FEBRUARY 2007 VOL15 NO2

NSC

NEW STEEL CONSTRUCTION

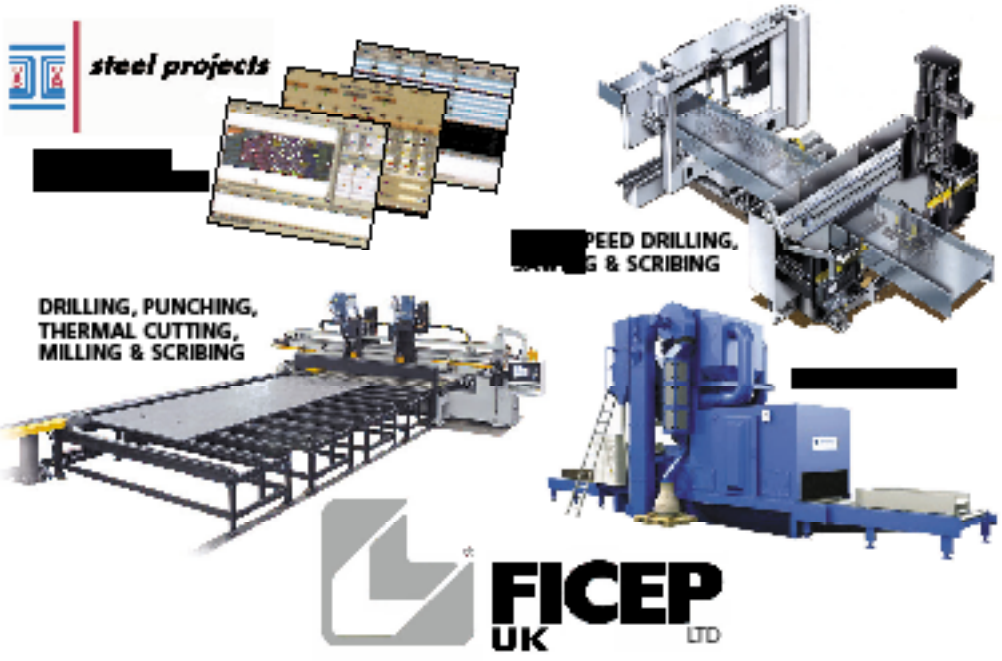
www.new-steel-construction.com

Iconic towers for City
Doncaster ready for St Leger
New printing press for Portsmouth
NSSS 5th Edition detailed

Dream Team

[redacted]

[redacted]



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FEATURES

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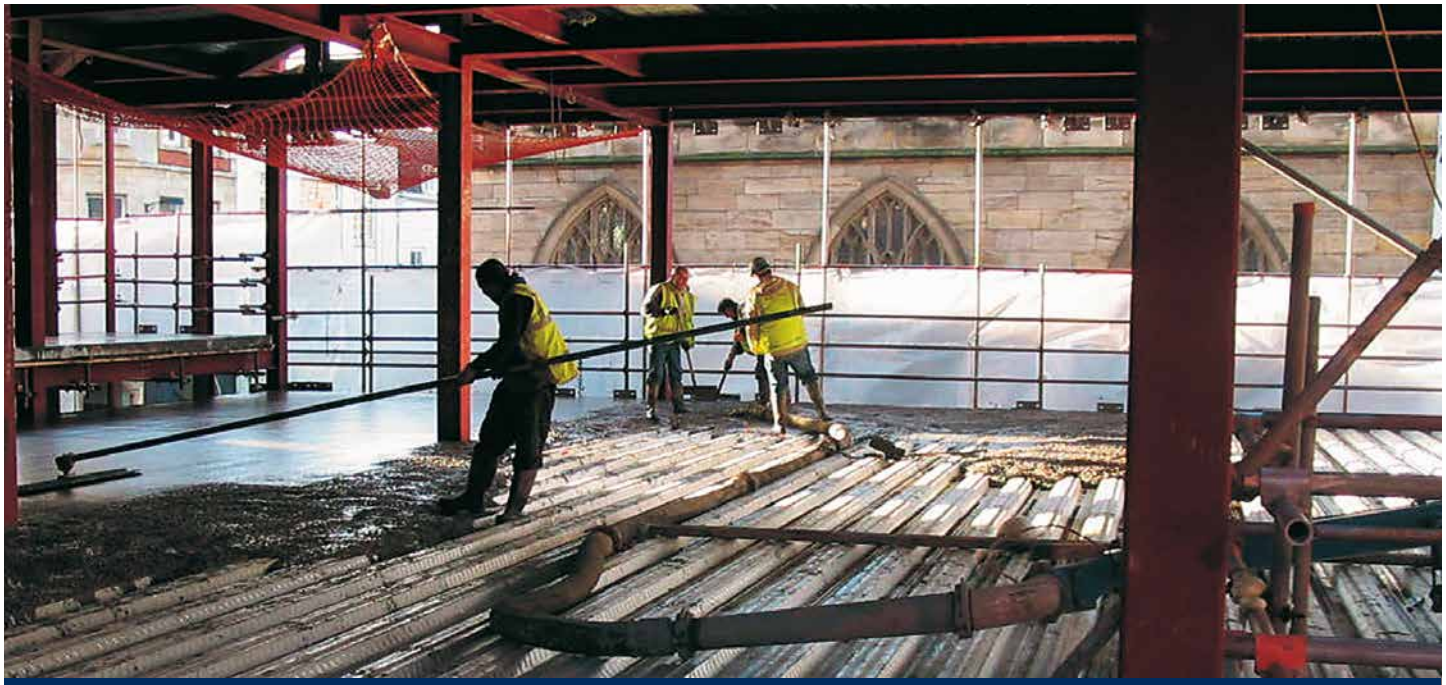

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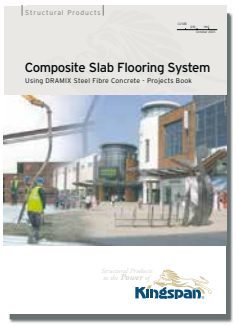

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A sustainable chance for steel to star

Nick Barrett - Editor

Hardly a day seems to go by now without some major company or organisation throwing its weight behind a drive towards a target variously described as carbon neutrality, or zero carbon footprints. Major clients of the construction industry such as retailing groups have been among the most prominent recently.

A lot of government initiatives are underway as well. For example, the Stern Report, published in December, signals government's intention to drive sustainability culture throughout our lives.

Only some of the private sector major users of steel have been taking any sort of a lead in asking their suppliers for sustainability evidence. That is clearly now about to change as any consumer focused company, any who have public sector clients, or any company with shareholders, will have to follow the lead of the more environmentally enlightened. This means hard questions will increasingly be asked of designers and suppliers.

Many initiatives are underway that will push sustainability even further up the agenda during 2007. For example, a review of the UK Sustainable construction strategy was carried out in 2006. The DTI is now working on developing an update of the Strategy which should be completed in 2007.

Later this year the UK Green Building Council will be launched, whose principal role is to stimulate the market demand for sustainable buildings and ensure that service providers and product manufacturers recognise and respond to rapidly changing market requirements.

Recycling pressure group WRAP continues to promote the specification of construction materials and products with recycled content. Steel is the most recycled construction material in the world and the industry is already working on increasing the already high percentage of recycling.

A lot is happening to improve sustainability of our homes. Zero carbon new homes are a target the government wants achieved within a decade. A code for sustainable homes was launched in December to drive a step-change in sustainable home building practice which will rank sustainability performance by a 'star' system.

An update of the BRE Green Guide to Specification, which is used to assess the environmental performance of construction materials under BREEAM, EcoHomes and the Code are nearing completion. Major client side initiatives are expected to be announced shortly.

Clearly 2007 is going to be a year that we look back on as one when sustainability ceased to be merely the subject of a debate, and hard questions will be asked demanding answers that stand up to scrutiny.

Fortunately a lot of work is underway by Corus, the BCSA, SCI and others which will mean the steel sector has the sustainability answers to hand. The BCSA's Sustainability Charter is going from strength to strength with more companies signing up monthly. A main attraction is the Charter's independent sustainability audit procedures that mean steelwork contractors can prove that they are operating in sustainable ways.

In news this month we have a story about a sustainability sophisticated client – Oxford University – who demanded some answers for its own satisfaction. This is a good example of an appraisal on a real world project which showed that steel performs significantly better on environmental grounds than the alternative framing material considered, concrete.

The study found that the superstructure of a steel building would generate 22% less CO_2 emisssions than the concrete alternative. This was an independent study carried out by a consulting engineer on behalf of its client, and it is encouraging that these are the sorts of results coming from unbiased research.

Much remains to be done and NSC aims to keep readers up to date with news of the steel sector's success towards the sustainability goals that are set. In the meantime, if you have any sustainability success stories to pass on we would be delighted to hear them.

Study proves steel is sustainable choice

An audit of the CO_2 emissions produced in the construction of an Oxford University departmental building comparing steel and concrete options shows that the superstructure of a steel building would generate 22% less CO_2 emissions than the concrete alternative.

Authors of the study say that there is such significant environmental benefit to be gained from auditing structural options that any appraisal of options or design changes should place as much emphasis on CO_2 emissions as on cost or programme implications.

The study, by consulting engineers Peter Brett Associates (PBA), showed that using a steel composite solution meant a reduction in overall CO_2 emissions of 361 tonnes. PBA was commissioned to design a new educational building near the city centre, consisting of four above ground storeys and two basement levels. The total footprint was some 12,000m^2 on a congested site with poor transport access. Adjacent buildings were in constant use and the number and size of deliveries to site would be a key design consideration.

PBA's Dr Fergal Kelly said: "The client, has a rigorous and knowledgeable approach to sustainability, which encouraged the design team to set high standards in this area. To ensure the most sustainable structure for the building we decided to investigate the various structural options in terms of CO_2 emissions and embodied energy. This project has demonstrated that in terms of the materials and the haulage involved in construction, steel is highly competitive in sustainability terms. This is despite the heavy steel structure in the basement to resist retaining wall forces."

The study included emissions related to materials, haulage of materials and excavation arisings, a comparison with a concrete option and updated changes to the structure. "So it was an audit on a live project as we took account of design changes during the construction process," said Dr Kelly.

The steel option was chosen for the project on the grounds that the overall structural cost was favourable, the programme faster and construction traffic to and from site was reduced. "However, it was an additional benefit that these aspirations were achieved in conjunction with improving sustainability credentials, Dr Kelly concluded.

Multi span steel viaduct for M25 junction

The busy M25/A282 junction in north Kent is undergoing a major improvemen which includes widening both roads as well as the adjacent A2, and constructing new free flow links.

Carrying one of these link roads for westbound A2 traffic onto the northbound M25 will be a new 450m-long viaduct.

This steel structure, sitting on eight concrete piers and two abutments, is one of the projects main elements and will require approximately 2,000t of steel.

Steelwork contractor Fairfield-Mabey has begun assembling the braced girders for the bridges decks.

Working in conjunction with main contractor Costain, Fairfield has worked out seven optimum positions for one 1,000t crane to lift most of the bridge decks into position.

Fairfield-Mabey, Project Manager Gordon Taylor said: "Because of the configuration of the roads over which the bridge will go most of the spans are different lengths, with the longest at 65m and the shortest at 39m."

All of the steel is weathering steel and the decision to use it was taken on the basis of whole life costing, said Mr Taylor.

"This type of steel doesn't need repainting as that operation at a later date in the middle of the M25 would have meant partially closing the motorway," explained Mr Taylor.

Fairfield-Mabey will partially erect the viaduct between February and April, with the final sections being lifted into position in June and July.

The company is also supplying and erecting a further 2,000t of steelwork for three more smaller viaducts carrying free flow links at the junction.

Work has started on assembling the braced girders.

The 450m long viaduct will carry A2 westbound traffic (bottom right) over the A2 and M25 and link up with the M25 northbound carriageway (top right).

3D modelling for steel construction

Two seminars will be held in March outlining the importance of Structural Building Information Modelling (BIM). They will act as a showcase for the latest technology available which provides a modern design collaboration platform for both engineers and steelwork contractors.

The technology will be explained through a series of case studies and practical demonstrations, such as the Barrett Steel Buildings way of working. Other presentations will be provided by Tekla, FICEP, CSC and RAM.

The seminars will be held on Tuesday 13 March at the National Liberal Club in London, and on Tuesday 22 May at the Cedar Court Hotel, Huddersfield. Cost per delegate is £80 plus VAT.

For further details contact Gillian Mitchell MBE at BCSA.

Tel: 020 7839 8566 Email: gillian.mitchell@steelconstruction.org

SCI to lead the debate at Futurebuild

Offsite construction methodologies will be one of the main topics at this year's Futurebuild conference.

Taking place from 27 February to 1 March at London's Earls Court 2, the conference is widely regarded as the most authoritative platform for offsite and modern methods of construction.

SCI said it will lead the debate on steel technology with Dr Graham Owens, Director for SCI, chairing the 'Steel Technology and Offsite Construction' seminar on 1 March.

Also taking part in the same seminar will be Terry Goodwin, Director Business Development Corus Strip Division, who will discuss the role of steel in a modern construction industry.

Dr Martin Heywood, Manager Construction Technology SCI, will outline the benefits of offsite steel construction in urban locations; Dave Turnbull, Managing Director of Caledonian Building Systems, will present priorities in the use of steel in offsite construction; John Williams, Marketing Manager for Kingspan, will discuss designing multi storey steel frame structures without a primary frame; Aran Chadwick, Atelier One Director, will focus on modular construction; and Keith Blanshard, Yorkon Director, will outline how a steel frame's offsite construction meets the sustainability challenge.

To support these presentations, case studies from Unite Modular Solutions and Waterman Structures will be shown.

