailer loads."

Fisher Engineering had to ensure that they allocated each of the 32 steel sections to a specific trailer load. This provided the site assembly team with the correct sequence of steel pieces for putting the truss together.

Assembling the truss took three weeks, and in order to make the lifting procedure as easy as possible this work was carried out adjacent to the area where it would be installed. Once assembled, the challenge was to get the truss into place and then stabilised by its surrounding and supporting steelwork.

Two large mobile cranes (450t capacity and 500t capacity) were needed to install the truss. However, having to utilise such large cranes for this job meant the project team had the challenge of getting these machines to site, bearing in mind both units exceeded the permitted road axle weight allowance, due to their ballast counter weights and telescopic jibs. The cranes had to be stripped down to reduce their overall weight and delivered to site on a number of trailers along with their accompanying rigging.

Once the cranes and the truss were assembled the lifting procedure was able to begin and this lasted three consecutive days.

"We actually had the truss up and connected to its two supporting columns within the first eight hours," explains Mr Hamill. "However, the cranes had to remain in position holding the truss until we had the steel frame to the rear erected as this would give it stability. Erecting the frame took 75 hours of continuous working, day and night."

After the proscenium truss and all of its supporting steelwork was up, the two cranes were repositioned so they could begin lifting the roof trusses into place. The 450t unit remained in the middle of the arena, close to the proscenium arch, while the 500 tonner was relocated to a plot outside of the arena, close to the site offices.

"Even though the 500-tonner had to lift truss sections up and over the erected arena steelwork, by placing it outside it was next to an area were we could assemble large truss sections without interfering with other site activities," explains Mr Hamill.

Half of the roof trusses' lengths were assembled inside the arena and this allowed the two cranes to install the 13 roof trusses in a series of tandem lifts. Fisher assembled and erected one complete roof truss per week, which included installing the connecting beams to adjacent steelwork. The largest of the roof trusses is 72m-long with the trusses either side sequentially getting shorter as the arena's shape tapers.

"Logistics has been the main challenge on this project so far," sums up Mr Alexander. "We've had large steel segments being assembled in the middle of the arena, while the area has also had to accommodate four or five cranes and numerous cherrypickers for the steel erection process. With so many machines working in a tight environment, planning has been key."

Construction work is scheduled to be completed in March 2013, and once a two month fit-out programme has been undertaken, the venue will be ready for a summer opening.

FACT FILE

Leeds Arena, Leeds

Main client: Leeds City Council
Architect: Populous
Main contractor: BAM Construction
Structural engineer: Arup
Steelwork Contractor: Fisher Engineering
Steel tonnage: 4,200t

Steel rakers support the terracing units of the arena

Essentially an office block, One Howick Place also includes residential and retail levels

Steel creates modern office spaces

Today, companies want offices that are large, open plan and flexible, and the best way of creating such spaces is with structural steelwork. One Howick Place in London is a project which is not only relying on steel for office space but also for two levels of apartments.

Long column-free spaces were essential for the office floors

Structural steelwork dominates the UK's multi-storey market with around 70% of these buildings usually constructed with a steel frame. The tall eye-catching towers located in the City of London and Canary Wharf bear testament to this fact, as the majority of these structures were built with structural steelwork as their main component.

The office sector has been affected by the economic downturn, but a number of high profile steel framed commercial buildings are in the offing. As well as commercial structures, multi-storey mixed use schemes also lend themselves to a steel frame, especially if large open-plan column free spaces are a prerequisite.

This was the case for One Howick Place in Westminster, a new 21,000m² commercial and residential block under construction in the city's Cathedral Conservation area. The £45M scheme is a redevelopment of the plot formerly occupied by the old House of Fraser headquarters. It includes nine levels plus basement and the structure will accommodate two areas of retail space, high quality Grade A offices over eight of the floors, with the two uppermost levels housing 33 apartments.

The scheme also includes a number of energy saving environmental features such as a combined heat and power (CHP) plant and photovoltaic cells on the roof, which will maximise energy efficiency and minimise the building's CO_2 emissions. These measures will help One Howick Place

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FACT FILE
One Howick Place, London
Main client: Doughty Hanson and Terrace Hill JV
Architect: Rolfe Judd
Main contractor: Kier London
Structural engineer: Price & Myers
Steelwork contractor: Rowen Structures
Steel tonnage: 1,440t

achieve its target of a BREEAM 'Excellent' rating.

Covering approximately 80% of the scheme's footprint, this mixed use part of the project has a structural steel frame with concrete floors, gaining its stability from two main internal staircase cores. The remaining 20% of the project is a largely independent concrete framed structure used for affordable housing.

"Steelwork was chosen for its economy and for the ease with which we could form the 16m-long clear spans for the offices," says Paul Hosford, Price & Myers Project Engineer.

In order to maximise the floor to ceiling heights the project has used cellular beams for the majority of the floor plates. These sections have openings which accommodate the M&E services and consequently keep the structural voids between floors to a minimum.

Approximately 666t of Fabsec cellular beams have been used on One Howick Place, with the majority of them weighing 2.5t each. However, further up the structure the beams get deeper and heavier as there are some 18.5t members supporting the increased loads of seventh and eighth floors.

"The column grid pattern changes for the residential part of the building. It isn't so open plan, so these heavier beams are supporting columns that start on the seventh floor and form apartment walls," explains Clem Bollon, Rowen Structures Site Manager.

The decision to construct the upper two residential levels of the project with steel was one of practicality as well as for ease and convenience of programme. Project Architect Martin York of Rolfe Judd says it was simpler to continue with a steel frame for the top floors, while steelwork's speed of construction was also an important consideration.

The majority of the concrete slabs up to seventh floor level are 130mm deep and formed with profiled metal decking, which acts compositely with the steel frame. This changes for the uppermost two levels of the building, which are set back from the facade to create a high level roof garden. Here, in order to minimise the structural depth, the beams are set with their top flanges within the concrete slab, so the metal decking is supported on shelf angles and consequently the slab is non composite.

The use of steelwork paid dividends when it came to designing and then constructing the main deliveries entrance for the building. A large column free area was required and a four-storey vierendeel truss was erected to create the 21m clear span over the service yard. For ease of erection the truss was supplied in prefabricated sections, with three main components at each floor level consisting of a floor beam and two column sections. This made the erection process quicker due to less assembly and bolting up being done on site.

Temporary works were installed at ground floor to assist with the erection of the first two levels of the truss. In order to keep it stabilised, the temporary works remained in place until the fifth floor of the steelwork had been erected and the first and second floor slabs had been concreted.

"A vierendeel truss was the only option as vertical cross bracing was ruled out owing to the extensive glazing in the facade," adds Mr Hosford. "This part of the frame worked especially well in steelwork."

One Howick Place is due to be completed by the autumn.

"Steelwork was chosen for its economy and for the ease with which we could form the 16m-long clear spans for the offices."

Top floor residential balconies framed with steel

Impression of completed scheme

Schools galore

Flexibility, transportation and ease of construction played major roles in the decision to choose structural steelwork as the framing material for six school projects on the Outer Hebrides, as Martin Cooper reports.

The new Nicolson Institute building sits adjacent to a preserved tower clock

FACT FILE
Western Isles Schools Project (Outer Hebrides)
Main Client: Western Isles Council
Architect: 3D Reid
Main contractor: FMP (Joint venture between Farrans, H+J Martin and Patton Group)
Structural engineer: Goodson Associates
Steelwork contractor: Walter Watson
Steel tonnage: 1,900t

Construction projects on locations away from the mainland can present a whole raft of unique challenges, particularly logistical problems associated with delivering materials to site. Having to rely on ferries, whose timetables can be disrupted by the unpredictable British weather, can result in programme delays which need to be factored into the scheme at an early stage.

These issues and many more have been encountered and successfully negotiated during the construction of six schools on the Western Isles (Outer Hebrides). All part of the same contract, the schools vary in size and location, but they all have one thing in common and that is a steel frame design.

The islands' local authority is dealing with an ageing population and is committed to rationalising its schools stock. With funding from the Scottish Executive, the project will result in four new primary schools, all replacing older facilities, and the rebuilding of two secondary schools, with a combination of new build and partial refurbishment. There is a commitment to deliver new, modern, state-of-the art schools that are well equipped and secure places for young people of the Isles.

Construction work on the various school project's began in 2010 with the final building - Daliburgh Primary School - scheduled to be handed over in August. Initially the overall project consisted of five schools, with Daliburgh only included within the contract as late as March 2011.

Early in the design process steel was chosen as the preferred framing material for all of the project's structures. A number of reasons were behind this decision, but as Frank Boyne, Goodson Associates' Project Engineer explains, one of steel's many attributes won the day.

"The flexibility of the material meant the schools were always going to be built with steel," he explains. "All of the buildings needed to have spaces which could change configuration in the future, and this is

The road from Stornoway to Barvas, a typical Hebridean highway

achievable with a steel frame."

Getting materials onto the islands and then transporting them across to far flung locations was also a consideration. Structural steelwork can easily be transported in small loads and this also lent itself as the ideal material. All building supplies and materials have to arrive by ferry and once on the Isles, the Hebridean roads are quite narrow and not suitable for large trucks.

"Logistics has been the greatest challenge on this project; organising the necessary materials and getting them to site on time," explains FMP Operations Manager Warren Wright. "We also had to find and organise a local supply chain, but as the project has progressed everything has become simpler and we've gained more and more experience of the locality."

"The flexibility of the material meant the schools were always going to be built with steel. All of the buildings needed to have spaces which could change configuration in the future, and this is achievable with a steel frame."

All 1,900t of the required structural steelwork was fabricated by Walter Watson and then delivered to site from its Northern Ireland facility via road and sea.

The company also supplied its own cranes and cherrypickers to erect the steel, using a local crane hire company at peak times.

The Hebridean weather has also been a major factor for the project. Being situated off the west coast of Scotland the islands quite often have a milder climate than the mainland, usually free of ice and snow. However, fierce winds regularly batter the Isles, stopping the local ferry services and preventing many outdoor trades from working.

"Wind was a challenge during the steel erection programme," says Trevor Irvine, General Manager Structural Division for Walter Watson. "During October and March the weather was particularly windy, too blustery at times to erect any steel, and we lost about three days in both months."

