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NSC

NEW STEEL CONSTRUCTION

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More for London
Hangar for university
Steel steps up in Devon
Truss beats legacy problem

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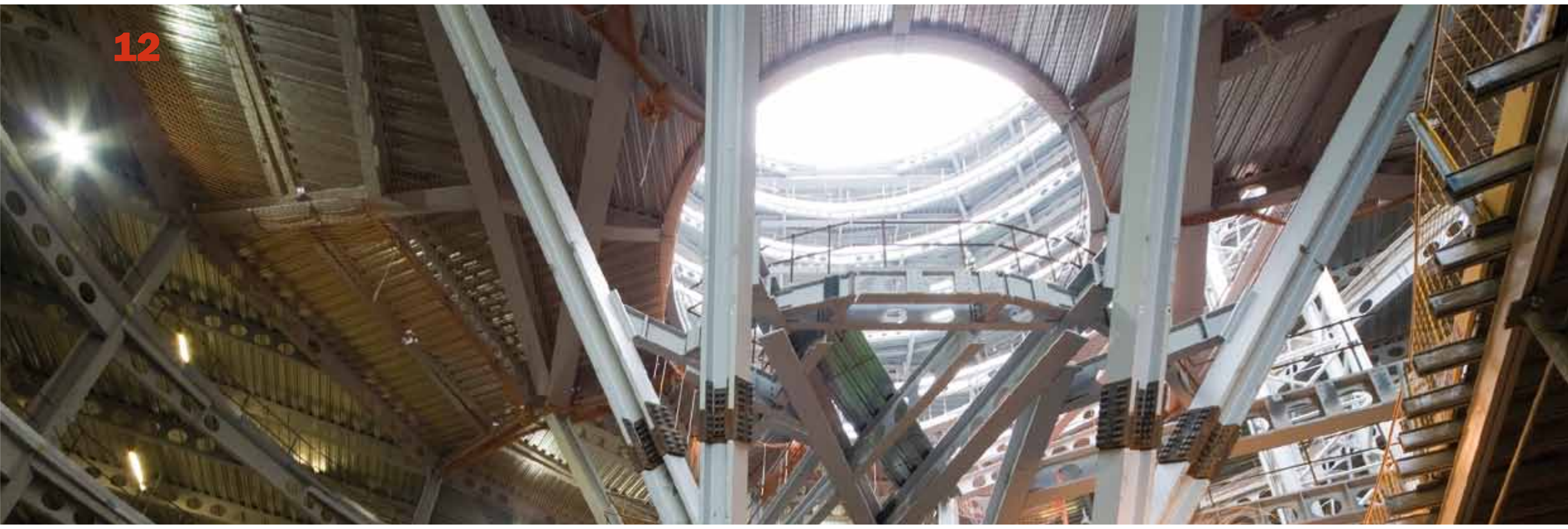

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Cover Image
More London Plot 7
Main Client: More London Developments
Architect: Foster & Partners
Steelwork contractor: Severfield-Reeve Structures
Steel tonnage: 5,200t


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SCI

Sustainability looks like a survivor

Recent construction industry related gatherings have been slightly muted affairs, unsurprisingly since the background economic news has been almost unremittingly bleak. But as David Smith, the economics editor of the *Sunday Times* and guest speaker at the BCSA's annual dinner, said, no matter how bad it looks now, recovery will come and the betting was that a start would be apparent by the end of the year.

That will still have been a long and deep recession for construction, and there will be casualties. One of the casualties predicted by many is the focus on sustainability that has dominated industry talk for the past few years. With the financial squeeze on it is feared that clients will not want to pay for sustainability and the industry will stop marketing its strengths in that area. This would be a big mistake.

The construction industry gathered at last month's Ecobuild conference eager to test the wind on whether sustainability should still concern them. The answer was an emphatic yes. Record crowds were reported at the event, dubbed the world's biggest for sustainable design and construction. Corus supported the UK Green Building Council stand, which displayed the Corus sustainability story, and fielded representatives to answer questions from visitors. Interest in steel's strong sustainability case was stronger than ever, they report.