Running parallel with Futurebuild is the Ecobuild conference. On 27 February as part of the 'Great Materials' debate, Dr Michael Sansom, Manager Sustainability Group at SCI, will present the case for the sustainability of steel in construction.

An exhibition will also run throughout the conferences and the SCI stand (F282) will be of particular interest to those who need in-depth information on the effective use and the benefits of steel in construction.

For information on the conference go to: *www.futurebuild.co.uk* or contact Clare Convy, Tel: 01344 636549, *c.convy@steel-sci.com* for information on the 'Steel Technology and Offsite Construction' seminar.

Two accolades for REIDsteel

Christchurch based steelwork contractor John Reid & Sons (REIDsteel) has been named Exporter of the Year 2006 at the recent Dorset Business Awards ceremony.

The company, which was also recently awarded the Queen's Award for Enterprise in International Trade, has seen an increase of 370% in export business during the last three years and it now represents 53% of total sales.

Managing Director, Michael Reid MBE said: "The reason the company is so successful worldwide is because we use our own computer programme to produce very cost effective designs of exactly what the customer wants."

The company designs, manufactures and constructs a wide variety of steel structures from wide span aircraft hangars, sports grandstands and industrial buildings to warehouses, hotels, offices and car parks.

These structures have been exported around the globe to more than 140 countries.

"As well as designing and fabricating the steel frame, REIDsteel can provide the cladding and insulation, ventilation, cranes and also make the doors, mezzanines, stairs and curtain walling, all in-house," added Mr Reid.

Right to Left: Tim Cook, REIDsteel Commercial Manager; Mike Chappell, REIDsteel Sales Manager; Ian Brown of Dorset Exporter of the Year award sponsor, RBS.

New look for Bristol's historic centre underway

Work is now well underway on the £500M Bristol City Centre regeneration programme, the largest project to take place in the city since World War II reconstruction.

The scheme consists of a four-storey, 170,000ft^2 flagship department store, to be occupied by House of Fraser, a further 15 major stores and more than 100 new shops set in three new streets.

There will be over 2,600 car park spaces, new cycle routes, bus and coach stops and numerous dedicated public spaces, including a new square around Quakers Friars, featuring shops, restaurants and residential apartments

One of the focal points will be a new covered civic space in front of the proposed department store and an adjacent 100,000ft^2 cinema complex with 3,000 seats and 13 state-of-the-art auditoria.

There will also be 242 residential units including 24 affordable homes in the heart of the city and more than 310,000ft^2 of new office space with associated car parking.

The development, which is due for completion in Autumn 2008, is being undertaken by the Bristol Alliance, a joint venture between Land Securities and Hammerson.

Approximately 13,500t of steelwork will be supplied and erected on site by Severfield-Reeve.

AROUND THE PRESS

NCE Plus
11 January 2007
Cracks in concrete mega-bridge
Urgent structural repairs are being carried out to the 7.8km-long Oresund Bridge linking Sweden and Denmark after cracks were discovered in concrete at 50 different locations late last year. Cracking and scaling was found in the bridge's twin reinforced concrete trough girders during routine inspection, said Bjorn Svensen, Project Manager for bridge owner and operator Oresundsbro Konsortiet.

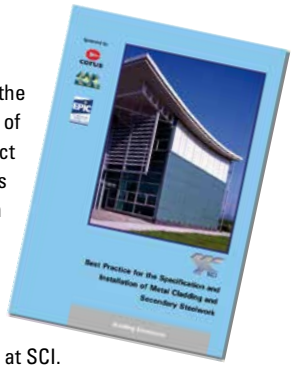
Contract Journal
10 January 2007
Steel still more cost effective
Derek Tordoff said: "A modern office building in most UK cities has clear span floors of 15m to 18m. Every cost study, and more importantly real projects, show that the cost of such desirable layouts in steel is virtually the same as a short span layout. Why would a client want internal columns if, for the same cost, he can have total flexibility."

Building
12 January 2007
Taking the stage
Big steel columns form the sculptural bones of the half-built facade, which defines the £50M Leicester Performing Arts Centre which is a gentle, sweeping curve. These columns are suspended from a massive roof structure cantilevering dramatically from inside the structure.

The Structural Engineer
9 January 2007
Re-opening Wembley Arena
The new east end terrace was formed from lightweight steel, being either 5mm or 6mm folded plate supported on steel raker beams to columns. This had benefits of weight depth and speed of construction compared to concrete, and partly replicated the existing terrace construction.

New Civil Engineer
11 January 2007
Complex hangar structure
The 135m long angular steel hangar is to become part of the RAF Museum and will house the National Cold War Exhibition. To cope with loading variations, wall thickness of the circular hollow steel section tubes making up the truss rafters varies from 6.3mm to 25mm.

SCI launches best practice guide to tackle Part L changes



Changes to Part L of the Building Regulations in England and Wales have resulted in deeper cladding systems, a need for improved air tightness and hence an improved quality of design and construction.

To answer the question, 'What are these regulatory changes doing to our structures?' the SCI has carried out a research project into the impact of the Part L changes on the structural performance of buildings.

Following this research, SCI in association with the DTI, Corus, MCRMA (The Metal Cladding and Roofing Manufacturers Association) and EPIC (Engineered Panels in Construction) has now published a best practice guide on the specification and installation of building envelopes and the supporting secondary steelwork.

Many of the leading players in the industry are already producing metal-clad buildings that exceed the requirements of the latest building regulations. The SCI said it is aware of instances where problems have been encountered due to poor practices in the design office or on site.

"The reasons for these problems are varied, but a common theme is the lack of appreciation of the mutual dependence between the various components and, consequently, the need for greater cooperation between the members of the project team," says Dr Martin Heywood, Manager Construction Technology at SCI.

"This is particularly relevant in the light of recent regulatory changes," he adds.

The SCI *Best Practice for the Specification & Installation of Metal Cladding & Secondary Steelwork* is available from SCI, contact Clare Convy Tel: 01344 636549.

Quick answers from fixing selector

Lindapter has launched a second generation of its on-line steelwork fixings design software, adding more beam sizes and improving the user interface.

Known as Steelwork Fixings Designer, Lindapter's software uses images and pop-out menus to take users rapidly through the selection process. Three steps are needed, selection of type of steel, type of connection and finally the beam sizes.

The tool is now able to present the correct fixings for most common applications within a couple of minutes.

Lindapter's fixing solution, which requires no welding or on-site drilling, is displayed in the form of a 2D drawing, with the source data and fixing materials detailed alongside.

The drawing is automatically emailed to the user and kept on file at Lindapter to help with any queries which may arise. The system will also generate a quote by clicking on a button above the drawing.

Hospital extension gets fast track construction with Metsec framing

A new £26M extension at the Ipswich Hospital NHS Trust has used 3,000m^2 of Metsec SFS site fixed, light gauge, galvanised steel framing as infill walling.

Derek Adams, Project Manager for principal contractor, Kier Eastern said: "SFS provides a much quicker turn around of construction and it allows follow on trades to start work on the first fix items earlier in the programme.

"But the biggest advantage is that while internal works are proceeding, the outer skin of the brickwork can continue independently without delaying them," added Mr Adams.

The extension, known as the Garrett Anderson Centre, is the largest development at the hospital in 30 years and will provide a new accident and emergency department, critical care centre, day surgery suite and operating theatres and beds.

SFS was specified to provide a fast dry envelope to the treatment centre. Mostly 200mm sections were used to close in the structural columns of hot rolled steel to form a straight wall on the 7,500m^2 three-storey building.

The hospital extension is due to be complete by December and open in early 2008.

Hopes high for adjudication review

Hopes are high that industry pressure for a change in the Construction Act will result in removal of the need for contracts to be 'in writing' before coming under the adjudication regime. BCSA is among the industry groups that has been pressing for this change.

BCSA Legal and Contractual Affairs Director Marion Rich said: 'People may be wondering what is happening with the Construction Act review, whether it has been forgotten or just disappeared. In fact, it is still going on and at the time of NSC going to print, we are awaiting draft legislation which was promised earlier for "the turn of the year", which we interpret as meaning any time up to the end of February.'

The review process has been a slow and long drawn out one, since first announced in the Chancellor's budget in March 2004. A first consultation was held in 2005 and the results published in January 2006 by DTI. In this document, DTI let the industry know its thinking on possible changes to the legislation.

DTI at that stage had decided not to take forward proposals for a change to the requirement for a construction contract to be evidenced 'in writing' before it could come within the Act. 'This was a problem caused by the Court of Appeal's interpretation in *RJT Consulting Engineers Ltd v DM Engineering (Northern Ireland) Ltd,* that all the terms of the contract had to be in writing,' says Mrs Rich. 'Until then, it had been thought that the 'writing' just had to establish the existence of a contract.'

Since then, the industry has been awaiting further developments from DTI. Mrs Rich said:'There has been some indication about DTI's thinking on adjudication and "writing" and a great swell of opinion from the industry seems to have persuaded DTI to change its views on this, but otherwise, DTI are playing their cards very close to their chest.'

Final proposals and draft legislation are expected by the end of February. This is to be followed by one final period of consultation with the industry before the draft legislation goes ahead. BCSA will alert members for opportunities to contribute to the next stage of consultation.

Largest UK office park underway

What is claimed to be the UK's largest office park is taking shape on the northern outskirts of Newcastle-upon-Tyne.

Cobalt Park will eventually offer 2.25 million square metres of modern office space and create over 10,000 new jobs in the region.

Working for contractor Bowmer & Kirkland, Caunton Engineering has fabricated and erected steelwork for three office blocks on the site.

During early 2006 Caunton's initial involvement with the project was the erection of Cobalt Units 13B and C.

These two three-storey office blocks are joined by a central atrium and both incorporate 18m spans broken by a central 300mm asymmetric section beam (ASB) which carries the pre cast floor slabs on the bottom flange.

Denis Morton, Caunton Project Manager said the ASBs were configured such that there is an attendant reduction in the thickness of the floor depth, and hence a lowering of the overall building's height.

Last year Caunton also completed the four-storey Cobalt 14 office block. It is due to start erecting Cobalt D this month, a four-storey ninety-degree angular shaped structure with a central atrium.

Five steel framed schools for Leeds

The recent completion of steel erection at the John Smeaton School in Leeds represents one of the final phases of a £100M PFI project for Leeds City Council.

Elland Steel, working on behalf of main contractor Carillion, has supplied and erected 3,450t of structural steel for the project which involves the construction of five new secondary schools and one primary school on five separate sites.

Bob Thorpe, Elland Steel's Managing Director, said his company has a Preferred Specialist Trading Agreement with Carillion working within the supply chain management.

"Our early involvement gives the opportunity to utilise our expertise and maximise the effectiveness of our performance," added Mr Thorpe.

The three-storey John Smeaton School consists of six interconnected blocks, required a total of approximately 725t of steel, and was erected during a 12 week programme which also included metal decking and precast stairs.

"Generally the schools were not complex structures, but each had interesting features, such as assembly halls and music rooms which required some intricate and curved steelwork," added Mr Thorpe.

NEWS IN BRIEF

The BCSA has launched a new **Safety in Steel Construction Health & Safety Service** (SiSC). It offers the designated competent person a 24-hour telephone helpline advisory service.

Following the success of 2006's inaugral event, **ShedS - The Networking Event** - will take place on 6-8 February 2007 at the Celtic Manor Resort, Newport, South Wales. For more information on attending the event contact Ana Da Cerca, Event Coordinator Tel: 020 7921 8231 or email *adacerca@cmpi.biz.* Alternatively, visit the website: *www.shedshow.com*

Barretts of Apsley has completed extensive rebuilding of its production facilities in order to house a range of new **Kaltenbach** machines. The units include the latest Kaltenbach KF1505 CNC automated plasma plate processing centre, two automated saw/drill systems and a Gietart shot blaster.

Applications are being invited for the **2007 Metals Industry Apprentice of the Year** with the closing date set for 1 March and the outcome to be announced at the Metals Industry Awards Evening & Gala Dinner in Sheffield on 25 April. The winner will receive a prize package that includes computer vouchers worth £1,200 and the presentation will be made at the Court Dinner of the Worshipful Company of Tin Plate Workers in London on 16 May.

Designers' guide to EN1991-1-2, EN1992-1-2, EN1993-1-2 and EN1994-1-2 has been published by Thomas Telford. One of the co-authors of the book, BCSA's Dr David Moore, said there is a fundamental lack of understanding of the principles of structural fire engineering design and one of the main aims of the publication is to demystify the subject so that it can be readily understood and used by structural engineers.

Delivering a new market for London

More than 800t of structural steelwork will be fabricated and erected by Atlas Ward Structures for two new buildings at the Western International Market in Hounslow, west London.

The market is one of the UK's leading wholesale fruit, vegetable and flower markets, and the latest development includes a new 136,000ft² produce hall and a 38,000ft² flower hall, to replace obsolete buildings.

The project was awarded to Atlas Ward by main contractor Bowmer & Kirkland on behalf of Kier Property Developments acting as development partner with the London Borough of Hounslow.

Jim Martindale, Atlas Ward's Engineering Director said both warehouses are propped portal frame structures featuring external three metre cantilever plant walkways.

"We've kept the construction fairly simple on these structures which has speeded up the steel erection," he added.

Atlas Ward said it's steelwork will be finished by mid February.

New office block for former newspaper site

A 14-storey office development is taking shape on the former Birmingham Post and Mail site in Snow Hill, Birmingham.

Colmore Plaza will offer 300,000ft² of office space, feature an impressive two-storey entrance foyer and a striking modular glazed facade.

Developer Abstract Land said the building is a first for Birmingham in terms of design, innovation and flexibility. Built using the very best materials throughout, the office block will provide sustainable high performance space, constructed to a City of London standard.