Building schools

The biggest scheme in the contract is the Nicolson Institute, which is the largest secondary school in the Western Isles and located in Stornoway, less than a mile from the town's ferry port. One of the easier jobs to get materials to, the scheme required 900t of structural steelwork for a new three storey structure.

This building (which will replace the nearby existing Nicolson Insititute buildings) has a central core accommodating a games hall and assembly area, with four attached teaching wings radiating off of it. Adjacent to the new build is an existing listed structure

Balivanich Primary School takes shape

Daliburgh Primary School will be the final project to complete

Point Primary was the first school to be handed over

Flexible classes in Westside Primary School

Nicolson Institute is the largest school on the Isles

known as the Pentland Building, as part of the project it is being refurbished and will be linked into the new school building via a covered steel framed walkway.

The new building will ensure pupils do not have to travel from one building to another for classes as all of the departments will be under one roof, which has been one of the client's aspirations throughout the design process.

The design of the classroom blocks revolves around a regular grid pattern, although as previously mentioned, many of the classes could be reconfigured in the future to form larger or even smaller spaces.

For stability the structure has steel braced staircase cores, with some further bracing placed along elevations where there are no windows.

A nearby gas terminal meant the school's steel design had to incorporate blast loading, in order to withstand a worst case scenario of an explosion. "To this end we added more and heavier bracing in the cores than would normally be required and upgraded the detailing of the frame for a greater robustness," says Mr Boyne.

Sir Edward Scott's steel frame goes up during the winter months

Also on the Isle of Lewis are two primary school projects, Point Primary School at Bayble and Westside Primary at Barvas. Both are of similar design, featuring a single storey square structure containing a central enclosed courtyard.

Point was the first project to be completed and was handed over to the client at the end of last year. The Westside project kicked off a little later and is due for completion this month (March).

Being single storey structures they lend themselves to small steelwork loads, as no single member is longer than 8m. Bracing provides the frame's stability and this is mostly located in elevations, as many of the partition walls feature sliding doors which give the schools the required flexibility. The schools also feature indoor multi use games areas, separated from an adjacent dining room by a sliding partition, allowing the area to be opened up into an even larger zone.

The elements have played a significant role in each of the school projects and Westside Primary is no exception. "The steelwork erection was initially programmed

Steel deliveries

All of the project's steel was initially transported by ferry from Walter Watson's plant in Northern Ireland to Troon on the west coast of Scotland and then by road to Kilmarnock. Here the loads were sorted and dispatched in 25t loads - nothing bigger would be transportable on the Isles' road network - to one of three ports, depending on the final destination.

"Scheduling was very important, and each load was ready in Kilmarnock at least three days before it was needed on site," explains Trevor Irvine General Manager Structural Division for Walter Watson. "We needed to make sure enough steel was arriving on each site and in the correct order, especially as windy conditions can result in ferry services being cancelled at short notice."

From Kilmarnock deliveries- using a local Hebridean haulier - were transported to Ullapool for the three projects on the Isle of Lewis, Uig on the Isle of Skye for the Sir Edward Scott School on Harris, and the port of Oban for jobs on Benbecula and South Uist.

to be completed in 10 days," says Liam McAuley, FMP Site Manager. "However we had some extremely windy weather and for three days no steel could be erected, but all of the school's 150t was still up in 14 days, which was good going."

The second largest job within the overall contract, which was completed last December, is Sir Edward Scott School in Tarbert, Isle of Harris. Requiring 300t of steel, the building is a combined primary and secondary school consisting of a three storey high braced framed structure built around a courtyard.

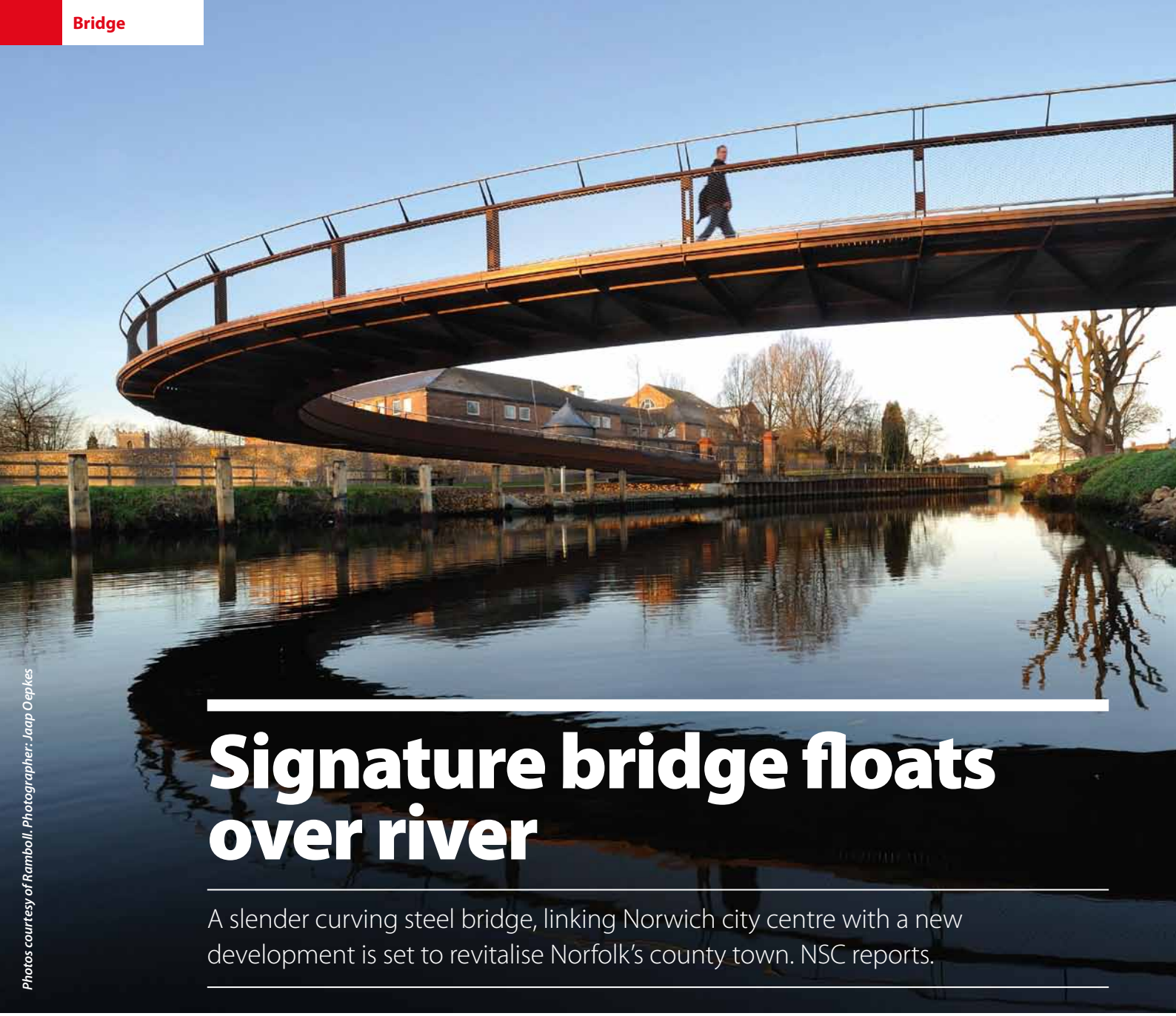
A swimming pool and community building was recently completed on the site and the new school structure ties into this building along one elevation. An extra challenge for this job was the fact that the swimming pool had to be kept operational throughout the construction programme.

Furthest south on the Isle of South Uist is the remotest of the projects, Daliburgh Primary School. Designed as a simple single storey steel structure like the other primary schools, (including Balivanich Primary School on Benbecula) this project was the last to be included in the Western Isles Schools Project and will be open in time for the new academic year this coming August.

The new school is being erected immediately adjacent to the existing school which will remain fully operational throughout the construction period.

Commenting on the project when the steel frame was completed last October, Gemma Gordon, Associate Director with Scottish Futures Trust said: "When complete, this will truly be a school for the future as it has been designed with flexibility at its core making it easier for the school to adapt to meet future curriculum demands."

Summing up the project as a whole, Mr Boyne says the reason the schools have all been successfully constructed was partly due to the fact that the steel design was kept as simple as possible and everything was tied up at an early stage. "In this way no changes were needed to the structural design which would have been a little more problematical than usual because of the locations."



Photos courtesy of Ramboll. Photographer: Jaap Oepkes

Signature bridge floats over river

A slender curving steel bridge, linking Norwich city centre with a new development is set to revitalise Norfolk's county town. NSC reports.

Winding its way through Norwich, the River Wensum has always played a significant role in the city's history and livelihood. Numerous bridges have been constructed over the years linking the various parts of the city, helping to increase trade and facilitate better transportation links.

The latest addition to Norwich's catalogue of bridges recently opened and created a large amount of local and national interest. Known as Peter's Bridge, this new pedestrian and cycle crossing links the historic city centre with the new Barrack Street Development, and was named after and conceived by local businessman Peter Jarrold, former chairman of Jarrolds (St James).

The project's brief required a structure that would make the most of the distant views of the cathedral and touch the ground lightly on both riverbanks, while causing minimal environmental impact on the natural environment.

"The concept was for a bridge that was slender, with sweeping curves derived from the unique features of the site and the imposed clearances," explains Stephen James, Ramboll Associate. "The final design is a dynamic and unique bridge form that appears to float over the site with little visible means of support."

Early in proceedings a number of schemes for the bridge were looked at, with a steel composite design winning the day. Structural steel incorporating a hardwood deck ticked all of the client's boxes.

The main structure is fabricated from weathering steel which was chosen primarily for its aesthetic. The material develops a deep brown coating over time, which will be in keeping with the structure's semi rural location.

Weathering steel also brings a number of maintenance and environmental benefits to the project. It should require no painting during its 120 year lifetime, negating the need for any work taking place over the river and lessening the chances of spillages into the eco-system.

Structurally the 90m span bridge consists of a curved primary box beam which carries cantilever supports for the decking. A closed steel box beam represented the optimum form to resist the bending and torsion experienced by the deck and allowed the designers to manipulate the cross sectional shape to achieve the required aesthetic and structural form.

The box beam is also the spine of the bridge, and all load from the deck and balustrade is transferred to the cantilevering cross beams. This then applies torsion and bending to the girders, the torsion in one arm of the bridge being resisted by the bending capacity of the other.