Steelwork contractor Robinson Construction has erected 750t of steel for the project and used Westok cellular beams for both the primary and secondary floor beams.

The cellular beams were designed using the SCI/Westok software Cellbeam V6, with its import/export link to CSC's Building Designer. This allowed Robinson to determine the limiting temperature of the cellular beams, which helped to minimise the cost of the intumescent fire protection.

Typically, 630 x 178 x 152 asymmetric beams were used for the main 11.7m internal spans.

The building is due for completion in April 2008.

Diary

For all SCI courses, contact Sandi Gentle, email: education@steel-sci.com telephone: 01344 636500
For BCSA seminars contact Gillian Mitchell, email gillian.mitchell@steelconstruction.org telephone: 020 7839 8566

7-8 February 2007
BS 5950-1:2000 Understanding the Essential Principles
Two day course. Edinburgh

13 February 2007
Acoustic Design in Steel
One day course. Dublin

20 February 2007
Multi-Storey Steel Framed Structures
One day course. Southampton

27 February 2007
Portal Frame Solutions
One day course. Croydon

8 March 2007
Preparation for Eurocode 3
One day course. Swindon

13 March 2007
One day seminar on 3D Modelling for the Steel Construction Industry.
Cost £80 + VAT (£60 + VAT to BCSA members). National Liberal Club, London

13 March 2007
Connection Design Workshop
One day course. Edinburgh

23 March 2007
Connection Design Workshop
One day course. Dublin

27 March 2007
One day seminar on Corrosion Protection for Infrastructure Projects.
A joint Highways Agency, BCSA and RQSC seminar. Cost £80 + VAT. National Liberal Club, London

27 March 2007
Portal Frame Solutions
One day course. Gloucester

22 May 2007
One day seminar on 3D Modelling for the Steel Construction Industry.
Cost £80 + VAT (£60 + VAT to BCSA members). Cedar Court Hotel, Huddersfield

6-7 June 2007
The design of steel bridges
Wrightington Hotel & Country Club, Wigan. £215 inc VAT. www.corusevents.com, email events@corusgroup.com. t 01724 405060

Above; The new stand towers over the famous Town Moor track.

Grandstand finish

The redevelopment of Doncaster Racecourse is set to transform the site into one of the most modern and impressive sporting venues in the UK. Martin Cooper takes his place in the press box.

FACT FILE
Doncaster Racecourse, South Yorkshire
Main client: *Arena Leisure*
Structural engineer: *TRP Consult*
Main contractor: *ISG interior/exterior*
Steelwork contractor: *Billington Structures*
Project value: *£35M*
Steel tonnage: *1,500t*

The three hundred year-old Doncaster Racecourse is currently undergoing a major redevelopment. The course which hosts the oldest of the five British flat racing classics - the St Leger run annually since 1776 - will have a new grandstand, equipped with all modern facilities including an exhibition hall, up and ready for the historic meeting in September.

There is also a much bigger picture to envisage, as the Racecourse is ultimately just one piece in the overall transformation of Doncaster. In the past five years, the Borough has attracted over £750M worth of investment from both public and private sectors, which has helped boost the local economy and improve transportation links.

Other significant projects recently completed include the Frenchgate retail development in the town centre, the Sports Complex at Lakeside and a new football stadium for Doncaster Rovers.

Commenting on the Racecourse redevelopment at last November's topping out ceremony, Mayor Martin Winter said: "When complete, the Racecourse will provide a real boost to Doncaster. Residents will see a massive change in the facilities and will be able to appreciate a day at the races at its very best. The new attraction will also provide an anchor for bringing investment into the Borough along with a whole host businesses."

The overall centrepiece of the project is the grandstand structure and its interconnected conference and exhibition hall.

As well as the grandstand, the Racecourse works also include £1M invested in the racing surface, improving both irrigation and drainage which the owners say will ensure the best conditions for the very best thoroughbreds to run in. Meanwhile, new stables are being constructed and these will be complimented by a new horsewalk, saddling boxes, pre-parade ring and weighing room.

Far left: The five-storey structure was built with 14m-long columns spliced at 2nd level to give the overall 28m height.
Left: Steel made the stand's 18m cantilever roof possible.

All of this work constitutes Phase One of the project, with a second phase, including a four-star hotel due to begin in 2008. The overall centrepiece of the project is the grandstand structure and its interconnected conference and exhibition hall. The new five-storey stand will feature numerous bars and restaurants and two levels of private boxes - with panoramic views stretching across the famous Town Moor track.

The state-of-the-art exhibition centre will be housed on the ground floor of the new grandstand and extend back 24m, incorporating more than 4,000m^2 of floor space with a number of alternative room and break-out area layouts.

Most of the grid sections have a unique make-up as there are numerous exits and wheelchair access points.

The new grandstand replaces an old 1970s concrete framed structure which main contractor ISG InteriorExterior began demolishing in January 2006. In line with its sustainability charter, the majority of the concrete, including foundations, were recycled and incorporated in the new scheme. Demolition was completed in June and then steelwork erection was able to commence in late August.

At first the idea was to refurbish the existing stand, but once substantial amounts of asbestos was found, it was more cost effective to demolish the structure and build a new one.

"The decision was then taken to construct the new Grandstand with steel as the programme was very tight," says Tim Royle, Director of TRP Consulting. "Steel also lends itself to the large spans required in the exhibition area as well as the deep cantilever roof."

Mike Rowe, Contracts Director for Billington Structures comments: "By early January we'd completed most of the steelwork, with the exception of a small section of the main entrance canopy. This was the last piece to assemble and lift into place."

For the main grandstand Billington erected approximately 1,500t of structural steelwork with the construction predominantly consisting of column and beams supporting metal decked floors and precast concrete slabs for the terracing.

"We had to erect and programme our work around the pre-cast deliveries," comments Mr Rowe. "There was so much of the material used it dictated our schedule somewhat."

Even with this slight inconvenience, Mr Rowe is quick to point out that Billington was however, always ahead of its contractual programme. All exposed steelwork used on the project was also pre-painted and this contributed to speeding up the overall construction process.

The stand is an imposing structure at 90m-long, with a maximum height of 28m and topped with a 18m cantilever roof.

A whole array of different size beams were used for the terracing areas. Mr Rowe points out that most of the grid sections have a unique make-up as there are numerous exits and wheelchair access points.

The main structural steelwork was erected in 10m x 10m grids, which was also replicated on the roof assembly. The main columns, which are centred at 10m intervals and support the roof, are predominantly 356 x 406 x 235 UC's. These 14m long members were spliced at the building's second level to give the overall height of 28m.

The cantilevered roof is constructed with a number of tapered 18m-long Westok 838mm x 194mm beams which are 30m long overall, having a 18m cantilever section, which were chosen for the durability and lightness.

A grid spacing of 10m x 10m or 10m x 15m was adopted for the main stand to suit the large open plan dining and bar facilities which occur at each level. This was again a key factor in the decision to adopt a steel frame.

The 10m bay spacing couldn't work for the terracing, comments Mr Royle, due to issues of crowd induced vibration and the associated natural frequency limits. This combined with the complexity of the terrace profile with alternating banks of seating and standing area led to a reduction in the bay spacing for the terrace structure to 5m.

Adjoining the back of the Grandstand - and incorporating the ground level of the stand - is the 70m-long exhibition centre which has no internal columns and has clear spans of 20m.

"The exhibition centre needed the open areas and we constructed this structure by using 24m long Westok beams," explains Mr Rowe.

The construction and planning has all gone to plan, however running directly below the Grandstand at a depth of 6m is a main sewer which initially caused some structural headaches. Mr Royle says the answer was to insert a series of 10m long beams to transfer the load over the brick sewer and then lay the ground floor concrete slab on top of this structure.

Doncaster Racecourse is due to re-open for business on 17 August, followed by a Grand Opening Ceremony on the first day of the Ladbrokes St Leger meeting in September. The new Grandstand is set to become a landmark structure for all race-goers.

Hold the front page for steel

A new extension to the Johnston Press works in Portsmouth required some hefty steel bracing to support a narrow and tall structure.

FACT FILE
Print works, Hilsea, Portsmouth
Main client: *Johnston Press*
Architect: *Oxford Architects*
Structural engineer: *McLay Collier*
Main contractor: *Warings Contractors*
Steelwork contractor: *ACL Structures*
Project value: *£11.6M*
Steel tonnage: *900t*

What a building will eventually house often dictates how the structure is constructed and what it will look like. Add to this the available space and quite often a new structure has to be engineered to fit a number of important criteria.

An example of this is the new Johnston Press redevelopment in Hilsea, Portsmouth. This large extension, next to the existing Portsmouth News building will eventually house the latest printing press technology with a capacity to produce more than 80,000 newspapers per hour.

"The building is tall because of the need to accommodate an 18.2m high press, considerable ventilation ductwork and a maintenance crane, together with the need to house an internal erection gantry crane for lifting the presses into place. The width was dictated by the available space and the need for a further framed and trussed structure for offices, plant and a mailroom," says Alan Rose, Partner of structural engineers McLay Collier.

The construction of the structure also had to take into account a requirement for a large truck turnaround area and storage space to the rear of the building.

Johnston Press gained planning permission for the project following an announcement in 2005 that it had secured a 15 year contract to print for News International. This workload, in addition to the numerous local newspapers the company is already producing from its premises, meant a larger press hall was required.

Work commenced on site in July 2005 with the demolition of part of the existing structure containing an old press hall and service areas.

Prior to steel erection beginning, main contractor Warings had already built a long 5m wide reinforced concrete inertia block onto which the new printing press equipment will sit. This inertia block runs virtually the length of the new 60m long press hall building and resembles a concrete trench.

ACL Structures completed the majority of the steelwork in an eight week programme. But the challenge, says ACL's Site Supervisor, Jason Berry, was erecting the frame for the press hall around the concrete inertia block.

The challenge was erecting the frame for the press hall around the concrete inertia block.

"It had recently been cast and we couldn't run plant machinery over it, so we had to erect the majority of the steelwork with 120ft reach cherry pickers and one 35t mobile crane positioned outside of the building's frame so it could get the required reach," explains Mr Berry.

What also necessitated the need for the large crane was the overall height of the new structure and the fact that the site was so tight, as it sits next to an existing building.

"Ordinarily we would erect the steelwork for a job of this size from the inside," says Mr Berry. "But for the press hall that just wasn't possible."

Left: Sturdy bracing was erected at both ends of the building.
Below: the press hall was erected around the concrete inertia block.

Top: The new extension has a stepped appearance running down from the press hall to the offices and then the mailroom.
Above: Steelwork was mostly completed in eight weeks.

"Basically we have a large steel structure built over a concrete interior. The concrete inertia block has two rows of internal concrete columns - one either side - but the rest of the structure is all steel. "Steel is more adaptable for the large open plan areas and the height," explains Mr Berry.

ACL erected main spliced columns in three individual 8m sections to give the overall height. The majority of these members were 686 x 254 x 140. But a free-standing building with a length of 60m, a width of 16m and a height of 24m meant some sturdy steel bracing was needed.

A free standing building with a length of 60m, a width of 16m and a height of 25m meant some sturdy steel bracing was needed.

Mr Rose says, normally on this type of building there are free faces into which the bracing can be inserted. However the design of the structure, with one side of the press hall immediately abutting an existing building and the majority of all other faces being required for access, meant that the bracing of this structure was particularly challenging.

"The bracing at the west end was fairly conventional, however, at the east end it had to be contorted around the stair tower and on to the relatively narrow, solid side panels," explains Mr Rose.

The bracing consists of mainly circular hollow sections up to 219mm diameter at the lower levels. "We also had to incorporate possible future plans to extend the building, - which is easier with steel but also limited the locations where we could brace the structure," Mr Rose adds.

As well as the main press hall, ACL Structures has also erected an adjoining lean-to building which will be used as a mailroom and distribution centre. The structure has no internal columns and consequently features a number of long 24m trusses to support the roof.

Each truss weighs 4.5t and they were brought to site fully assembled and lifted into position as complete units. They are predominantly made up of 203 x 203 x 71 columns.

The lean-to structure also contains a mezzanine office level, covering approximately a quarter of its floor area. "We had to insert some large floor beams for this level," says Mr Berry. Some heavy equipment will also be stored on this floor so some 610 x 229 x 101 beams were erected.

Connected to the lean-to structure, ACL is also erecting a large 20m x 20m steel canopy over a truck docking area. This will consist of cold rolled purlins supported by a number of steel rafters.

Johnston Press anticipates the new presses will start rolling by the end of the year, and before then a second phase of the project will have started. The adjacent 1960s newspaper building is scheduled to be renovated and an additional steel framed mezzanine floor erected within to support new offices.

Compulsory scheme for painting

A new national transportation infrastructure sector scheme for steelwork painting has been published on the United Kingdom Accreditation Scheme web site.

The scheme covers the quality management system requirements for corrosion protection of ferrous materials in transportation infrastructure assets using industrial coatings. Put more simply the scheme (NHSS 19A) applies to the painting of steelwork in transportation structures, such as bridges, stations, toll booths and interchanges.

It has been designed to enhance the quality and long term performance of the coatings used to protect steel assets and applies to new work and maintenance work. Scheme 19A has been drafted to be sector neutral and is therefore suitable to be adopted by clients across the transportation sector.

Clients such as the Highways Agency and Network Rail are adopting the scheme as a mandatory requirement for suppliers contracted to them for undertaking any painting of steelwork in their structures. The Highways Agency has added the scheme to the list of mandatory national highway sector quality management schemes included in Appendix A to Volume 1 of the Specification for Highway Works.

Clients are adopting the scheme as a mandatory requirement for suppliers contracted to them for undertaking any painting of steelwork in their structures.

The scheme includes specific requirements for contractors to achieve a skilled workforce and adopts the Industrial Coatings Applicator Training and Certification Scheme (ICATS) developed by the Institute of Corrosion (ICorr) for operatives as the bench mark level for industry, together with the ICorr certification scheme for paint and coating inspectors. The scheme document, which has been developed through a partnership of industry stakeholders and client bodies, can be freely downloaded from the United Kingdom Accreditation Scheme (UKAS) web site: www.ukas.com/information_centre/publications.asp

Steelwork contractors and painting contractors undertaking works for clients who have adopted the scheme, such as the Highways Agency, should be working towards compliance with the scheme requirements to meet the implementation programme, which is described in the scheme document. This requires contractors to be taking action now as they should be working towards having 40% of their corrosion protection operatives certified to the ICATS scheme by 31 July 2007 and be achieving full compliance with scheme requirements by 31 January 2008.

Contractors should be having early discussions with their quality management system certification body, such as the Steel Construction Certification Scheme (SCCS), to ensure that they will be geared up for auditing and certifying against the new sector scheme to meet the implementation programme.

The Register of Qualified Steelwork Contractors Scheme (RQSC) is progressively including this requirement in its bridgework audits; RQSC is a tendering requirement for Highways Agency bridge projects.

The new sector scheme has been welcomed by the Highways Agency. A spokesman for the Agency said that the scheme should improve the quality of application of paint coatings used to protect its steel structures from corrosion, reducing whole life costs and disruption on the road network through extending the life of coatings. He added that it is also a further step forward in meeting the Agency's aim of achieving a fully skilled workforce on its roads.

On 27 March there will be a Highways Agency/BCSA/RQSC Joint Seminar on the new Scheme at the National Liberal Club, London, chaired by Derek Drysdale, Divisional Director, Highways Agency. The Seminar Programme will include: Background to the Scheme and Implementation by the Highways Agency; Impact on Quality Management Auditing Requirements; Industrial Coatings Applicator Training Scheme, and Implementation by Network Rail.

The fee for the Seminar is £94 (£80+VAT). For bookings contact Gillian Mitchell MBE at BCSA. Tel: 020 7839 8566. Email: gillian.mitchell@steelconstruction.org :

Above and below: The new scheme applies to all steel transportation infrastructure such as toll booths and bridges.

For further background information on the new Scheme contact:
ICATS:
Tel: 01709 560459
Email: enquiries@ruanetpo.com
UKAS:
Tel: 020 89178400
Email: info@ukas.com
RQSC:
Tel: 020 7839 8566
Email: gillian.mitchell@steelconstruction.org
SCCS:
Tel: 020 7747 8126
Email: peter.mould@steelconstruction.org

Left: Cold war aircraft are suspended from steel roof trusses in the huge hangar. Below: A total of 672t of steel has created this innovative structure formed of two curved triangular areas with a central spine.

Steel provides new home for Cold War collection

The National Cold War Exhibition opens this month displaying a unique range of historic aircraft now preserved in an innovative steel structure, reports Victoria Millins.

One of the largest collections of aircraft from the Cold War has been brought together in a new landmark structure. The Royal Air Force Museum Cosford is now home to the National Cold War Exhibition, one of the first to focus solely on this significant part of modern history.

Some of the aircraft on display are the only surviving examples and needed to be preserved in a purpose designed building with controlled humidity and lighting. Architects Feilden Clegg Bradley, structural engineer Michael Barclay Partnership and building services engineer Max Fordham designed the innovative structure, formed of two triangular areas to reflect its content and the Cold War period.

The £12.4M project was completed in December 2006 and will open to the public this month. The exhibition tells the whole story of the Cold War from culture and sport to economics and space with missiles, radar designation models, military vehicles and even a piece of the Berlin Wall on display as well as a number of interactive kiosks.

The design consists of a central spine supporting a series of steel trusses of varying length and pitch spaced 8.4m apart and which fan out and slope on angles from 25° to vertical. The finished structure, clad in steel, is characterised by its sweeping curves in two directions despite every structural element being straight.

The building measures 160m in length, has a maximum width of 60m and is 30m high. The fabric covered gable ends have been designed to be removable making it possible to take the aircraft in and out when necessary.

Steelwork contractor SH Structures, carried out the supply and installation of the 672t of complex steel used for the project. (See New Steel Construction October 2005 for further information on the construction details.)

The central spine includes a 75m long elevated walkway, which divides the two triangular areas and features a lift up to a look out area to view the museum from above and to get a closer look at suspended aircraft.

The design provides over 8,000m^2 of space for two classrooms and an auditorium as well as the huge display hall. A total of 17 aircraft are now on display including Britain's three V-Bombers; Vulcan, Victor and Valiant and the massive Short Belfast with its 45m wingspan. A number of aircraft are also suspended from the roof such as a Canberra at 13t (with the engine removed) and a 9t Dakota.

Director General of the RAF Museum Michael Fopp said: "This is the largest expansion at the museum since it was founded and it is the world's first exhibition dedicated to the Cold War. It reflects not only the aircraft but the lifestyle and culture.

"The building itself is designed to show the divided ideologies of the Cold War with a dark and a light side." The 'dark' side houses the missile carriers and weapons and the 'light' side holds the transporters and items associated with the lifestyle of the period and is the only part of the structure with glazing. The exposed structural steelwork has been designed to be a significant feature of the structure and is unpainted to emphasise the atmosphere and the industrial feel of the Cold War.

The structure is characterised by its sweeping curves in two directions, despite every structural element being straight.

FACT FILE
Aviation Museum, RAF Cosford
Main client: *RAF Museum and Bridgnorth District Council*
Architect: *Feilden Clegg Bradley*
Structural engineer: *Michael Barclay Partnership*
Main contractor: *Galliford Try*
Steelwork contractor: *SH Structures*
Project value: *£12.4M*
Steel tonnage: *672t*

Complex steel frame helps revitalise Nottingham city centre

Value engineering has contributed to a reduction in steel during construction of a large city centre development in the East Midlands, as Margo Cole discovered

FACT FILE
Trinity Square, Nottingham
Client: *Helical Bar in association with Overton Developments*
Architect: *Haskoll*
Structural engineer: *BWB Consulting*
Design and Build contractor: *Shepherd Construction*
Steelwork contractor: *DA Green*
Project value: *£47 million*
Steel tonnage: *1,000t*

Above: Despite considerable value engineering, there is still 1,000t of steelwork in the new structure
Below: Floor slabs are composite steel deck and in situ concrete

For the last 30 years Nottingham has seen little in the way of major retail development, but that is set to change later this year with completion of Trinity Square, a large mixed-use development in the heart of the city. The scheme is not a typical shopping centre, but two city blocks that will house 17,650m^2 of shops and restaurants, 462 car park spaces and 700 student flats. One block will be 10 storeys in height, and the other six.

The larger of the two, the North block, will have retail and leisure space in the basement, ground and first floors. Above this will be two levels of car parking, topped with five floors containing 500 student flats. The South block also contains three levels of retail and commercial space, and 200 student flats on the two upper floors.

Main contractor Shepherd Construction is using two different forms of construction for the £47M scheme: in situ concrete for the North block and steel frame for the South.

The scheme's developer Helical Bar wanted large, open floor spaces on the lower levels to attract potential retailers. While this makes good commercial sense, it set the scheme's structural engineer, BWB Consulting, the challenge of finding a way to take the loads from the upper floors down to ground level when the structural grids do not line up.

This has been achieved by installing a transfer slab at level two in the North block and considerable support steel at the same level – immediately above the retail space – in the South block. Here, the apartments are being built on a standard 3m grid, whereas the retail space below is on an 8m x 7.5m grid.

This is just one of many complexities in the structural steel frame. The building has three straight sides that are not square to each other, with the fourth side a curved façade that forms the backdrop to a new public piazza. One corner of the building has a stainless steel and glass overhang feature that cantilevers over the two fully glazed floors below, resulting in structural columns having to spring from cantilevered beams.

"It's a pretty complex building," admits Shepherd's Project Manager, Malcolm King. "When we looked at the drawings we just thought it was a lot of steel, but what you've actually got is a simple grid for two thirds of it, and then you have to incorporate this curved piazza area into this square grid. You also have the challenge of stepping the building back."

The design also has to deal with a level change of 3m from west to east. "The basement is flat," explains Mr King, "But when it comes to ground floor level, the client was looking to meet the existing external ground level for the shops, so there are lots of steps and joggles in the ground floor."

The client was looking to meet the existing ground floor level for the shops, so there are lots and steps and joggles in the ground floor.

He says that, during the design process, "the transition from concept to real thing was quite interesting". Detailed design resulted in an extra 300t of steel being required compared to initial estimates. Shepherd, BWB and steelwork contractor DA Green carried out a major value engineering exercise to try to claw some of this back, but the contractor was still facing a higher tonnage of steel than it would have liked.

"We decided to use Grade 50 steel for a lot of the major repetitive components," says Mr King, "the advantage being that we can use the same member sizes but it is a lot lighter, so we reduce our tonnage but issues about the architecture and headrooms don't get impacted on.

"It is only worth doing for major elements where there is considerable weight: the columns and the main and secondary beams to the floor slabs up to level two," he adds.

Grade 50 steel is stronger than traditional Grade 43 and, in some circumstances, could result in smaller member sizes had the team chosen to go down that route. However, as Ian Burchnall,

Contracts Manager at DA Green, points out, changing to Grade 50 does not give any benefit in deflection, so beam sizes were likely to remain the same. He adds: "By changing to Grade 50, they were not affecting the programme with a full redesign, but they were still getting benefits."

Using Grade 50 for these key structural components allowed Shepherd to cut the total tonnage of steel down by 50t, giving a new total of almost exactly 1,000t.

Steel design began in April 2006, with erection starting three months later. In addition to the structural steelwork, DA Green is also supplying and installing steel decking from Sudwelders for the composite floor slabs, and installing precast concrete stairs from Bison Concrete Products.

The ground, first and second floors were erected from the ground, but for the two residential floors erectors have been using cherry pickers working from level two, together with a 50m reach luffing jib tower crane. The decision to work from level two has had repercussions on sequencing, particularly the construction of a service trough that runs below the floor slab at this level.

"None of the services from the flats can go through the retail space," explains Mr King, "So we have everything – including soil and vent and rainwater – going through this trough, which is a waterproof, completely self-contained void in the ceiling space above the shops."

The trough is being built in the same way as the rest of the structure with the steelwork hanging from the beams at level two of the main frame. Access to the trough will be via 200 manholes located in the corridors between the student flats.

"Initially we were going to form all those holes when we cast the floor slab," explains Mr King, "but we soon realised that wouldn't be the most effective way to go, so now we've laid the slab and we'll cut the holes out later."

This decision enabled DA Green to make full use of that floor slab for erection of the upper floors. However, the floor and walls of the trough cannot be concreted until the steelwork contractor has moved off, because the level two beams have not been designed to carry both the load of the concrete in the trough and the 3t cherry pickers.

When finished, the service trough will range between 750mm and 1200mm in depth, and will be 1500mm wide.

Erection of the final section of steel frame – the upper level of the curved side of the building – is set to finish soon. "For such a complex frame, the steelwork build has fitted very well," says Mr Burchnall, reflecting on the success of a decision to split the detailing by Green's in-house CAD team into four separate models, bringing them together at the last minute prior to fabrication.

Shepherd will now continue with the cladding (a mix of brick, steel, glass, stainless steel and prefabricated concrete) and interior construction. The contract includes shell and core for the retail units – which have phased handover dates – and full fit-out of the student flats.

The entire scheme is due for completion at the end of 2007.

Above left: Steel erection has been done using cherry pickers and one tower crane
Above: The building's footprint leaves little space for storage or access during construction

Left: Stepped, cantilevered steel will hold feature glass and stainless steel cladding at one corner of the building

Stylish design for structures

Aesthetically and structurally, the design of the 35 storey Broadgate Tower and the adjacent 12 storey 201 Bishopsgate building are very much Skidmore Owings & Merrill (SOM) productions, similar in nature to high rise SOM buildings in Boston and Chicago. Each of the London buildings is steel framed and clad in stainless steel and glass, with the SOM signature of exposed structural members and angles contributing to a 'sharp' visual effect.

The Broadgate Tower is a parallelogram in plan, whereas 201 Bishopsgate features concave and convex elevations, as well as one straight side adjacent to the tower. Both buildings gain their stiffness from a combination of steel bracing and lift shafts, although the massive steel cross members contribute the majority of the tower's robustness, the lift core steelwork being suspended from the main frame.

London gets signature towers

The City of London's next high rise office development contains British Land's Broadgate Tower and 201 Bishopsgate buildings – iconic steel structures and logistical challenges for William Hare and Bovis Lend Lease. Jon Masters reports.

Economic conditions have become good again for big speculative developments in London and along Bishopsgate, close to the capital's financial heart, the latest high rise structure is progressing on schedule. Steelwork contractor William Hare is now nearing the end of its part in the Broadgate Tower and 201 Bishopsgate development – an impressive steel construction project in many ways.

Some heavy structural engineering has been employed at the base of both buildings to allow them to be built over mainline rail tracks just north of Liverpool Street Station and equally impressive work has followed as the steel frames have risen. Both buildings are now nearing full height – 35 storeys in the Broadgate Tower and 12 in the adjacent 201 Bishopsgate. When Hare's work is completed a total of 13,000t of steelwork will have been fabricated at the company's Yorkshire yards, transported to central London and erected within a site no bigger than the buildings' footprints.

At peak production late last year, Hare's site team was taking delivery of 120t of steelwork every day, unloading it along Primrose Street to the south for Broadgate Tower and in the 'pit-lane' established within the columns of 201 Bishopsgate for receiving materials for that building.

At peak production, Hare's site team were taking delivery of 120t of steelwork every day.