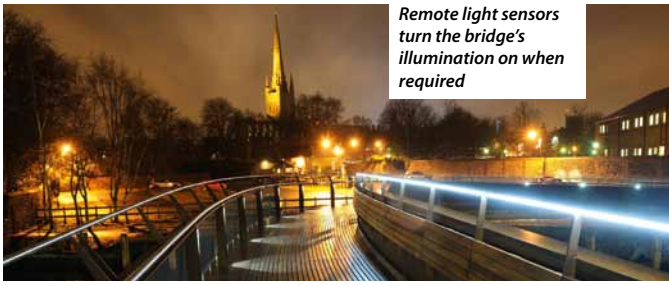
Horizontal loading is resisted as the bridge acts as an arch, supported by bracing which ties the box girder, the edge beam and the cross beams together. A tuned mass damper located inside the spine box girder at midspan dampens vertical accelerations induced by resonant pedestrian loading.

The bridge is supported at the two abutments and on two slender stainless

FACT FILE
Peter's Bridge, Norwich
Client: Jarrolds (St. James)
Architect: Ramboll
Main contractor: R.G Carter
Structural engineer: Ramboll
Steelwork contractor: SH Structures
Steel tonnage: 70t

The bridge was erected in three large sections

The mid span section is lifted into place



Remote light sensors turn the bridge's illumination on when required

"The final design is a dynamic and unique bridge form that appears to float over the site with little visible means of support."

columns which accentuate the impression of the bridge floating over the water. At each abutment there are two bearings; one fixed uplift bearing located below the box girder and one sliding guided bearing under the balustrade end of each bearing beam. This provides a vertical, lateral and torsional restraint at the abutments.

Steelwork contractor SH Structures fabricated the bridge steelwork in five sections for ease of transportation to site. Once delivered, they were set up on temporary trestles, with the two midspan sections then welded together which resulted in three bridge segments.

During fabrication a lot of emphasis was placed on off site manufacture, and to this end site welds were minimised. SH Structures advised Ramboll throughout the design procedure about buildability of the bridge and also designed a bolted splice connection at midspan to remove any need for temporary works to be placed in the river during the erection process.

"Using a 1,000t capacity crane the bridge was very quickly erected," says SH Structures Contracts Manager Dave Perry. "We initially installed the two abutment sections and supported them on temporary works, then during the following day we installed the large central span."

A large proportion of the timber decking was installed prior to the lifts and although this resulted in the need for a larger crane, it minimised the amount of work needed to be done over the water.

"This bridge is a glorious addition to the many Norwich bridges constructed over the years. It is a sophisticated construction in wood and weathering steel with a very pleasing shape in the form of a J," sums up Mr Jarrold.

The slender weathering steel frame supports a hardwood timber deck

Big BIM is where the magic is

Business Information Modelling has become an often misunderstood industry buzzword. Nick Barrett reports from BCSA's National Meeting which heard that BIM is another area where steel contractors are well ahead of the game.

Ian Hoppe, BCSA Deputy President, welcomes the Government's Chief Construction Adviser, Paul Morrell, to the meeting

The UK construction industry is being driven towards adoption of Business Information Modelling (BIM) by a cost conscious government looking for 20% savings, value for money and reduced carbon emissions from greater supply chain efficiency.

A bumpy ride towards this brave new collaborative BIM world can be expected for some, but steel contractors have already arrived and are in good shape to support the government's BIM objectives, the BCSA's National Meeting heard. Steel construction is routinely operating in ways consistent with Level 2 BIM, which all supply chain members on government projects must achieve by 2016.

BCSA Vice President Ian Hoppe chaired the Meeting, saying that BIM had become an industry buzzword that was often used and often misunderstood.

Definitions of BIM were not yet fully understood, but surveys had shown that the industry accepted that within five years everyone would be using it. The purpose of making BIM the subject of the National Meeting was to help demystify it.

Chief Construction Adviser Paul Morrell underscored the government's commitment in his presentation, spelling out that there was no additional money to be expected from government so cost savings had to be achieved. "We need to reduce emissions at the same time as reducing public spending," he said. Construction prices had risen at more than double the rate of inflation in the years before the recession, which was not sustainable: "Our clients live in a deflationary world," he said. No sector of the industry is safe from global competition he warned.

Mr Morrell said that BIM would address some long standing issues in construction, some of which stemmed from industry fragmentation, which can result in a silo mentality. Poor communications means project teams continually reinvent the wheel and there are fractures in the value chain between creation of an asset and its management.

He said industry practices of tendering at up to 15% below cost in the hope of somehow making money had to be reversed. The government intended to become a strong client, one that knows where value lies.

BIM should not be seen as something with a software solution, but as a process in which data and its use throughout the supply chain during a building's lifetime is important, rather than how the data is produced.

BIM held out the promise of solutions to reconciling opposing pressures, but Mr Morrell said: "Calm down, there is a lot of work to do and we will not do it all overnight."

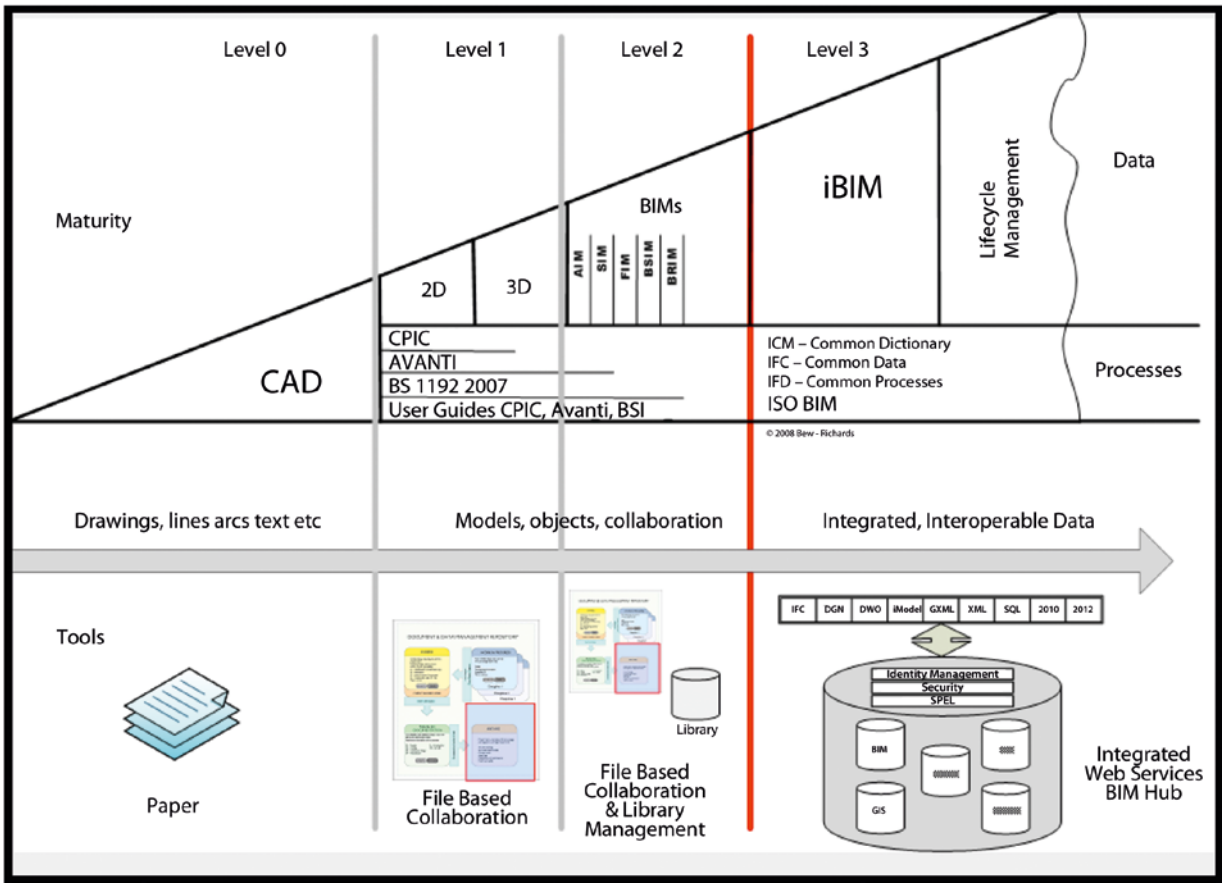
Andrew Bellerby, Managing Director of software developer Tekla, said that BIM is here already and its use was accelerating. Structural steelwork was already well placed in the new world of BIM and steelwork contractors were already taking part on BIM led collaborations on projects. He explained that BIM was not just 3D modelling, not just clash checking or prevention, but was a process. His definition says BIM "in its simplest form is effective communication and collaboration of geometry and information through the design, construction and operation of a building in collaborative and open workflows and processes."

He drew a distinction between 'lonely BIM' – some speakers called it 'little BIM' - which takes place within your own organisation, and the use of BIM with external parties – "big BIM" as some called it.

Integrated information management is the aim. To improve the measurement and management of public assets public clients will expect specific information be delivered by the supply chain. This information set, called Construction Operations Building Information Exchange format (COBie) delivers consistent and structured asset information useful to the owner-operator for post-occupancy decision-making.

Mr Bellerby said he sees BIM as an opportunity for steelwork construction to lead the field as it already has all the experience of building models.

Professor David Greenwood of Northumbria University described the work of the BIM Academy which involved the university and Ryder Architecture. Several projects had already used BIM. He said his view of BIM was that it was a means towards



Levels of BIM maturity

integrated project delivery rather than an end in itself.

"It is a process, not a product," he said. He urged not getting sidetracked by a 'lust for technology'– "We need to go beyond that to get all of the industry involved." Professor Greenwood also said BIM should be an inclusive process rather than an exclusive one used by companies to secure competitive advantage.

Kevin Lea, Business Development Manager of software developer CSC, said structural engineers have a pivotal role in the BIM process. He had seen BIM implemented well, as well as badly. He contrasted 'external' BIM which involves collaboration with others, with 'internal' BIM which is mostly about internal design processes, saying external BIM can often be achieved for free if internal BIM is adopted; most engineering firms already have all the software they need but are not using it effectively. For example, Fastrak is a good design tool that has BIM capability and Tekla provides a good detailing tool that has BIM capability, but many did not realise this.

The success of BIM depended on software solutions being able to communicate with each other and on a full appreciation of internal and external BIM processes.

Dan Clipson of Arup gave an engineer's perspective on BIM, having used the approach on several projects. "We have got past the definition stage and are now talking about changing the process," he said. Designs were being produced now after full collaboration.

BIM should not be seen as something with a software solution, but as a process in which data and its use throughout the supply chain during a building's lifetime is important, rather than how the data is produced.

Mr Clipson said government had been the main driver towards BIM, but other clients were now becoming interested. He warned about using new BIM related software tools to just do things the same old way, which would not deliver all the potential benefits. "Little BIM is what helps us, but big BIM is where the magic is," he said.

Summing up, Ian Hoppe said some questions had been answered by the presentations but there were still questions about how BIM was going to be implemented to fulfil the vision. He said the steel construction sector would continue to support the government's drive towards greater efficiency.

The Government Construction Client Group published a Strategy Paper on BIM in July 2011, which delegates were encouraged to obtain and read. It can be found at *https://connect.innovateuk.org*

Professor David Greenwood of Northumbria University speaking on BIM

Speaker Dan Clipson of Arup

A view of Torsion – Part Two

In Part One, the two mechanisms by which a member can resist torsion were introduced. One of them, so-called 'warping', can be simply understood – not as warping but as **differential flange bending** – and, on its own, simply calculated. The other, named after **St Venant**, is simple to understand for thin-walled hollow sections, but becomes mathematically demanding for conventional sections. In Part Two, Alastair Hughes describes an escape route for non-mathematicians.

The problem

Elastic torsion resistance of 'solid' sections is not a simple matter of shear flow, as in the thin-walled hollow section considered in Part One. The shear stress will, broadly speaking, be at its highest at the periphery of the cross-section and diminish towards the middle. To take the simplest of examples, a solid round shaft could be viewed as a set of nested thin-walled hollow sections in each of which the shear flows as previously considered – but the strain, and hence the stress, would be proportional to the radius; at the centre there might as well be a small hole and the metal half way out would be 25% as effective as that at the periphery – 50% of the force per unit length at 50% of the lever arm. Without axisymmetry, the flow of the shear around the section will vary in intensity and direction according to laws of compatibility of strain. As with every elastic problem, there must be a unique solution, but in all except the simplest shapes this can only be arrived at by numerical methods. It is at this point that most of us non-mathematicians run for cover.

The membrane (or soap film) analogy

Fortunately help is at hand. A Bavarian engineer of the early 20th century, Ludwig Prandtl, as an aside from establishing the study of fluid dynamics, recognized that the equations which govern St Venant shear are identical to those which control the shape of a pressurized soap bubble that stretches across the same outline. Subject only to small deflections, the mathematical equivalence is exact.

This analogy must be one of the most potent in all engineering. Few can make sense of a set of equations but everyone can visualize the form a soap bubble will take.

Here are the instructions. Cut the cross-section outline out of a thin rigid plate which is the top of an otherwise sealed box into which air can be pumped by something like a bicycle pump after the soap bubble has been stretched across the section-shaped hole. The characteristic of the soap film is that it has constant surface tension in all directions. The bubble will inflate in proportion to the pressure. Stop pumping as soon as the form is clearly visible. The volume of air under the membrane (above base level) is proportional to the torsional moment. The shear flows along the contours. Its intensity – the shear stress – represents the slope of the membrane.

The pictures here are not of real soap bubbles but simulations, for which we are indebted to Chris Williams and Rachel Cruise of Bath University and their form-finding software. (They are not responsible for the rather vivid rendering!) The section portrayed is 406 × 178 UKB74.

For an I-section, the membrane mainly takes the form of a cylindrical barrel between the parallel sides of the flange or web. The slope is obviously greatest at the outer faces and zero at the summit at mid-thickness (where the direction of shear flow reverses). If, for example, the web is half as thick as the flange, constant surface tension demands that the slope at the web face is half what it is at the flange face. Consequently the volume under the membrane is, per unit length, **one eighth** that at the flange, where twice as much metal is working four times as hard. Only a fraction of the total torsional performance is contributed by the web.

Where the boundaries of the cross-section are not parallel, the form of the membrane becomes three-dimensional. At the flange tips, there is a tendency to span across the corners, flattening the membrane and resulting in some loss of effectiveness as the shear flow 'cuts the corner'. Conversely, the bubble domes up at the junction of flange and web, especially with a generous root radius, and typically the gain at the two junctions more than compensates for what is lost at the four flange tips.

Observe, in passing, how helpful the root radii are in keeping the bubble attached, and minimizing the stress raising effect of re-entrant corners.

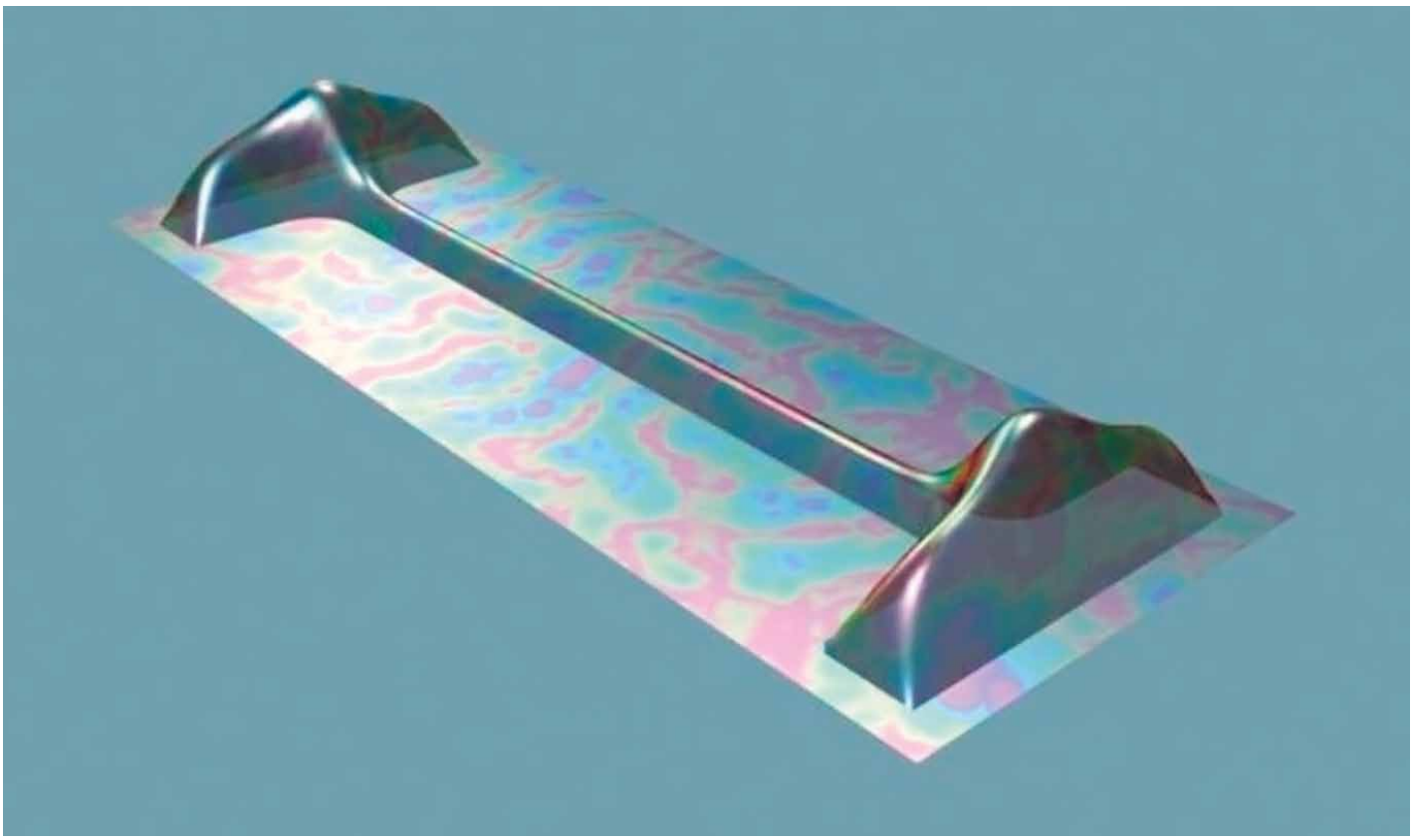
The membrane analogy has, in the not so distant past, been used for quantitative purposes. It may seem hard to believe today, but people in lab coats really did blow bubbles as described and take precise measurements of their shape in order to derive torsional properties.

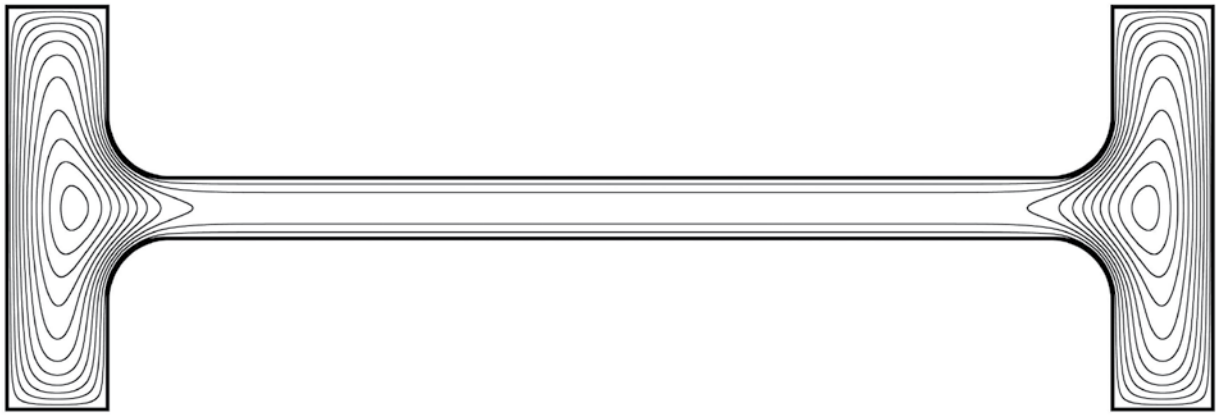
Hollow sections

The analogy extends to hollow sections, for which the loose plate cut out from within the section needs to be (i) weightless and (ii) constrained, as if on rails, to move only in the vertical direction, without rotation or translation. It rides upwards as the air is pressurized, so its whole area contributes to the volume under the bubble. In a thin walled hollow section, convexity of the membrane accounts for a very small proportion of the total resistance, and the slope, alias the shear stress, diminishes only slightly from outside to inside.