"It feels not long ago since we were planning the delivery programme and doing trial runs to check the logistics would work with the size of the lorry loads," says Hare's London Director Nick Day.

Six tower cranes have been used by William Hare, including two jump cranes per building.

FACT FILE
201 Bishopsgate development
Main client: *British Land*
Architect & structural engineer: *Skidmore Owings & Merrill*
Construction manager: *Bovis Lend Lease*
Steelwork contractor: *William Hare*
Project value: *£292M*
Steel tonnage: *13,000t*

Below: Fabsec beams feature in 201 Bishopsgate.

"Routes into the city and traffic arrangements were all agreed with the Corporation of London, Transport for London (TfL) and City Police. Overall everything has gone well. Loads were seldom late and we have generally matched or exceeded our planned piece rate (of steel erection)."

It is now two years since the steelwork under way at Bishopsgate was being planned, but Hare's involvement in the project dates back to 2000 when the firm priced up a smaller development for the same site. Developer British Land shelved that scheme due to market conditions. A large 2.5m deep, twin decked, steel raft was built by Bovis Lend Lease though to create a safe working platform over the Liverpool Street tracks.

The site created by the raft lay dormant until 2004 when British Land and its development manager M3 Consulting appointed Bovis Lend Lease as construction manager and Hare was awarded a contract for alterations and extensions to the steel raft (see box, over page). Market conditions had come good again and the plans changed and expanded to include the Broadgate Tower and 201 Bishopsgate buildings, designed by the American architect and structural engineer Skidmore Owings & Merrill (SOM).

The design concept now also included large unobstructed floor spaces and lobbies, aesthetic sharp lines and steel frames with structural elements exposed including the main steel bracing. The new Broadgate Tower footprint extends beyond the limit of the raft, which had to be extended with six massive A-frames included in the design to transfer the weight of the tower into its foundations.

Above: Steel erection of both 201 Bishopsgate and the Broadgate Tower is progressing on schedule for completion before April 2007.

"This was an engineering feat in itself, just building up to the fifth floor. The new Broadgate Tower footprint required careful load transfer into the existing raft and this has been achieved by the design of the A-frames, each consisting of two 20t box girders of 40mm plate steel. Before these were fully erected, most of what could be seen on site was temporary steelwork for supporting the A-frames and floors up to level five," Mr Day says.

Each A-frame consists of two 20t box girders of 40mm plate steel

Hare was awarded the steelwork contract for both buildings – around 8,000t in the Broadgate Tower and 5,000t in 201 Bishopsgate – in December 2005, two months after starting work on the 600t of extra raft steel. Erection of the main steelwork got under way in May last year, with three tower cranes per building including two jump cranes inside the tower.

"It was quite challenging, coordinating the crane jumps," Mr Day says. "The cranes were free standing up to floor 11 and then were jumped every sixth floor, but only after all of the frame erected at that point was fully bolted and welded. The majority of the steel fixing has been carried out from three MEWPs (mobile elevated work platform) on each building, lifted up every three floors."

Steel erection has progressed smoothly since May last year, Mr Day says, helped by planning that "modularised" the steel pieces where possible to reduce pressure on the cranes. Also, secondary steel was engineered in the early days of the project with service holes and lift shaft and, where possible, cladding brackets pre fixed to the steel when it arrived on site. "Plus, the decision to site-weld the main nodes in the external frame has helped with the required building tolerances," Mr Day adds.

Hare's 160 strong workforce of steel erectors, deck fixers and welders (it also has a management team of 20 on site) is due to finish steel erection and floor decking by Spring this year – all decking has been cut off site to minimise noise in the vicinity and Hare's own proprietary edge protection system has been used. Concreting of the composite floors, fire protection, dry wall partitions and cladding, services and just about all of the project's other trades are now following up behind erection of the two steel frames.

Column heights have been fabricated at three storeys to further reduce pressure on the cranes and each of the main signature diagonal bracing members in the Broadgate Tower consists of two 13.5m welded sections. Clear floor spaces in both the tower and 201 building have been achieved with 20m spans and 12m bays, and beam depths

Both buildings are being constructed with use of Hare's proprietary edge protection systems for safety.

of 500-600mm are typical – Fabsec beams in 201 Bishopsgate and plated girders in the Broadgate Tower. It all adds up to around 300 pieces of steel per floor in the tower and about twice that number in each floor of 201 Bishopsgate.

"It has all fitted together well. We have had to work closely with the structural engineer SOM and the cladding contractor Josef Gartner to make sure all of the steelwork and fixings fit and we have had to interface with a lot of other trades," says Mr Day. "Overall this is a very integrated project, so far achieving a smooth follow on of work.

Rail extension makes room

The raft over the Liverpool Street rail tracks – and now beneath the Broadgate Tower and 201 Bishopsgate – is a 2.5m deep structure of two twin steel framed decks on piled foundations with precast planks and concrete topping. William Hare's job on first arrival, through a separate contract to the main building steelwork, was to cut through the 300mm top slab and expose the steelwork for adding another 600t of steel for strengthening and extending the raft.

The 201 Bishopsgate frame fits on the original raft structure, built in 1999, but the Broadgate Tower extends further out, which necessitated an extension to the raft and the six massive steel A-frames for distributing the tower loads evenly over the raft and down into its piled foundations.

"Eight new piles from 3m diameter at the top to 9m in diameter at the bottom were machine dug down to 20m in depth to form the extended foundations," says Bovis Lend Lease Project Manager Robert Dudley. "The steel trusses of the raft were then extended out on the west side by William Hare with new 2.5m deep girders. Twelve massive steel and concrete node pieces connect the base of the A-frames to the old and new piles."

Update for steelwork specification

National Structural Steelwork Specification for Building Construction – 5th Edition was published last month. Dr David Moore, BCSA Director of Engineering explains the significant changes.

Above: The cover of the new edition of the NSSS.

On 1st January 2007 the BCSA published the 5th edition of the National Structural Steelwork Specification for Building Construction (NSSS). The revision of the NSSS was prompted by the developing of a forthcoming European standard for the fabrication and erection of structural steelwork, BS EN 1090-2, which is expected to be introduced at the start of 2008.

"It was decided not to completely adopt the philosphy of BS ES 1090-2 but to create a kind of halfway house between version 4 of the NSSS and the new European standard."

"At the start it was decided not to completely adopt the philosophy of BS EN 1090-2 but to create a kind of halfway house between version 4 of the NSSS and the new European standard," explains Dr David Moore, BCSA Director of Engineering.

The updated specification contains a number of changes that will be of interest to specifiers and steelwork contractors.

The reference standards for steel sections, structural bolts and welding have been updated to reflect the changes that have occurred since the publication of the 4th edition of the NSSS. The erection tolerances for foundation supports have now been aligned with the National Structural Concrete Specification.

The preferred generic treatment specifications originally developed by CIRIA have been moved from the Commentary into the NSSS.

Meanwhile, the welding quality standard BS EN ISO 3834-3 (replacing BS EN 729-3) and by reference the welding coordination standard BS EN ISO 14731 (replacing BS EN 719) are now part of the NSSS. Steelwork contractors are required to operate their welding quality systems in line with these standards.

"Those steelwork contractors with quality systems certified to BS EN ISO 9001 should expect to have the scope of certification endorsed by a specific reference to BS EN ISO 3834-3 in due course," says Dr Moore. This will align with forthcoming requirements in BS EN 1090-1 and -2.

A new section has been added giving options for post-galvanizing inspection to avoid liquid metal assisted cracking. This is based on guidance given in the joint BCSA and Galvanizers Association publication 'Galvanizing Structural Steelwork - An Approach to the Management of Liquid Metal Assisted Cracking'.

A new Annex D has been added which gives practical advice on how to carry out the visual inspection of welds. The recommendation given in this Annex are based on the key procedures given in BS EN 970. These include visual inspection prior to welding or between weld passes, and visual inspection after deposition of each weld pass or at final completion.

Meanwhile, the hold times in Annex A have been revised. These are now based on heat input and weld size rather than material grade. They are based on the recommendations given in Annex C of BS EN 1011 Part 2.

"The test requirements for stud welding have been clarified," adds Dr Moore. They have been developed from issues identified in the BCSA 'Code of Practice for Metal Decking and Stud Welding'. The revised recommendations include trial welds, tests and non-conformity procedures.

Copies of the 5th edition of the National Structural Steelwork Specification for Building Construction may be purchased from BCSA or SCI at £25.00 to non-members and £18.75 to members per copy. A further 10% discount is given to BCSA Members on orders of 20 or more.

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Above: Gala Bingo, Newcastle - 50m span cellular rafters proved more economical than heavier UBs or plate girders.

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Stiffened moment connections

Alan J Rathbone, Chief Engineer for CSC, explains the practicality of applying welds to stiffeners while maintaining adequate strength.

Introduction

In the haunched moment connections of portal frame structures it is common practice to provide stiffeners to achieve the necessary moment of resistance in the connection. These stiffeners are welded to both the flange and web of the column (and in some cases to the web of the beam and the endplate). For some stiffeners the detailing of the welds on the column side can be problematic when trying to balance the practicality of applying the weld with the requirements for adequate strength.

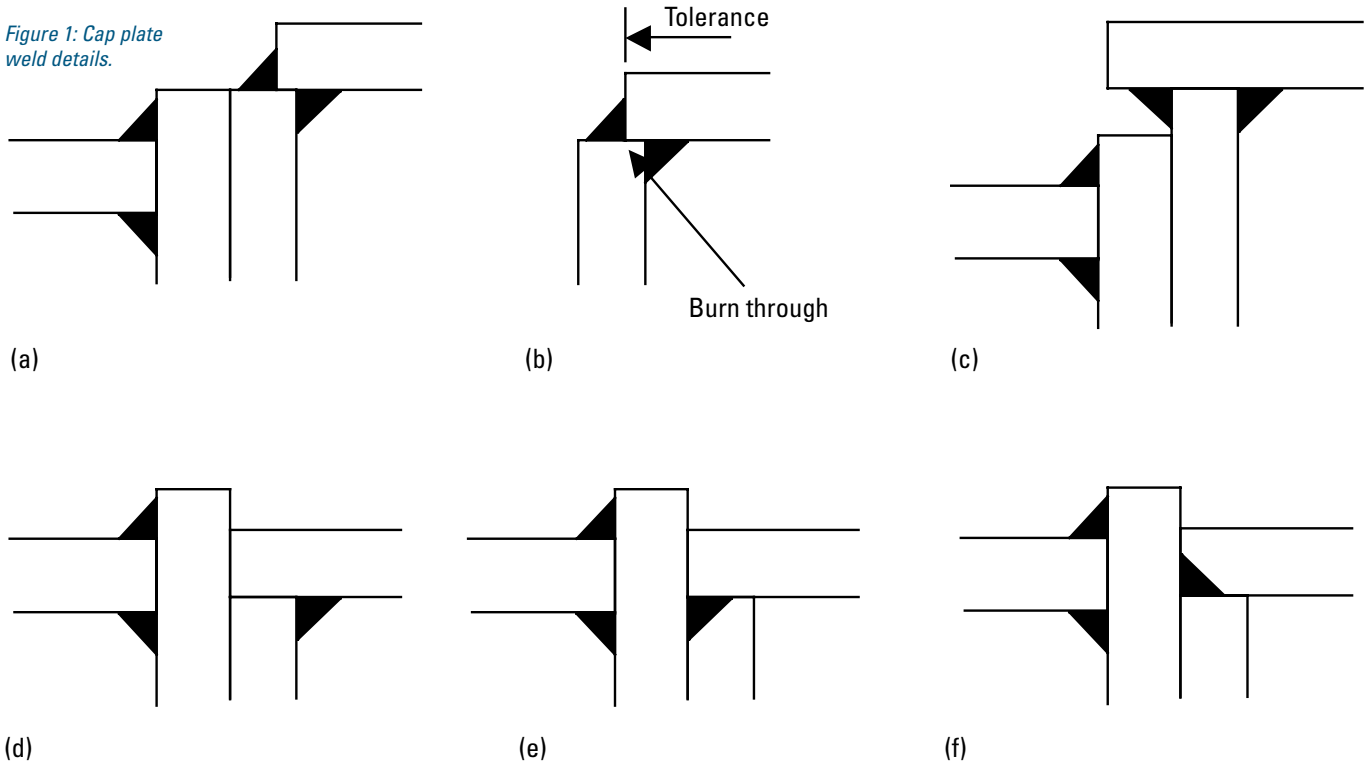
Cap plate details

In design, cap plates can be used to advantage when there are significant reverse (negative) bending moments applied to the connection. In this case they can enhance the compression resistance of the column web both in bearing and buckling. Lifting devices can be incorporated into them to assist with 'clean' lifting of the column into its erected position.

The 'standard' detail for a cap plate is shown in Figure 1(a). The end plate and column top are aligned and the cap plate is mounted on the top of the column. The simplest weld is single sided and follows the full profile of the column. This may prove inadequate in design terms and so the double sided weld as actually depicted in Figure 1(a) may be adopted. As indicated in Figure 1(b), due to the variations in the rolled size of the column section and the length and positioning of the cap plate there may be a tolerance issue. For lighter columns with thin flanges there may be a possibility of burning through the corner.

Alternative details can be 'invented' such as those shown in Figure 1(c). This is not to be recommended since the raised column top and the oversailing stiffener may interfere with other components in the eaves area. Also, the cap plate may be too distant from the beam flange to be convincingly able to assist with the compression resistance of the column since the point of rotation

Figure 1: Cap plate weld details.