A single longitudinal cut in the hollow section would, at a stroke, keep the interior plate attached and grounded, reducing the volume of air above the baseline by a factor which depends on the thickness but could easily be as much as 100. That's another dramatic demonstration of the superiority of hollow sections. The volume due to membrane convexity is all that remains.

As a matter of interest, the analogy is good for hollow sections with more than one cell (in which the detached plates may rise to different levels) and with varying wall thickness. In a single cell hollow section, the shear stress will be lower where the wall is thicker – the reverse of the case with open sections, but obvious, in both cases, with the insight provided by the membrane analogy. Another difference is that the walls of rectangular hollow





sections with $h >> t$ are prone to torsion-induced shear buckling (in principle at least; few in the current range are slender enough to be susceptible) whereas open sections, with St Venant shear tugging the two sides of the element in opposite directions, are not.

The sandhill analogy

There is also a sandhill analogy to represent plastic torsion. The sand has a constant angle of repose (alias the yield stress in shear, $\tau_y = f_y/\sqrt{3}$) and the volume that can be heaped on the cross-section corresponds to the volume of air under the membrane (alias the torsional moment). The hollow of a hollow section will enforce a plateau, only marginally higher than its elastic counterpart. En route to full plastification, the soap bubble can be visualized as being pumped up into a roof-like shape which matches the sandhill.

A fascinating detour, but plastic torsion is of mainly academic interest – except perhaps to the designer of an expendable energy-absorbing structure.

Verification of St Venant torsional resistance

With hollow sections, it is important to recognize that one consequence of their efficiency in resisting torsion is that virtually the entire volume of metal can be mobilized close to yield, so interaction with other effects is very direct. If utilization versus torsion is 50%, 50% is left to counter regular shear and bending effects.

The design torsional moment resistance of a hollow section is the product of St Venant torsional section modulus W_t (from section property tables) and $f_y/\sqrt{3}$, though there is evidence that non-circular hollow sections cannot always achieve it under test. Parasitic warping effects may be to blame. It's comforting that serviceability nearly always governs.

With open sections, it is not helpful to talk of a torsional section modulus, and none is tabulated. For one thing, resistance is even less likely to govern. Nor is its verification a simple matter of evaluating the maximum shear stress anywhere on the surface. For example, St Venant shear stress on the surface of a web (numerically small, but additive to regular shear) gets to be calculated, whereas twice that stress just round the corner on the flange, not to mention the stress concentration at the re-entrant corner itself, might be overlooked.

It is, however, premature to discuss the verification of I-sections before coming to terms with the lengthwise interaction between the St Venant and 'warping' resistance mechanisms. That will be the subject of Part Three.

A forum for professionals

The Steel in Fire Forum is a discussion group for those interested in the behaviour of steel framed structures under the influence of fire. BCSA Sustainability Manager John Dowling writes on the forum's history and its potential.

Organised by the University of Sheffield and funded by the steel construction sector, the Steel in Fire Forum meets twice a year, usually once in Sheffield and once in London. It is a gathering of like minded researchers, specialists and design professionals, all interested in structural fire engineering design methods and dissemination of this knowledge.

The formation of the Steel in Fire Forum can be traced back to the 1980s when British Steel (now Tata Steel) saw the potential for developing alternative means of engineering buildings for fire over and above those described in documents such as Approved Document B (see box, below). It began to understand the positive benefits for the structural steel industry of an improved understanding in this area.

To encourage this, a regular ad-hoc meeting group of interested engineers and fire scientists, from a variety of research organisations, were arranged to facilitate an exchange of information.

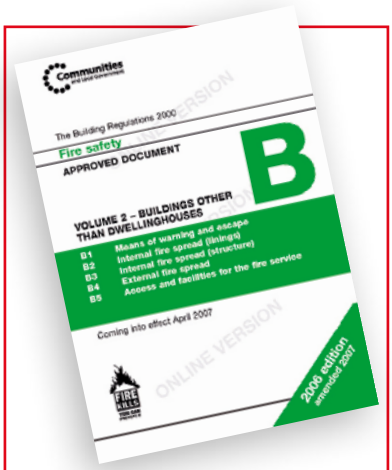
Professor Colin Bailey of the University of Manchester has described the manner in which cooperation between researchers took place during the Forum's early days: "The early analytical work concentrated on the behaviour of isolated beams and columns. Different theoretical approaches were implemented and the results were compared both with each other and with the available test data at regular group meetings. Initial comparisons were inconsistent, but these improved as the modelling techniques were gradually refined.

In 1995, the nature of these meetings was changed and the Steel in Fire Forum was created in earnest. This was prompted in part by the work associated with the Cardington fire tests, which had begun about that time. These large scale fire tests (see below) demonstrated that composite steel deck buildings had far greater inherent fire resistance than was apparent from standard fire tests. This created an upsurge in interest and research in structural behaviour in fire and it was decided that a more formal forum was required for the exchange of information. Since then it has gone from strength to strength.

It has also gone international and meetings this year will include contributions from Finland, Luxembourg and New Zealand. Details of the agenda and locations can be found on the website www.steelinfire.org.uk and attendance is open to anyone interested in the subject.

The Cardington fire tests were carried out between 1995 and 2003. In order to obtain a direct comparison with the standard fire test, the first test was carried out on a single unprotected beam and surrounding area of slab. The results indicated that a failure deflection would have occurred at a temperature over 1000°C, far greater than the temperature of 700°C at which it would have failed if tested in isolation.

Further tests were carried out in compartments varying in size from 50m^2 to 340m^2 with fire loadings provided by gas, wooden cribs and standard office furniture. Columns were protected but beams were not. Despite atmosphere temperatures of over 1200°C and temperatures on the unprotected steel beams of 1100°C in the worst case, no structural collapse took place.



Approved Document B is the most widely used source of information on fire precautions in buildings in England & Wales. The equivalent in Scotland is Technical Handbook 2 and in Northern Ireland it is Technical Handbook E. The requirements are prescriptive and fire performance is determined by reference to standard fire tests. However, the document also makes it clear that alternative approaches are also allowed if they can be shown to meet the requirement of the Building Regulations. This opens the door for the engineered solutions which are facilitated by the work of the Steel in Fire Forum.

Technical Report: Design of Light Steel Sections to Eurocode 3 (ED005)

Light steel members are especially prone to local buckling, within this new report the design consequences of this behaviour are dealt with in depth, notably the calculation of effective cross section properties. Design guidance for members in compression and members in bending is also given.

Such sections are commonly used in a range of building types as secondary steelwork (e.g. purlins and cladding rails in industrial buildings) and as the primary load-bearing elements in light steel framing applications (e.g. in residential buildings).

The guidance includes:

- A brief introduction to relevant Parts of the Eurocodes, notably BS EN 199313 *Eurocode 3: Design of steel structures. Cold formed members and sheeting,* followed by detailed design guidance.
- Eight worked examples are provided to illustrate the application of the design rules to practical building applications.

The technical document is freely available to SCI Corporate and Sole Trader Members from Steelbiz. www.steelbiz.org
Non members can purchase a PDF copy for £40 + VAT.

Catalogue number	**ED005**
Authors	A G J Way
	M D Heywood
Pagination	86 pp
Pages	Electronic Technical Report
Publication date	2012

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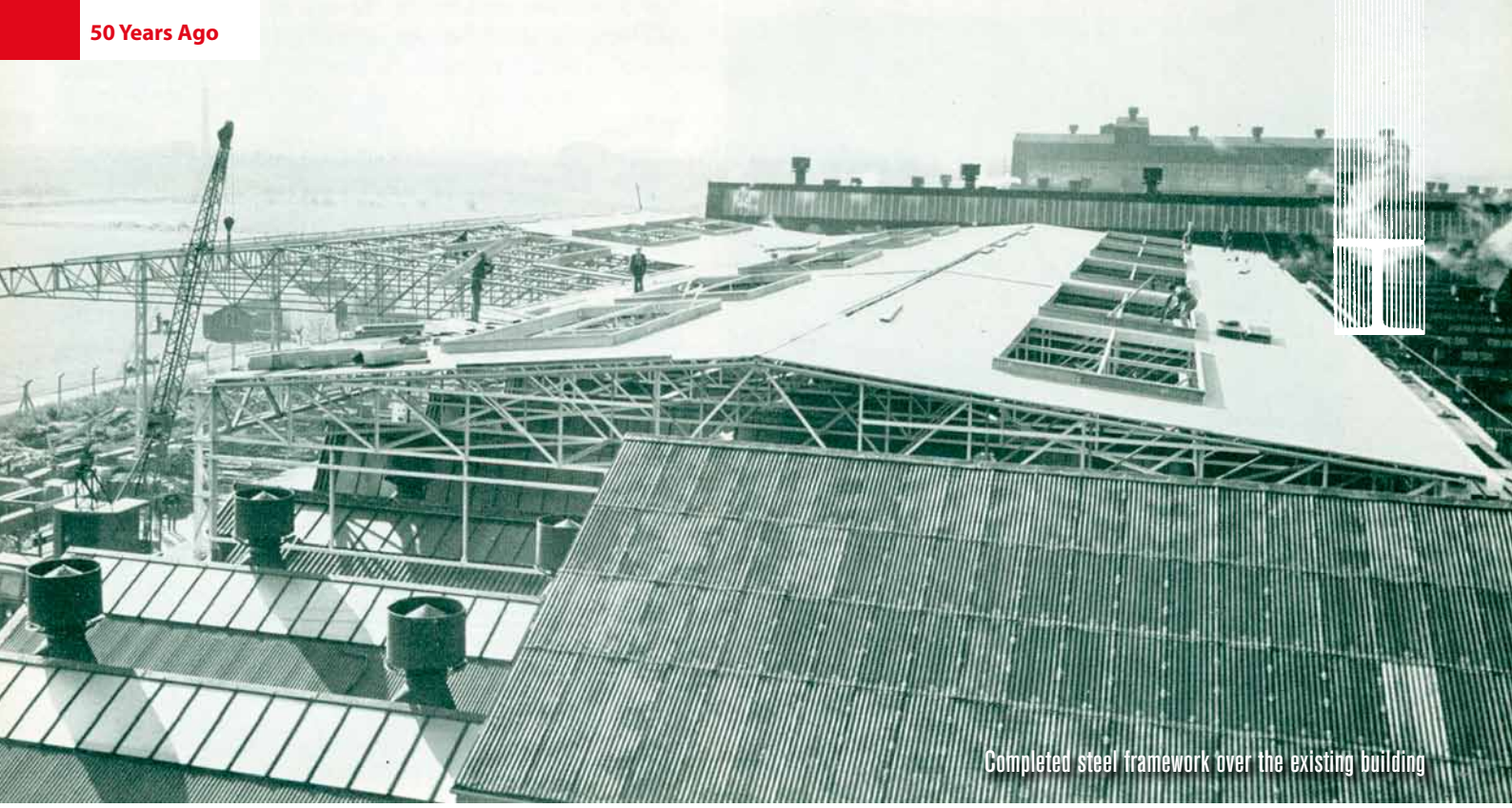


Completed steel framework over the existing building

Building a new factory over an existing one

FROM BUILDING WITH STEEL, FEBRUARY 1962

A new factory storehouse, intended to replace a smaller building, was partially erected over the existing building while it was still in use.

This unusual example of the flexible design possibilities of structural steelwork came about when Pirelli Limited decided to build a new tyre store at their Burton-on-Trent factory to replace the existing store, which was inadequate in area and lacking in headroom.

When Pirelli approached their consultants for advice on the structural planning of their new store, they pointed out various problems, e.g. the new store had to be in roughly the same position as the existing building and it could not encroach upon a nearby playing field.

It soon became apparent that the only solution was the build the new store wholly or partly over the existing building while the latter was in use and to demolish the smaller store afterwards. The proposition was perfectly practicable because the level of the new tie line was to be 24 ft., well clear of the existing ridge so that fork lifts could be used for handling tyres.

The final scheme comprised an area of 246 ft. × 164 ft. The 164-ft. length was divided into two spans of 82 ft., one of which (i.e. exactly half the job) was erected over the existing store while the other span formed an addition to the total covered area of the factory, built out over the existing access road.

This scheme required a row of columns to be erected within the existing premises, 82 ft. from the gable wall, projecting through the old roof. The column centres in line were 41 ft. apart. A temporary platform was built on top of the old roof, and 41-ft. span lattice girders were taken, piece-small, along the platform to the inner column line and assembled and erected there. After the corresponding line of lattice girders along the old gable had been erected, a mobile crane put up the secondary lattice girders spanning the 82 ft. over the existing building.

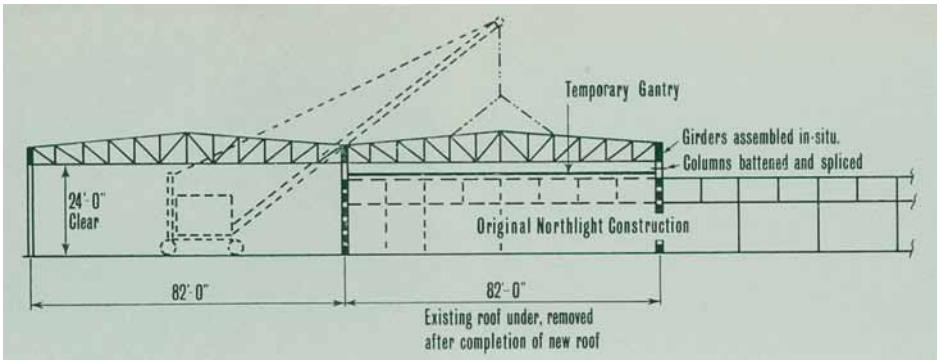
The remainder of the steel erection presented no unusual difficulties and was completed in the normal way.

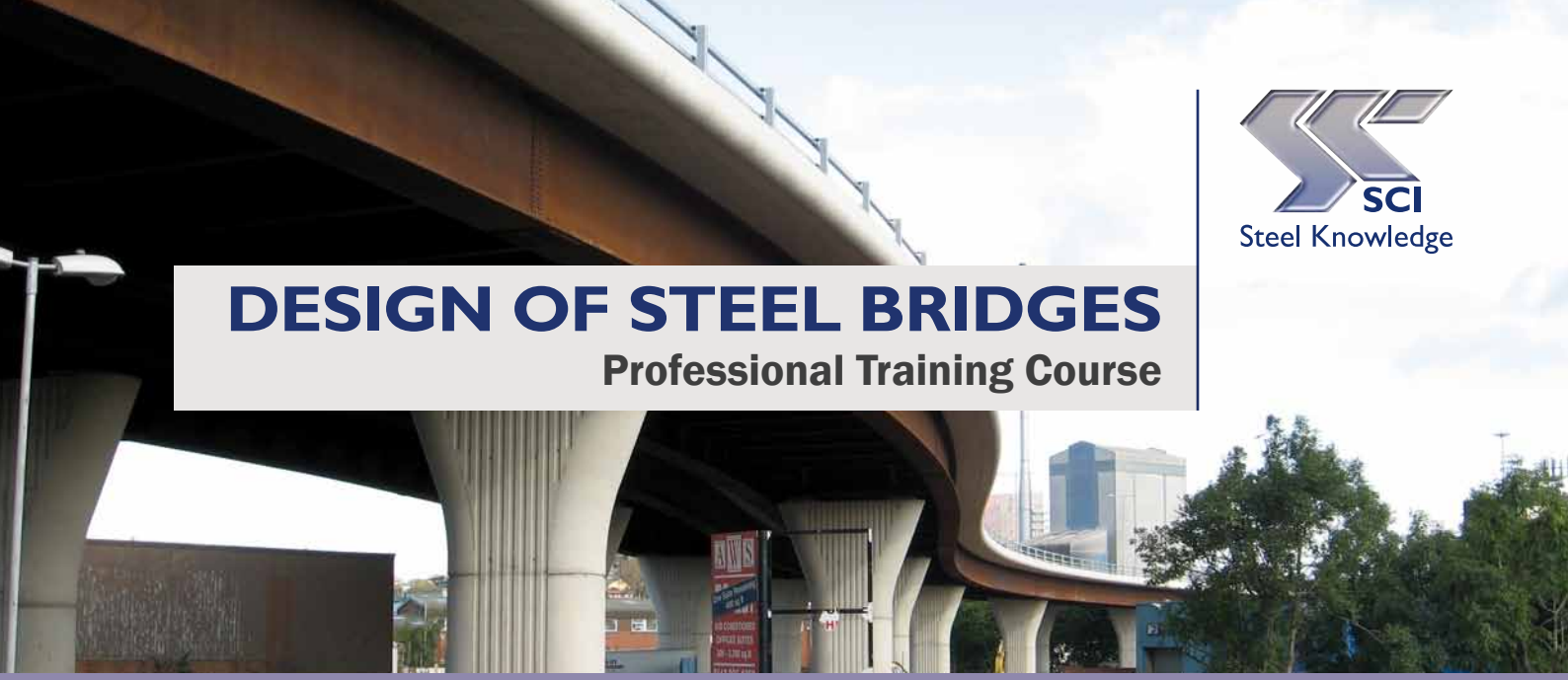
The weight of steelwork was 149 tons, i.e. approximately 8 lb. per sq. ft. of area covered. The roof covering was a metal decking and the sides were clad in coloured protected metal sheeting.

The project as a whole, including clearing away the old fabric underneath, took seven months to complete. The new store, of lattice girder construction, covers 40,000 sq. ft. Fifty per cent of this was erected over the top of an existing North light building before the latter could be dispensed with and demolished. This could only have been done rapidly and economically with structural steelwork of this type.

Architects: Douglas and J. D. Wood, FF./A.R.I.B.A.
Consulting Engineers: Laithwaite and Partners.

Erection proceeding on open site





SCI
Steel Knowledge

DESIGN OF STEEL BRIDGES

Professional Training Course

21 & 22 March 2012 in Leeds

This two day course is aimed at graduate engineers with a basic knowledge of bridge design.

Speakers include designers and steelwork fabricators actively involved in highway bridge design. The course therefore provides the latest best practice design guidance.

For structural design reference is made to the Eurocodes - their use is required by client authorities for all new bridge design projects.

All the presentations will be accompanied by a comprehensive set of notes.

Paper and pdf copies of a range of SCI, BCSA and Tata Steel publications related to bridge design will also be provided.

Course objectives

- Give an overview of common forms of steel bridge used in the highway infrastructure
- Explain the design basis set out in the Structural Eurocodes and the evaluation of bridge loading
- Examine the modelling techniques for bridges to determine internal forces and moments
- Explain the basis for determining the resistance of structural members, bracing systems and connections
- Examine requirements for fatigue design
- Give practical guidance on material selection, connection detailing, bridge articulation and support
- Give guidance on design for economical and durable construction

Fee and Registration

The cost of the course is: **£250 + VAT (BCSA & SCI members)**
£300 + VAT (non-members)

Lunch and refreshments included on both days.

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British steel – first in Kuwait

On the 16th December 1991, under the lavish splendour of five steel framed structures, designed in the bedouin style by Architect John Rowe Parr, and fabricated by Robinson Construction of Derby, the Heads of State of six Arab nations gathered at Bayan Palace, Kuwait, to discuss the rebuilding of the war-torn city, under the mantle of the Gulf Co-operation Council.

The conference centre, believed to be the first structural steel contract to be awarded since the end of the Gulf war, comprised of a main entrance dome, conference theatre, main and central lobbies and a banqueting suite. The banqueting structure, seating 250 people, is reported to be the largest single span tented structure without a central support.

Due to the sensitive nature of such a gathering, complete secrecy surrounded the conference from conception through to its closure.

On the 3rd September 1991 John Robinson, Managing Director of Robinson Construction returned to Derby with an order from management contractors, Stirling Management, to draught, fabricate and erect over 147 tonnes of complex tubular structural steel.

Mobilisation was swift and precise, a plan of campaign established and management designated to their respective tasks. Over the following weeks John spent the majority of his time commuting between London Consultants 'atelier one' and the Derby fabrication plant, extracting the information necessary to perform such a herculean task. Draughting commenced almost immediately, by the 25th September, a convoy of Robinson Construction fully laden trailers left Wincanton Close – destination Heathrow Airport. Twelve hours later an Air France 747 Cargo Freighter, its contents over 140 tonnes of fabricated steel, took off for Kuwait.