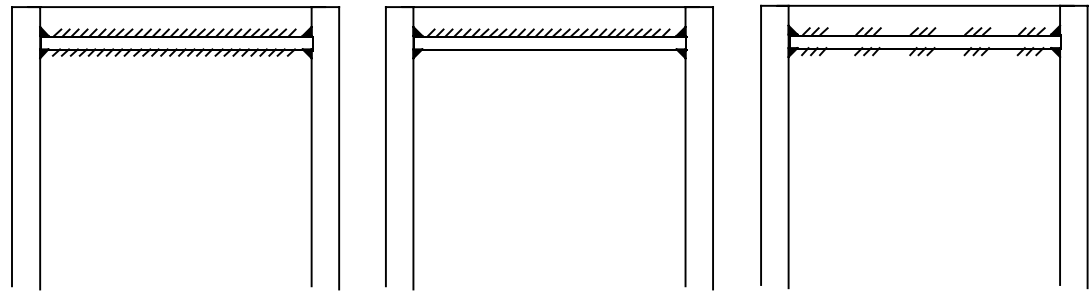


Figure 2: Full depth stiffener web welds.

of the connection is assumed to be about the centre line of the beam flange (in reverse bending).

The other alternatives shown in Figure 1 are variations of the same concept. That is, to ensure that the cap plate is in line with the beam flange and hence forms a direct load path. This relies on the cap plate and its welds being made flush after welding so that they could be considered as 'fitted'. 'Fitted' infers that the cap plate resists the component of the compression from the beam flange in direct bearing and hence needs only nominal welds. The variations in Figure 1(e) and 1(f) require a 'prep' for the welding and so are less desirable. Before attempting to adopt any of the 'fitted' details, the steelwork contractor should be consulted to ensure that such a detail can be achieved with normal workshop practices.

The 'standard' detail with single or double sided welds is simple to execute and is the first choice for most steelwork contractors. In the design of these welds, whether single or double sided, any opening of the weld, due to flexure in the column flange under positive bending, is not normally taken into account. Fortunately, the forces required of the stiffener and its welds under this loading condition are relatively small. For significant reverse (negative) bending moments, the cap plate and its welds are likely to be subject to a significant compression force (in the same way as a normal compression stiffener at the bottom of the connection). This may create more difficulty in satisfying the design requirements and the 'fitted' cap plate may then be worthy of consideration.

The 'standard' detail with single or double side welds is simple to execute and is the first choice for most steelwork contractors

Of course, if the reverse (negative) bending moments are relatively small then the unstiffened column web, even allowing for the end condition, is likely to be adequate. A cap plate is then not required from a design point of view and, given that it is not required for other purposes, should be omitted to improve cost effectiveness.

Full depth stiffeners – web welds

As an alternative to a cap plate, a pair of full depth stiffeners can be used that are positioned just below the column top as shown in Figure 2(a). This is a much more robust detail in design terms as the flange welds are symmetrically disposed around the stiffener. The position of the stiffeners will be such that they align with the beam flange and thus can be clearly taken to be fitted and hence require only nominal welds.

However, it is not often used in preference to a cap plate because there are two piece parts and significantly more welding is required. Incorporating lifting devices is usually impractical.

The cost component in fabrication of having to use full length welds along the whole stiffener to column web interface could be reduced by adopting one of the two details given in Figure 2(b) and (c). The one sided weld of Figure 2(b) could distort the plate during the welding process but is probably more efficient to lay than the stop-start of the double sided stitch weld in Figure 2(c). A further alternative (not shown) would be to provide a longer stitch alternately on each side of the stiffener. There would be less stop-starts and the alternating sides would maintain the line of the stiffener.

In design terms given the same amount of weld material, the continuous one sided weld is also more efficient since for the stitch weld at each start and stop, a leg length must be discounted in the design length of the weld. The stitch weld should comply with the minimum length requirements of BS 5950-1: 2000.

In the normal double sided weld detail, the length of weld, being the full width of the web, is usually more than adequate to resist the design force and the use of a relatively small weld (6 mm fw) is usually found to be an over-provision. The alternative details with less total length of weld are likely therefore still to be adequate.

Whilst the details in Figures 2(b) and (c) are suggested as alternatives to a cap plate, such savings in weld material could also be used for full depth stiffeners used in standard situations - eg - as a compression stiffener at the bottom of the connection.

Of course, for both positive and negative bending moments, the column web in compression may be adequate without stiffening. In this case full depth stiffeners should be omitted to improve cost effectiveness. Indeed, particularly in multi-storey construction, increasing the column size (web

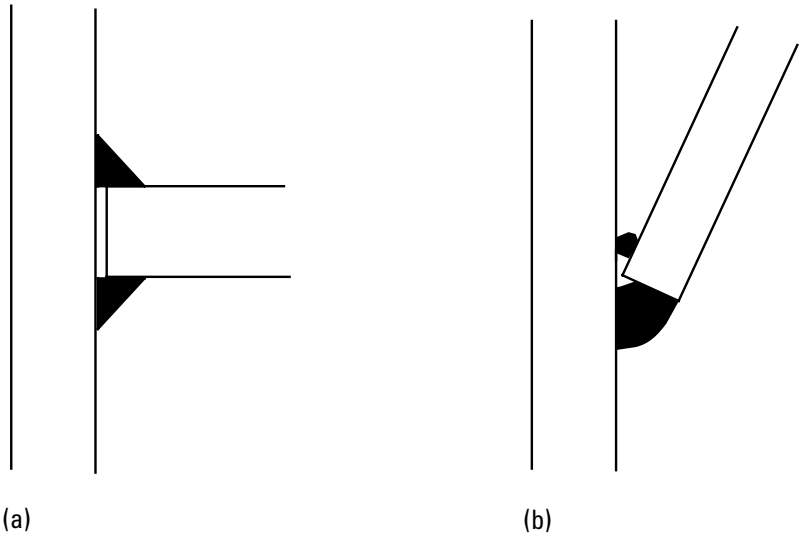


Figure 3: Single stiffener weld details.

thickness) to avoid stiffening can be a cost effective solution.

Diagonal stiffeners – flange welds

The standard flange weld details for compression and diagonal stiffeners are shown in Figure 3(a) and (b). These are taken from the Green Book on moment connections for which adequate design rules are provided.

However, compression and diagonal stiffeners are often used together and this creates a more difficult detail for the flange weld and consequently a difficulty in satisfying the design requirements. Three alternatives are shown in Figure 4(a), (b) and (c). The main difficulty in the weld detail stems from the steepness of the diagonal stiffener compounded by the crowded nature of the joining elements. In all cases (including the single stiffener detail of Figure 3(b)) the diagonal stiffener is usually sufficiently angled that the weld on the top side of the stiffener can only be placed as a sealing run and this cannot be relied upon in design. Indeed, the diagonal stiffener may be sufficiently steep that a sealing run cannot be placed from the top and so should be placed from underneath (this is not possible with the detail in Figure 4(a) since the compression stiffener is placed first).

Figure 4(c) overcomes the crowding issue by separating the two stiffeners such that the single stiffener details of Figure 3(a) and (b) can both be used. Clearly they should be separated sufficiently to allow the weld material to be placed without difficulty. As shown the shear stiffener weld might still be difficult to place and moving the two stiffeners further apart would interrupt the load path from one to the other.

The details in Figure 4(a) and 4(b) are probably the most common in practice. In Figure 4(b), if the compression stiffener is 'fitted' then the flange weld need only hold it in place (and resist any (smaller) tension forces in reverse bending). However, the diagonal stiffener is only held by a single fillet weld. Again this may be adequate since most of the shear transfer from the web panel to the shear stiffener occurs through the web weld. The problem with this detail occurs when the compression stiffener is not fitted and in all cases when the diagonal stiffener to flange welds must resist a significant design force. When the compression stiffener is not 'fitted' then the use of the detail in Figure 4(a) would overcome

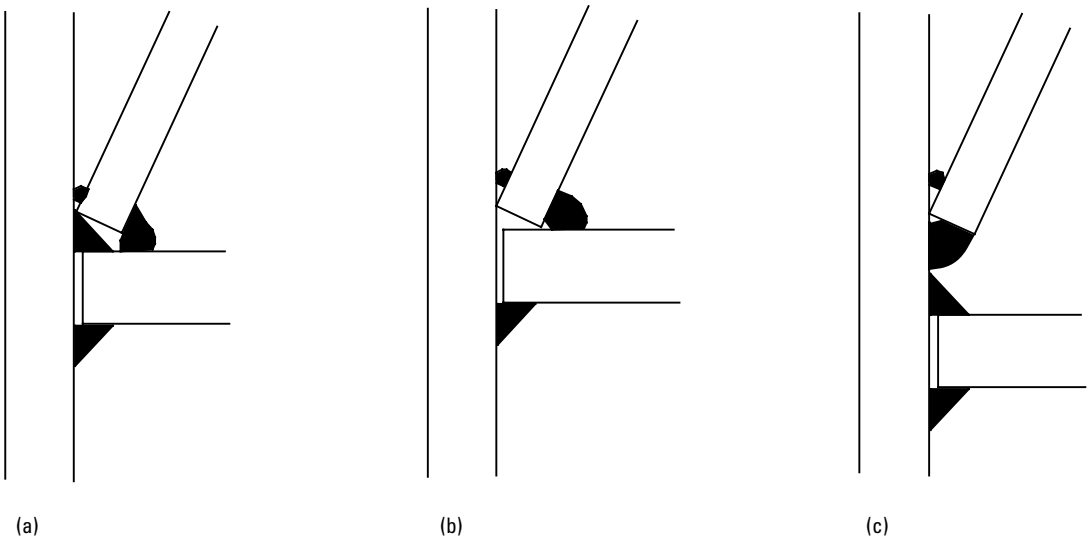


Figure 4: Combined stiffener weld details.

this – the compression stiffener being placed first. Improvement in the robustness of the weld can be made by 'preparing' the end of the diagonal stiffener – effectively giving a full strength butt weld – but with the penalty of increased fabrication time and hence cost.

Of course, the preferred detail is to avoid the use of diagonal stiffeners altogether. In portal frame haunches this can be achieved by increasing the haunch depth (so reducing the shear) or increasing the section size or grade. In multi-storey construction other beams that frame into the web prevent the use of diagonal stiffeners. In this case the best option is usually to increase the column size or, if there is no other option, to use web plates – the standard detail for these requires a significant amount of welding.

The best advice in all of these situations is to consult the steelwork contractor.

The best advice in all of these situations is to consult the steelwork contractor – who knows what is achievable in the workshop and what is economic. It is the old axiom that least weight in the member sizes may pay the penalty of increased fabrication costs.

Steelwork speeds civil airport expansion

At practically every civil airport throughout the world the story is the same. Because of increased traffic, both freight and passenger but particularly the latter, expansion of facilities has become imperative. In some instances although generous estimates of future traffic were made when planning the original airports it is obvious that these will in many cases be exceeded even before the planned dates are reached.

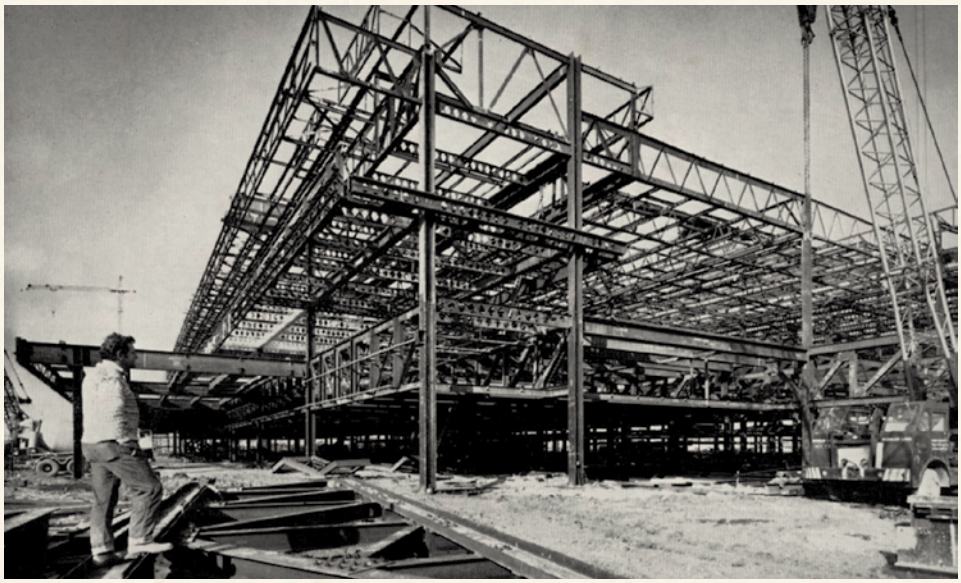
Britain is no exception, and extensions are being made and new airports constructed, up and down the country. Speed of completion, economy and suitability for even further expansion are essential requirements for such work, requirements that have resulted in considerable use of steel framed buildings.

Nowhere in the country is this rapid expansion so evident as at Heathrow which now has the distinction of being the busiest international airport in the world. Even after making allowance for the continuing upward trend in world air travel the figures for Heathrow are spectacular: in 1965 approximately 10 million passengers used the airport and in 1966 this total exceeded 12 million. In August last year nearly 1.5 million passengers entered or left Heathrow, the record for any day being 60,040 passengers and 823 aircraft movements, the highest for any European airport.

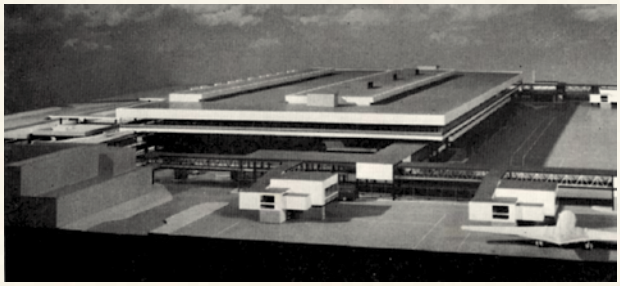
Passenger Pier System

The average annual increase in air traffic at Heathrow is in the region of 14-17 per cent and to cope with this the British Airports Authority is implementing a massive building programme aimed at speeding the flow of passengers through the airport, one stage of which is the provision of a £2 million pier system in No.1 and No.3 buildings enabling passengers to walk direct into their aircraft. When completed there will be four such piers, two to each building, each with up to eight fingers giving access to aircraft parked nose-in on each side. Two of these piers and the central portion of the other two are now completed.