The following day at Kuwait Airport, Eddie Major, site engineer for Robinson Construction, along with three other erectors supervised the off-loading and transportation to site. The task which lay ahead for Eddie and his crew could not have been more physical.

Relentlessly the team worked solidly for four weeks, erecting the structures under extreme and arduous conditions, which included basic shortages such and water and food supplies, communications and support plant, all this compounded with the continuous cloud of smog produced from the still raging oil fields.

By 26th October when John Robinson arrived on site for the completion of the final phase, over 160 tonnes had already been erected. When, on 5th November 1991 hand over was completed for the project with three days to spare, Robinson Construction were satisfied in the knowledge that the magnificent structures had been manufactured and erected with 100% accuracy.

Taken from
STEEL CONSTRUCTION February 1992
Cover images of (above) the finished conference centre, and (underneath) the centre under construction

Above: Impression of the finished conference centre.

Below: 104 tonnes of British steel - destination Kuwait.

ASD Westok
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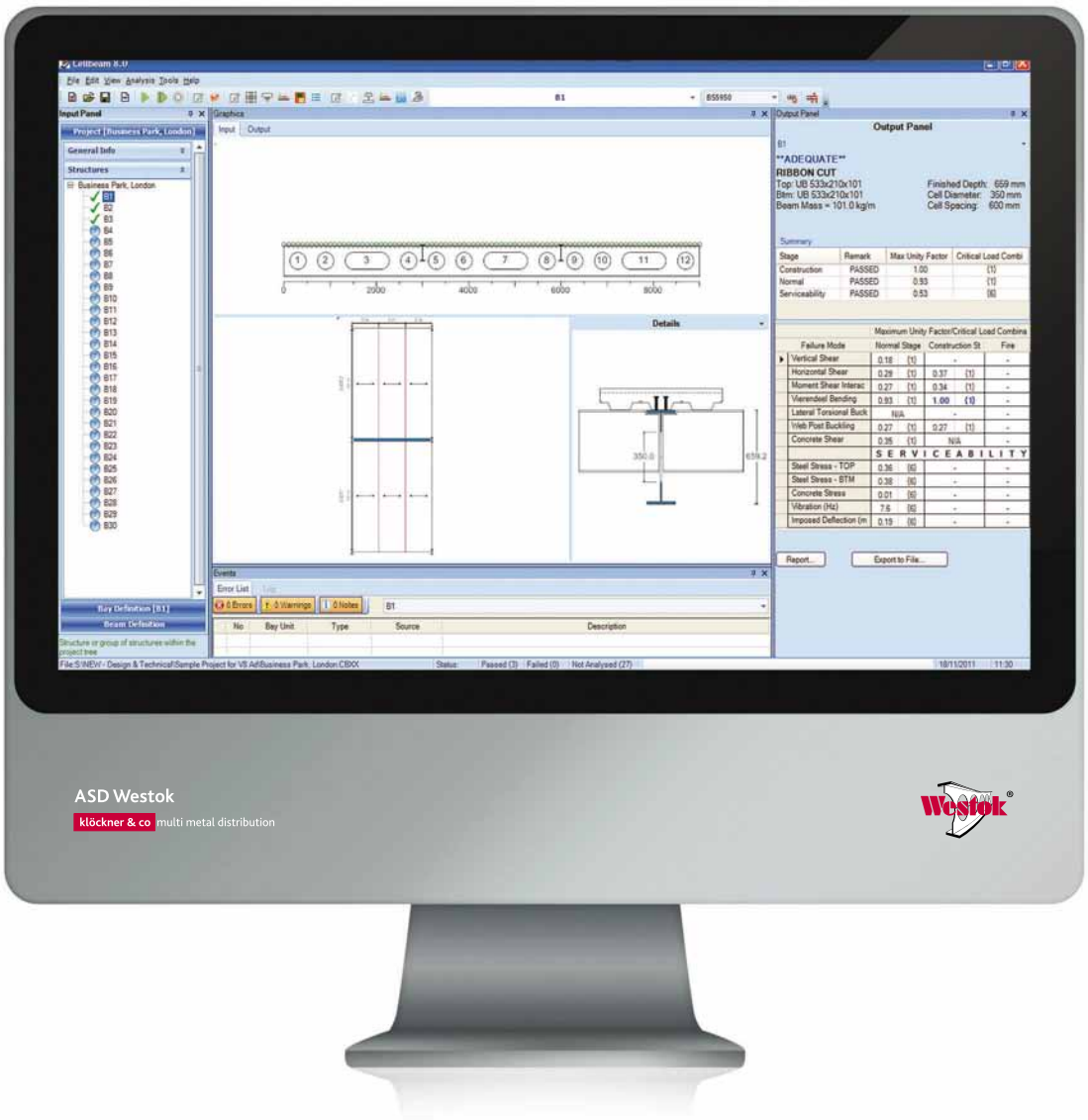
New Cellbeam®V8

Working in conjunction with the SCI, ASD Westok have now developed **Cellbeam®V8,** BS5950 and EuroCode, the software for cellular beam design.



Cellbeam®V8 includes EuroCode and is now furnished with numerous upgrades and enhanced functionality. Below are just some of the benefits that can be found in our new software.

- Design to BS5950-1 & BS5950-3.1A1 or to the Eurocodes (UK and Ireland)
- A large number of structural configurations, including floor and roof beams, internal and edge beams, cantilevers, prismatic, curved and tapered sections
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For more details, to get your CD or to talk to our structural advisory engineers please call:

0113 205 5270 or email **info@asdwestok.co.uk**

www.asdwestok.com

New and revised codes & standards

From BSI Updates February 2012

UPDATED BRITISH STANDARDS

BS EN 1998-2:2005+A2:2011
Eurocode 8. Design of structures for earthquake resistance. Bridges
AMENDMENT 2
Also incorporates Amendment 1 and Corrigendum 1

BRITISH STANDARDS WITHDRAWN

BS 648:1964
Schedule of weights of building materials
This standard has been withdrawn as it was the primary source of data for use with BS 6399. BS 6399 is now superseded by Eurocode BS EN 1991-1-1 and withdrawn. The committee will continue to review BS 648 for any content that may need to be retained as NCCI for use with BS EN 1991-1-1

NEW WORK STARTED

PD 6705-2
Structural use of steel and aluminium. Recommendations for the execution of steel bridges to BS EN 1090-2
Will supersede PD 6705-2:2010

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – ADOPTIONS

11/30243784 DC
BS ISO 8686-1 Cranes. Design principles for loads and load combinations. General

11/30254168 DC
BS EN 10088-3 Stainless steels. Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes

Strength from Advisory Service

Designing and building in steel has never been as straightforward as it is today, and steel still remains the material of choice for construction in the UK. The steel sector provides comprehensive and in-depth technical back up to ensure that those using steel have all the guidance and support they could need at their finger tips.

The co-ordinated and comprehensive support provided by the BCSA's Structural Advisory Serivce is free of charge to specifiers, clients and designers. Technical experts are on hand to provide an extensive range of services, including design assistance on structural form, performance of steel buildings, seminars and in-house CPD presentations, etc.

Richard Dixon, Manager, Structural Advisory Services, who heads up the network of Regional Technical Managers throughout the UK and Ireland said: "We have a team of experienced regional engineers who are on hand to offer design support and advice to designers, and to point them to the wide range of technical guidance and resources available to them and inform them in a practical way on key topics like EC3 and the sustainability of steel construction through in-house CPDs."

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Steelwork contractors for buildings

BCSA is the national organisation for the steel construction industry.
Membership of BCSA is open to any Steelwork Contractor who has a fabrication facility within the United Kingdom or Republic of Ireland.
Details of BCSA membership and services can be obtained from
Gillian Mitchell MBE, Deputy Director General, BCSA, 4 Whitehall Court, London SW1A 2ES
Tel: 020 7747 8121 Email: *gillian.mitchell@steelconstruction.org*

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

- **C** Heavy industrial platework for plant structures, bunkers, hoppers, silos etc
- **D** High rise buildings (offices etc over 15 storeys)
- **E** Large span portals (over 30m)
- **F** Medium/small span portals (up to 30m) and low rise buildings (up to 4 storeys)
- **G** Medium rise buildings (from 5 to 15 storeys)
- **H** Large span trusswork (over 20m)
- **J** Tubular steelwork where tubular construction forms a major part of the structure
- **K** Towers and masts
- **L** Architectural steelwork for staircases, balconies, canopies etc
- **M** Frames for machinery, supports for plant and conveyors
- **N** Large grandstands and stadia (over 5000 persons)
- **Q** Specialist fabrication services (eg bending, cellular/castellated beams, plate girders)
- **R** Refurbishment
- **S** Lighter fabrications including fire escapes, ladders and catwalks
- **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	SCM	Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●		●											Up to £2,000,000
ACL Structures Ltd	01258 456051			●	●	●	●				●				●		●	Up to £2,000,000
Adey Steel Ltd	01509 556677				●	●	●	●		●	●			●	●		●	Up to £4,000,000
Adstone Construction Ltd	01905 794561			●	●	●												Up to £1,400,000
Advanced Fabrications Poyle Ltd	01753 531116				●		●	●	●	●	●				●	✓		Up to £400,000
Alex Morton Contracts Ltd	028 9269 2436			●	●	●	●		●	●	●			●	●			Up to £400,000
Angle Ring Company Ltd	0121 557 7241												●					Up to £1,400,000
Apex Steel Structures Ltd	01268 660828				●		●			●	●							Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●						Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●			Up to £800,000*
ASD Westok Ltd	0113 205 5270												●			✓		Up to £6,000,000
ASME Engineering Ltd	020 8966 7150				●					●	●			●	●	✓		Up to £1,400,000*
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✓	●	Above £6,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●							●				Up to £2,000,000
Austin-Divall Fabrications Ltd	01903 721950			●	●		●	●		●	●			●	●			Up to £200,000
B&B Group Ltd	01942 676770			●	●	●	●	●		●	●	●		●		✓		Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●				Up to £400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✓		Up to £1,400,000
Barnshaw Section Benders Ltd	01902 880848												●			✓		Up to £800,000
BHC Ltd	01555 840006	●	●	●	●	●	●							●				Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●		✓	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●			Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●		✓	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●			●	●	✓		Up to £3,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●	●			●	●	✓	●	Up to £2,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●	●	●	●	●		●	●	✓	●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●		✓	●	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●			Up to £6,000,000
Cordell Group Ltd	01642 452406	●			●	●	●	●	●	●	●					✓		Up to £3,000,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●			Up to £800,000
D H Structures Ltd	01785 246269				●		●				●			●				Up to £40,000
Discain Project Services Ltd	01604 787276				●					●	●				●	✓		Up to £800,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●			●					✓		Up to £6,000,000
ECS Engineering Services Ltd	01773 810003	●		●	●	●	●	●	●	●	●			●	●	✓		Up to £2,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✓	●	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✓	●	Up to £3,000,000
Fisher Engineering Ltd	028 6638 8521		●	●	●	●	●	●	●	●	●	●				✓	●	Above £6,000,000
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		●	●	●	●	●	●	●	●	●	●		●			●	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			●	●	●	●	●			●						●	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✓		Up to £2,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✓	●	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●				✓		Up to £2,000,000
Henry Smith (Constructional Engineers) Ltd	01606 592121			●	●	●	●	●										Up to £3,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●			Up to £3,000,000
Hillcrest Fabrications Ltd	01283 212720				●			●							●			Up to £400,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**SCM**	**Contract Value (1)**