All piers are of generally similar design, with the passenger walkway at first floor level. The ground floor level is for use by the staff control-



Above: No. 1 passenger pier, Heathrow.
Left: Steelwork for the North East terminal complex, Heathrow.
Right: Model of the North East Terminal complex – the main passenger building is in the centre and one of the piers is in the foreground.



ling the servicing machines on the apron: engineering equipment will also be housed there. The piers are steel framed, the choice of this form of construction being largely influenced by two major considerations. First there was the need to complete the piers as quickly as possible and second, it was necessary to develop a simple design that could be easily repeated for all piers. It was felt that structural steelwork met this and other requirements more satisfactorily than other materials. The total amount of steelwork in the piers amounts to some 1,400 tons. In addition two piers will be constructed as part of the North East terminal complex described later.

North East Terminal Complex

The most recent major project at Heathrow is the £8 million North East passenger terminal complex for British short haul and domestic operators and said to be the largest in the world. It is due for completion in 1968.

The passenger building itself, approximately 600 ft by 275 ft, is planned to accommodate 'Arrivals' passengers on the ground floor and 'Departures' passengers on the upper level, served by an elevated one-way approach road which also gives access to a multi-storey car park. There are 5,600 tons of steelwork in the main building and 1,300 tons on the coach stations and the two piers.

A structural steel frame was selected for the main building for reasons of construction speed, adaptability and architecture, and much of the steelwork is exposed and painted. The uncased universal columns express the structure elegantly and without obtrusion and are isolated visually from the floors which they support, thus enabling the quality of the large internal spaces to be appreciated.

The staircases are prominent features of the public spaces, constructed with exposed steel stringers, consistent with the main steel frame. Some are similar to those in the last passenger building constructed in the Central terminal area; others incorporate cantilevered landings and considerable use is made of cantilevered construction throughout the building.

The building has a height limitation due to radar clearance lines and sight lines from the control tower and this, together with the necessary clearances for baggage conveyors and other services in the mezzanine and roof voids, imposed severe restrictions on structural floor depths. Extensive use has been made of castellated beams to provide continuous access runs for the pipes and ducts of the air-conditioning and other services, and the deep voids are framed wherever possible with lattice girders.

The steel used in the design was mild steel to B.S 15 and high yield stress steel to B.S 968 where there was restricted headroom. The construction is generally shop welded with main site connections of high strength friction grip bolts. The section of elevated road in front of the building is steel-framed, composite with an 8-in. reinforced concrete slab, for which stud-welded shear connections were used: on the airside a road runs within the building providing access for coaches and separating the passenger area from the baggage handling handling accommodation.

Architects - Frederick Gibberd & Partners:
Structural Consultants - Sir William Halcrow & Partners.

AD 307
Additional Moments in Braced Bays: 2

This is the second AD in a series that comments on the forces and moments to be designed for in beam-column-bracing connections in braced frames. *AD 306* covered the 3 most common cases which should be used where possible. This AD covers a further 3 connection details which are frequently employed and offers advice on how they can be designed.

Figure 1 shows a situation, with two alternative gusset plate details, that arises due to the inclination of the bracing member when the centre lines of the members are coincident. Although the gusset is only attached to the beam this arrangement should be designed as the first case in *AD 306* using either of the models described therein. Alternatively, the designer may rearrange the whole beam-column-bracing detail in accordance with either the second or third cases as described in *AD 306* and design appropriately.

In order to create an alternative simple detail to Figure 1 the gusset plate may be attached to the column separately as shown in Figure 2. In this case the horizontal component ***H*** of the brace force causes additional bending of the column. The bending moment diagram caused by this effect may be determined directly from the structural analysis if modelled appropriately but in hand calculations it is usual to take an additional moment, ***M = He*** on the column. This is a primary moment acting on the column and not a nominal moment and is therefore not to be distributed into the column above and below the joint as described in clause 4.7.7 in BS 5950-1: 2000. The column should be designed for the primary moment as well as the nominal moment from the beam end reaction in accordance with section 4.8.3 of BS 5950-1: 2000. Refer to *AD 275* for guidance on the design of columns in simple structures and special design cases.

The arrangement shown in figure 3 is commonly used when the floor beam in the braced bay is attached to the column web. In this case it is usual to assume that there is no additional moment from the brace force on the column or connection due to the thickness of the column web. The vertical shear through the connection is the beam reaction plus the vertical component of the bracing force. The column is designed for the nominal moment due to the assumed eccentric reaction of the beam shear.

In summary, when additional moments arise in braced bays due to the location of the setting out point they must be added to the usual nominal moments from the beam end reactions and accounted for in the design of the column and its splices. Moreover, the gusset plates in both *AD 306* and *AD 307* are shown subject to tension only. A further AD will offer advice on the design of gusset plates subject to both tension and compression.

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Tel: 01344 636555

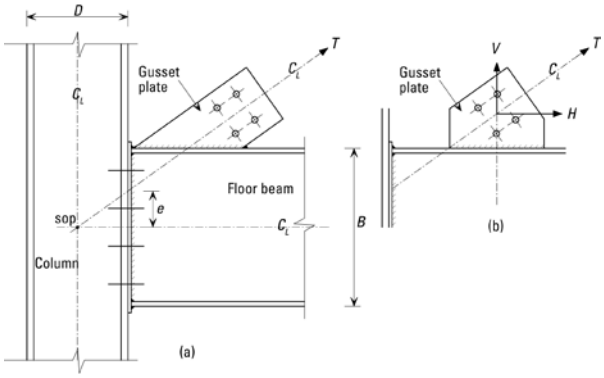

Figure 1: Typical bracing type connection for simple construction

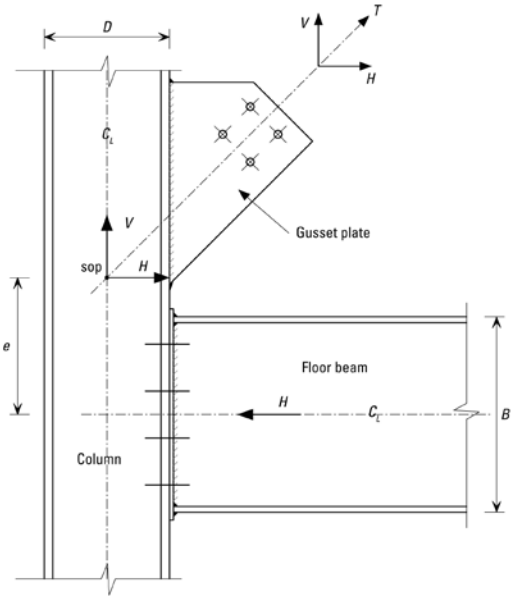

Figure 2: Bracing connections made directly to column

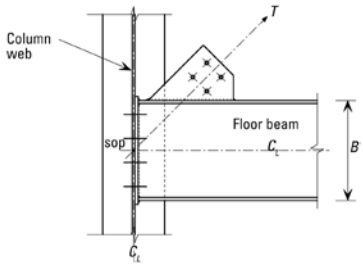

Figure 3: Bracing arrangement for beam attached to column web.

AD 308
Fire Protection of Beams with Web Openings

Following the publication of RT983 'Interim guidance on the use of intumescent coatings for the fire protection of beams with web openings' in December 2003, SCI prepared a further report RT1006 'Fire Design of Cellular Beams with Slender Web Posts', in May 2004. This report was prepared for Westok Limited, to extend the scope of the guidance given in RT983 specifically for beams designing at room temperature using Cellbeam software.

Westok Limited has now issued Cellbeam V6.0.10 which includes a fire design module. This software reports limiting temperatures for each beam design and generic tables of limiting temperature are no longer required. Westok have therefore requested that SCI issue this public notification of the withdrawal of RT1006.

Using the limiting temperatures from Cellbeam, the determination of an appropriate protection thickness should be based on the manufacturer's product specific fire testing data, obtained from fire testing carried out in accordance with the ASFP fire testing protocol for cellular beams. In the short term, generic data given in Table 4.1, Table 4.2, Table 4.3 and Appendix B of RT1085 may also be used, but in future this document will also be withdrawn.

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BCSA

Steel Construction Books

Health & Safety • Specification • Assessment • Erection • Design

National Structural Steelwork Specification

A 5th edition of the National Structural Steelwork Specification for Buildings has been produced. This new version is a half-way house between the 4th edition and the requirements given in the European standard BS EN 1090-2 which will eventually replace BS 5950-2 in about 12 months. Some of the changes include:

- Changes in the specifications for steel sections, structural bolts and welding to reflect changes that have occurred since the publication of the 4th edition
- The introduction of BS EN ISO 3834 for the management of welding activities
- A new section on Liquid Metal Assisted Cracking (LMAC)
- An updated section on hold times based on research carried out by TWI
- A new Annex which gives guidance on the visual inspection of welds

SPECIFYING - The Grey Book

Commentary on the 4th edition of the National Structural Steelwork Specification

This publication provides useful guidance to both specifiers and contractors and can be used as an informative reference.

STEEL BUILDINGS - The Silver Book

Steel Buildings

This book covers everything from steel design; section property tables; industrial and multi-storey buildings; cladding and decking; through to fire; transport and erection; software; contracts and case studies.

STEEL DETAILING - The Magenta Book*

Steel Details

This book provides practical advice on the issues that affect the efficient detailing of steelwork connections. The publication contains a rich array of details from actual structures and allows both engineers and architects to interrogate them.

DESIGNING - The Red Book

The Handbook of Structural Steelwork

This vital handbook gives practical design advice, worked examples, section properties and member capacities. This edition has been completely revised in accordance with BS 5950 - 1:2000.

GALVANIZING - The Beige Book

Galvanizing Structural Steelwork

An approach to the management of Liquid Metal Assisted Cracking. Practical guidance to clients, specifiers and engineers identifying circumstances where any increased risk of LMAC can be ameliorated.

ASSESSING - The Brown Book

Historical Structural Steelwork Handbook

Developments from the mid-19th Century in iron and steel and the changes in design, loading and stresses; tables of section properties rolled since 1857; guidance on assessment of existing structures.

CONNECTING - The Green Book*

Joints in Steel Construction: Simple Connections

Design guidance and worked examples based on BS 5950 - 1:2000 for connections in buildings designed as braced frames where connections carry mainly shear and axial loads only.

BRIDGES - The Purple Book

Steel Bridges

A practical approach to the design of steel bridges for efficient fabrication and construction.

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[redacted]

[redacted]

For help and advice on steel construction and information about companies and suppliers visit www.SteelConstruction.org

[redacted]

New and Revised Codes and Standards

(from BSI Updates December 2006)

AMENDMENTS TO BRITISH STANDARDS

BS 5400:-
Steel, concrete and composite bridges
- **BS 5400-9.1:1983**
  Bridge bearings. Code of practice for design of bridge bearings
  CORRIGENDUM 1 AMD 16749

BS 5950:-
Structural use of steelwork in building
- **BS 5950-3.1:1990**
  Design in composite construction.
  Code of practice for design of simple and continuous composite beams
  CORRIGENDUM 1 AMD 16721

NEW WORK STARTED

BS EN 10029 (Revision)
Hot rolled products of structural steels
- **BS EN 10025-6:2004/Amendment 1**
  Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT

06/30110083 DC
ISO 20332-1 Cranes. Proof of competence of steel structures. Part 1. General

CEN EUROPEAN STANDARDS

EN 1993:-
Eurocode 3: Design of steel structures
- **EN 1993-1-3:2006**
  General rules. Supplementary rules for cold-formed members and sheeting
- **EN 1993-1-4-:2006**
  General rules. Supplementary rules for stainless steel
- **EN 1993-1-5:2006**
  Plated structural elements
- **EN 1993-1-11:2006**
  Design of structures with tension components
- **EN 1993-2:2006**
  Steel bridges
- **EN 1993-3:-**
  Towers, masts and chimneys
- **EN 1993-3-1:2006**
  Towers and masts
- **EN 1993-3-2:2006**
  Chimneys

The British Constructional Steelwork Association Ltd

You can find email and website addresses for all these companies at www.steelconstruction.org

BCSA is the national organisation for the steel construction industry. Details of BCSA membership and services can be obtained from Gillian Mitchell MBE, Deputy Directory General, BCSA, 4 Whitehall Court, London SW1A 2ES
Tel: 020 7839 8566 Email: gillian.mitchell@steelconstruction.org

KEY

Categories
- **A** All forms of building steelwork
- **B*** Bridgework
- **C** Heavy industrial plant structures
- **D** High rise buildings
- **E** Large span portals
- **F** Medium/small span portals and medium rise buildings
- **H** Large span trusswork
- **J** Major tubular steelwork
- **K** Towers
- **L** Architectural metalwork
- **M** Frames for machinery, supports for conveyors, ladders and catwalks
- **N** Grandstands and stadia
- **S** Small fabrications

Quality Assurance Certification
- **Q1** Steel Construction Certification Scheme Ltd
- **Q2** BSI
- **Q3** Lloyd's
- **Q4** Other

Classification Contract Value
- **10** Up to £40,000
- **9** Up to £100,000
- **8** Up to £200,000
- **7** Up to £400,000
- **6** Up to £800,000
- **5** Up to £1,400,000
- **4** Up to £2,000,000
- **3** Up to £3,000,000
- **2** Up to £4,000,000
- **1** Up to £6,000,000
- **0** Above £6,000,000

Notes
1. Applicants may be registered in one or more categories to undertake the fabrication and the responsibility for any design and erection of the above.
2. Where an asterisk (*) appears against any company's classification number, this indicates that the assets required for this classification are those of the parent company.

* For details of bridgework subcategories contact Gillian Mitchell at the BCSA.

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Brigg Road, Scunthorpe DN16 1BP
Tel 01724 404040 Fax 01724 404229

CORUS TUBES
PO Box 101, Weldon Rd, Corby, Northants NN17 5UA
Tel 01536 402121

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FICEP (UK) LTD
10 The Courtyards, Victoria Park, Victoria Road, Leeds LS14 2LB
Tel 0113 265 3921 Fax 0113 265 3913

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Tel 01234 213201 Fax 01234 351226

PEDDINGHAUS CORPORATION UK LTD
Unit 6, Queensway Link, Stafford Park 17, Telford TF3 3DN
Tel 01952 200377 Fax 01952 292877

RÖSLER UK
Unity Grove, Knowsley Business Park,
Prescot, Merseyside L34 9GT
Tel 0151 482 0444 Fax 0151 482 4444

VOORTMAN UK LTD
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Amington Rd, Tamworth B77 4DP
Tel 01827 63300 Fax 01827 65565

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FORWARD PROTECTIVE COATINGS LTD
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Tel 01623 748323 Fax 01623 748730

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LEIGH'S PAINTS
Tower Works, Kestor Street, Bolton BL2 2AL
Tel 01204 521771 Fax 01204 382115

PPG PROTECTIVE & MARINE COATINGS
Micro House, Station Approach, Wood Street North,
Alfreton, Derbyshire DE55 7JR
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Tel 01476 577473 Fax 01476 577642

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Worksop, Notts S81 7BQ
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South Ribble Industrial Estate, Capitol Way,
Preston, Lancs PR5 4AJ
Tel 01772 259822 Fax 01772 259561

ALTERNATIVE STEEL CO LTD
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Tel 01942 610601 Fax 01942 821999

ASD METAL SERVICES – EDINBURGH
24 South Gyle Crescent, Edinburgh EH12 9EB
Tel 0131 459 3200 Fax 0131 459 3266

ASD METAL SERVICES – BODMIN
Unit 13, Cooksland Ind. Est., Bodmin, Cornwall PL31 2PZ
Tel 01208 77066 Fax 01208 77416

ASD METAL SERVICES – LONDON
Thames Wharf, Dock Road, London E16 1AF
Tel 020 7476 9444 Fax 020 7476 0239

ASD METAL SERVICES – CARLISLE
Unit C, Earls Way, Kingsmoor Park Central,
Kingstown, Cumbria CA6 4SE
Tel 01228 674766 Fax 01228 674197

ASD METAL SERVICES – HULL
Gibson Lane, Melton, North Ferriby, E. Yorkshire HU14 3HX
Tel 01482 633360 Fax 01482 633370

ASD METAL SERVICES – GRIMSBY
Estate Road No. 5, South Humberside Industrial Estate,
Grimsby DN31 2TX
Tel 01472 353851 Fax 01472 240028

ASD METAL SERVICES – BIDDULPH
PO Box 2, Tunstall Road, Biddulph, Stoke-on-Trent, Staffs ST8 6JZ
Tel 01782 515152 Fax 01782 522240

ASD METAL SERVICES – DURHAM
Drum Road, Drum Industrial Estate,
Chester-le-Street, Co. Durham DH2 1ST
Tel 0191 492 2322 Fax 0191 410 0126

ASD METAL SERVICES – CARDIFF
East Moors Road, Cardiff CF1 5SP
Tel 029 2046 0622 Fax 029 2049 0105

ASD METAL SERVICES – STALBRIDGE
Station Rd, Stalbridge, Dorset DT10 2RW
Tel 01963 362646 Fax 01963 363260

ASD METAL SERVICES – NORFOLK
Hamlin Way, Kings Lynn, Norfolk PE30 4LQ
Tel 01553 761431 Fax 01553 692394

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Sidmouth Road, Clyst St Mary, Exeter EX5 1AD
Tel 01395 233366 Fax 01395 233367

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Royal Oak Ind. Est., Daventry, Northants NN11 5QQ
Tel 01327 876021 Fax 01327 87612

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Dudley Hill, Bradford BD4 9HU
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Tel 01782 289909 Fax 01782 289804

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Caerphilly Road, Ystrad Mynach, Mid Glamorgan CF82 6EP
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Guide, Blackburn BB1 2QE
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Tel 01454 315314 Fax 01454 325181

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Wolverhampton WV11 3BR
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PORTWAY STEEL SERVICES
The Stables, Brook Farm, Westerleigh, Bristol BS37 8QH
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Birchwood Park, Warrington WA3 6GA
Tel 01925 817000 Fax 01925 818844

SOUTH PARK STEEL SERVICES
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Scunthorpe DN17 2BY
Tel 01724 810810 Fax 01724 810081

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Erimus Works, Valletta Street, Hedon Road, Hull HU9 5NU
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Barnsley, South Yorkshire S75 5NQ
Tel 01226 383824 Fax 01226 390004

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Whitchurch, Shropshire SY13 1LJ
Tel 01948 667700 Fax 01948 667744

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BALFOUR BEATTY POWER NETWORKS LTD
Tel 01332 661491

GRIFFITHS & ARMOUR
Tel 0151 236 5656

HIGHWAYS AGENCY
Tel 08457 504030

ROGER POPE ASSOCIATES
Tel 01752 263636

The Register of Qualified Steelwork Contractors

BUILDINGS SCHEME

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

A All forms of steelwork (C-N inclusive)
C Heavy industrial plant structures
D High rise buildings
E Large span portals
F Medium/small span portals and medium rise buildings
H Large span trusswork
J Major tubular steelwork
K Towers
L Architectural metalwork
M Frames for machinery, supports for conveyors, ladders and catwalks
N Grandstands and stadia
S Small fabrications

Company Name	Telephone	A	C	D	E	F	H	J	K	L	M	N	S	QA	Contract Value (1)
ACL Structures Ltd	01258 456051				●	●	●				●				Up to £2,000,000
Advanced Fabrications Poyle Ltd	01753 531116					●	●	●	●	●	●			●	Up to £400,000
Allslade PLC	023 9266 7531				●	●	●			●					Up to £4,000,000
Atlas Ward Structures Ltd	01944 710421	●	●	●	●	●	●	●	●	●	●			●	Up to £6,000,000*
B D Structures Ltd	01942 817770			●	●	●	●								Up to £1,400,000*
B & K Steelwork Fabrications Ltd	01773 853400		●		●	●	●	●	●		●			●	Up to £4,000,000*
A C Bacon Engineering Ltd	01953 850611				●	●	●								Up to £800,000
Ballykine Structural Engineers Ltd	028 9756 2560				●	●	●	●				●		●	Up to £2,000,000
Barrett Steel Buildings Ltd	01274 266800				●	●	●							●	Up to £6,000,000
Billington Structures Ltd	01226 340666	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Bison Structures Ltd	01666 502792			●	●	●	●							●	Up to £2,000,000
Border Steelwork Structures Ltd	01228 548744		●		●	●	●					●			Up to £1,400,000
Bourne Steel Ltd	01202 746666	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Brooksby Engineering	01707 872655					●		●	●	●	●				Up to £200,000
Butterley Ltd	01773 573573	●	●	●	●	●	●	●	●	●	●	●		●	Up to £3,000,000*
Cairnhill Structures Ltd	01236 449393		●			●	●	●		●	●			●	Up to £1,400,000*
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Compass Engineering Ltd	01226 298388		●		●	●	●		●						Up to £2,000,000
Leonard Cooper Ltd	0113 270 5441		●			●	●		●		●			●	Up to £800,000
Costruzioni Cimolai Armando SpA	01223 350876	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Curtis Engineering Ltd	01373 462126					●									Up to £800,000
Frank H Dale Ltd	01568 612212			●	●	●								●	Up to £6,000,000
EAGLE Structural Ltd	01507 450081				●	●	●	●	●	●					Up to £400,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●		●					●	Up to £4,000,000
Emmett Fabrications Ltd	01274 597484				●	●	●								Up to £800,000
EvadX Ltd	01745 336413				●	●	●	●		●	●	●		●	Up to £1,400,000
Fairfield-Mabey Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Fisher Engineering Ltd	028 6638 8521	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Glentworth Fabrications Ltd	0118 977 2088					●	●	●	●	●	●	●			Up to £2,000,000
Graham Wood Structural Ltd	01903 755991	●	●	●	●	●	●	●	●	●	●	●			Up to £6,000,000
D A Green & Sons Ltd	01406 370585				●	●	●	●				●		●	Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456		●		●	●	●	●	●	●	●			●	Up to £6,000,000
James Bros (Hamworthy) Ltd	01202 673815				●	●	●	●				●		●	Up to £2,000,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●			Up to £6,000,000*
Meldan Fabrications Ltd	01652 632075		●		●	●	●	●	●		●			●	Up to £4,000,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●				Up to £2,000,000
Normanby Wefco Ltd	01427 611000		●				●	●	●		●			●	Up to £800,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●	Up to £2,000,000*
Oswestry Industrial Buildings Ltd	01691 661596				●	●	●		●		●				Up to £400,000
RSL (South West) Ltd	01460 67373				●	●	●				●				Up to £800,000
John Reid & Sons (Strucsteel) Ltd	01202 483333	●	●	●	●	●	●	●	●	●	●	●			Up to £6,000,000
J Robertson & Co Ltd	01255 672855									●	●		●		Up to £100,000
Robinson Construction	01332 574711		●	●	●	●	●							●	Up to £6,000,000
Roll Formed Fabrications Ltd	028 7963 1631				●	●	●	●		●	●	●		●	Up to £800,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Rowen Structures Ltd	01623 558558	●	●	●	●	●	●	●	●	●	●	●			Up to £6,000,000
SIAC Butlers Steel Ltd	00 353 502 23305		●	●	●	●	●	●				●		●	Up to £6,000,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Henry Smith (Constructional Engineers) Ltd	01606 592121		●	●	●	●	●	●							Up to £2,000,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●			●		●	Up to £1,400,000
Warley Construction Company Ltd	01268 726020				●					●					Up to £400,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Webcox Engineering Ltd	01249 813225				●	●	●				●				Up to £400,000
H Young Structures Ltd	01953 601881		●		●	●	●	●				●			Up to £800,000

Notes (') Contracts which are primarily steel but which may include associated works. The steelwork contract for which a company is pre-qualified for 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.

RQSC
The Register of Qualified Steelwork Contractors Scheme

BRIDGEWORKS SCHEME

Based on evidence from the company's resources and portfolio of experience, the Subcategories that can be awarded are as follows:

FG Footbridges and sign gantries
PT Plate girders [>900mm deep], trusswork [>20m long]
BA Stiffened complex platework in decks, box girders, arch boxes.
CM Cable stayed bridges, suspension bridges, other major structures [>100m]
MB Moving bridges
RF Bridge refurbishment
X Unclassified

Applicants may be registered in more than one sub-category.

Company Name	Telephone	FG	PT	BA	CM	MB	RF	X	Contract Value (1)
Allerton Engineering Ltd	01609 774471	●	●	●	●	●	●		Up to £1,400,000*
Butterley Ltd	01773 573573	●	●	●	●	●	●		Up to £3,000,000*
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●		Above £6,000,000*
Costruzioni Cimolai Armando SpA	01223 350876	●	●	●	●	●			Up to £6,000,000
Fairfield-Mabey Ltd	01291 623801	●	●	●	●	●	●		Above £6,000,000*
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●		●		Up to £6,000,000
Interserve Project Services Ltd	0121 344 4888						●		Above £6,000,000
Interserve Project Services Ltd	020 8311 5500		●	●		●	●		Up to £400,000*
Meldan Fabrications Ltd	01652 632075	●	●	●	●	●	●		Up to £4,000,000
'N' Class Fabrication Ltd	01733 558989	●	●	●		●	●		Up to £1,400,000
Normanby Wefco Ltd	01427 611000	●	●	●			●		Up to £800,000
Nusteel Structures Ltd	01303 268112	●	●	●	●				Up to £2,000,000*
P C Richardson & Co (Middlesbrough) Ltd	01946 727119	●					●		Up to £6,000,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●		Above £6,000,000
Taylor & Sons Ltd	029 2034 4556	●	●	●	●	●	●		Up to £800,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●		Above £6,000,000*

Notes (') Contracts which are primarily steel but which may include associated works. The steelwork contract for which a company is pre-qualified for 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.

SCI Members

SCI

SCI (The Steel Construction Institute) develops and promotes the effective use of steel in construction. It is an independent, membership-based organisation. Membership is drawn from all sectors of the construction industry; this provides beneficial contacts both within the UK and internationally. Its corporate members enjoy access to unique expertise and free practical advice which contributes to their own efficiency and profitability. They also recieve an initial free copy of most SCI publications, and discounts on subsequent copies and on courses. Its multi-disciplinary staff of 45 skilled engineers and architects is available to provide technical advice to members on steel construction in the following areas:

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- Civil Engineering
- Codes and Standards
- Composite Construction
- Connections
- Construction Practice
- Corrosion Protection
- Fabrication
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- Fire Engineering
- Light Steel and Modular Construction
- Offshore Hazard Engineering
- Offshore Structural Design
- Piling and Foundations
- Specialist Analysis
- Stainless Steel
- Steelwork Design
- Sustainability
- Vibration

Details of SCI Membership and services are available from:
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Telephone: +44 (0) 1344 636509 Fax: +44 (0) 1344 636570
Email: pat.ripley@steel-sci.com Website: www.steel-sci.com

SCI would like to welcome the following new Corporate Members:

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