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	SCM	Contract Value (1)
Hills of Shoeburyness Ltd	01702 296321									●	●				●			Up to £1,400,000
J Robertson & Co Ltd	01255 672855									●	●				●			Up to £200,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●				Up to £6,000,000*
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✓	●	Up to £4,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●						●	Up to £2,000,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✓		Up to £3,000,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●			Up to £1,400,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●	●	●		✓	●	Above £6,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✓		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						●	●	●	●						✓		Up to £4,000,000
On Site Services (Gravesend) Ltd	01474 321552				●		●	●		●	●				●			Up to £200,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●			Up to £400,000
Paddy Wall & Sons	00 353 51 420 515			●	●	●	●	●	●	●	●							Up to £6,000,000
Painter Brothers Ltd	01432 374400								●		●				●	✓	●	Up to £6,000,000
Pencro Structural Engineering Ltd	028 9335 2886			●	●	●	●	●	●		●			●	●	✓		Up to £2,000,000
Peter Marshall Steel Stairs Ltd	0113 307 6730									●					●			Above £6,000,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●			Up to £1,400,000
REIDsteel	01202 483333		●	●	●	●	●	●	●	●	●	●		●				Up to £6,000,000
Rippin Ltd	01383 518610			●	●	●	●	●										Up to £1,400,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	●	Above £6,000,000
Rowen Structures Ltd	01773 860086		●	●	●	●	●	●	●	●	●	●		●				Above £6,000,000*
S H Structures Ltd	01977 681931						●	●	●	●						✓	●	Up to £3,000,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	●	Above £6,000,000
Shipley Fabrications Ltd	01400 231115			●	●	●	●		●	●	●			●	●			Up to £1,400,000
SIAC Butlers Steel Ltd	00 353 57 862 3305		●	●	●	●	●	●	●		●	●				✓	●	Above £6,000,000
SIAC Tetbury Steel Ltd	01666 502792			●	●	●	●				●	●				✓	●	Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●		●								●			Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●			Up to £800,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●	●			●			Up to £200,000
The AA Group Ltd	01695 50123			●	●	●	●			●	●	●		●	●		●	Up to £4,000,000*
Traditional Structures Ltd	01922 414172		●	●	●	●	●	●	●		●	●		●		✓	●	Up to £2,000,000
Tubecon AESS	01226 345261						●	●	●	●				●	●	✓		Above £6,000,000*
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●		●	Up to £4,000,000
W I G Engineering Ltd	01869 320515				●					●					●			Up to £200,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✓		Up to £6,000,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●	●	✓	●	Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●			●		●	●	●	●	●				●	✓		Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●					✓	●	Up to £2,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●		✓	●	Above £6,000,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	SCM	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
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
SCM Steel Construction Sustainability Charter
● = Gold, ● = Silver, ● = Member

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
AceCad Software Ltd	01332 545800		●								
Albion Sections Ltd	0121 553 1877	●									
Andrews Fasteners Ltd	0113 246 9992									●	
ArcelorMittal Distribution – Birkenhead	0151 647 4221								●		
ArcelorMittal Distribution – Bristol	01454 311442								●		
ArcelorMittal Distribution – South Wales	01633 627890								●		
ArcelorMittal Distribution – Scunthorpe	01724 810810								●		
Arro-Cad Ltd	01283 558206			●							
ASD metal services	0113 254 0711									●	
Austin Trumanns Steel Ltd	0161 866 0266								●		
Ayrshire Metal Products (Daventry) Ltd	01327 300990	●									
BAPP Group Ltd	01226 383824									●	
Barnshaw Plate Bending Centre Ltd	0161 320 9696	●									
Barrett Steel Ltd	01274 682281								●		

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
BW Industries Ltd	01262 400088	●									
Cellbeam Ltd	01937 840600	●									
Cellshield Ltd	01937 840600							●			
CMC (UK) Ltd	029 2089 5260							●			
Composite Profiles UK Ltd	01202 659237	●									
Computer Services Consultants (UK) Ltd	0113 239 3000		●								
Cooper & Turner Ltd	0114 256 0057									●	
Cutmaster Machines UK Ltd	01226 707865					●					
Daver Steels Ltd	0114 261 1999	●									
Development Design Detailing Services Ltd	01204 396606			●							
Easi-edge Ltd	01777 870901							●			●
Fabsec Ltd	0845 094 2530	●									
FabTrol Systems UK Ltd	01274 590865		●								
Ficep (UK) Ltd	01924 223530					●					

Steelwork contractors for bridgework

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
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	NHSS 19A	NHSS 20	SCM	Contract Value (1)
B&B Bridges Ltd	01942 676770	●	●	●	●	●	●	●	●	✓				Up to £1,400,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	✓		✓		Up to £3,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●			●	●	✓			●	Up to £2,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	✓	✓		●	Above £6,000,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●		●	●	●	✓			●	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●	●	●	●			●	●	✓			●	Up to £800,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	✓	✓	✓	●	Above £6,000,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●		●	●	✓	✓	✓		Up to £4,000,000
Painter Brothers Ltd	01432 374400	●		●					●	✓			●	Up to £6.000,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	✓	✓	✓	●	Above £6,000,000
S H Structures Ltd	01977 681931	●		●	●	●			●	✓		✓	●	Up to £3,000,000
SIAC Butlers Steel Ltd	00 353 57 862 3305	●	●	●	●	●		●	●	✓			●	Above £6,000,000
TEMA Engineering Ltd	029 2034 4556	●	●	●	●	●	●	●	●	✓				Up to £1,400,000*
Varley & Gulliver Ltd	0121 773 2441	●						●	●	✓		✓		Up to £4,000,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	✓			●	Above £6,000,000
Non-BCSA member														
ABC Bridges Ltd	0845 0603222	●								✓				Up to £100,000
A G Brown Ltd	01592 630003	●						●	●	✓				Up to £400,000
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	✓				Up to £1,400,000
Cimolai Spa	01223 350876	●	●	●	●	●	●			✓				Above £6,000,000
Concrete & Timber Services Ltd	01484 606416	●	●	●		●	●		●	✓			●	Up to £800,000
Donyal Engineering Ltd	01207 270909	●						●	●	✓	✓	✓	●	Up to £1,400,000
Francis & Lewis International Ltd	01452 722200							●	●	✓			●	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
Interserve Construction Ltd	0121 344 4888							●	●	✓				Above £6,000,000*
Interserve Construction Ltd	020 8311 5500	●	●	●	●		●	●	●	✓				Above £6,000,000*
Millar Callaghan Engineering Services Ltd	01294 217711	●						●		✓				Up to £800,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓				Up to £3,000,000*
The Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	✓			●	Up to £2,000,000

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
FLI Structures	01452 722200	●									●
Forward Protective Coatings Ltd	01623 748323						●				
Graitec UK Ltd	0844 543 888		●								
Hadley Rolled Products Ltd	0121 555 1342	●									●
Hempel UK Ltd	01633 874024						●				
Hi-Span Ltd	01953 603081	●									●
Highland Metals Ltd	01343 548855						●				
Hilti (GB) Ltd	0800 886100								●		
International Paint Ltd	0191 469 6111						●				●
Jack Tighe Ltd	01302 880360						●				
Jamestown Cladding and Profiling	00 353 45 434288	●									
Jotun Paints (Europe) Ltd	01724 400000						●				
Kaltenbach Ltd	01234 213201					●					
Kingspan Structural Products	01944 712000	●									●
Leighs Paints	01204 521771						●				●
Lindapter International	01274 521444								●		
Metsec plc	0121 601 6000	●									●
MSW	0115 946 2316	●									
National Tube Stockholders Ltd	01845 577440							●			

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
Northern Steel Decking Ltd	01909 550054	●									
Panels & Profiles	0845 308 8330	●									
John Parker & Sons Ltd	01227 783200								●	●	
Peddinghaus Corporation UK Ltd	01952 200377					●					
Peddinghaus Corporation UK Ltd	00 353 87 2577 884					●					
PPG Performance Coatings UK Ltd	01773 814520						●				
Prodeck-Fixing Ltd	01278 780586	●									
Rainham Steel Co Ltd	01708 522311								●		
Richard Lees Steel Decking Ltd	01335 300999	●									●
Structural Metal Decks Ltd	01202 718898	●									●
Studwelders Composite Floor Decks Ltd	01291 626048	●									
Tata Steel	01724 404040				●						
Tata Steel Distribution (UK & Ireland)	01902 484100								●		
Tata Steel Service Centres Ireland	028 9266 0747								●		
Tata Steel Service Centre Dublin	00 353 1 405 0300								●		
Tata Steel Tubes	01536 402121				●						
Tekla (UK) Ltd	0113 307 1200		●								
Tension Control Bolts Ltd	01948 667700						●			●	
Wedge Group Galvanizing Ltd	01909 486384						●				

HD-X

The ultimate drilling solution

The machine with 500mm independent 'X' movement on all spindles

MACH 2012

16 – 20 April

NEC • Birmingham UK

machexhibition.com

STAND 4621

- ↘ Simultaneous drilling of 3 different 'X' positions
- ↘ Hole patterns within 500mm envelope machined without unclamping and clamping saving time and enhancing accuracy
- ↘ Milling applications
- ↘ Fast, accurate scribing

For the definitive Production Performance

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