Paul King, Chief Executive of the newly launched UK Green Building Council, said in an address: "Even in tough times, and perhaps particularly in tough times, customers will demand more in terms of efficiency, quality and productivity. A built environment that is sustainable – economically, socially and environmentally – is the only one worth investing in now."

Mr King recognises there is more to sustainability than lowering carbon emissions, vital as that is, as the steel sector has recognised in its Target Zero drive (*NSC* News last month). The social benefits that go hand in hand with steel construction like better safety during construction, and training workers who are able to return home at night rather than employing an itinerant workforce, are also important.

Cost is important as a sustainable world doesn't want to waste money, and good news on that front comes from the latest update to the Cost Comparison study series. Fourth quarter 2008 figures show that steel has gained in competitive advantage over concrete since 1995.

The average building options in the study in 1995 showed a £12.10 per square metre advantage for steel – this had grown to £22.22 in 2008. Steel has obviously increased in price since 1995, but so has concrete and reinforcement bar has increased most of all.

Commitment to making productivity gains and sharing them with the construction industry lies behind the remarkable success story of steel when, arguably, cost was the main driver in deciding on what material to choose. That same level of commitment lies behind the steel sector's current drive to improve its already creditable sustainability case.

On any measure of sustainability steel ticks all the boxes of the Triple Bottom Line – environmental, economic and social. That is one thing at least that will survive all this recession throws at it.

Nick Barrett - Editor

BCSA completes member assessments

Last year all of the BCSA's steelwork contractor members, both in the UK and the Republic of Ireland, were audited to assess their capabilities. Now all of this gathered information has been incorporated into the membership lists printed in the back pages of *NSC*.

Companies capabilities are defined in terms of two primary criteria, class and category.

Class gives guidance on the size of the steelwork contract the company has the financial and management resources to undertake. If a project lasts longer than a year, the value is the proportion of the steelwork contract to be undertaken within a 12 month period.

The Categories give guidance on what types of steelwork a company is competent to undertake. This relates to the company's works facilities, its track record and its technical and management experience.

The assessments provide clients with an easy way to pre-qualify steelwork contractors before contracts are tendered. To assist specifiers, the categories have been extended as follows:

BUILDINGS

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

BRIDGES

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

Sigma debuts in Dartford

Albion Sections' new Sigma purlins product has debuted on a warehouse project erected by Crown Structural in Dartford, Kent.

Sigma purlins are 10% more efficient than previous products and have less weight. For spans between 6m and 7m less accessories, such as sleeves and anti sag systems, are needed, which means less material cost and a quicker erection time.

John Jones, Managing Director, Albion Sections, said: "We are customer focused and work extremely hard to provide customers with the tools needed to compete and offer improvements in their service.

"The main driver for the Sigma development was to combat rising costs, now that prices have fallen, our investment has not gone to waste as our customers have a competitive edge when choosing our purlins."

The 800m² distribution warehouse in Dartford, Kent required Crown to erect 50t of steelwork and 450m of Albion Sections' Sigma.

Utilities work powers ahead at Olympic Park

The steel frame for the Energy Centre located in the west of the London 2012 Olympic Park has been completed by The AA Group (TAAG).

The building will provide an efficient power, heating and cooling system across the Olympic site as well as for the new buildings and communities that will develop after 2012.

More than 500t of structural steelwork has been used on the two-storey building which also includes a 45m-high flue extractor tower.

"The site is hemmed in by railway lines and a large water main," explained Kevin Nixon, TAAG Project Manager. "This meant we had to carefully plan in advance where our crane and cherrypickers could be located."

Once the three week steel erection programme was completed, TAAG then installed 3,500m² of concrete planks to form the floors and roof of the Energy Centre.

"We used a small mobile tower crane for the majority of steel erection as no piece was heavier than 5t," said Mr Nixon. "For the flue tower, however, we had to use a 62m reach access unit."

The Energy Centre is due for completion by the end of 2009 and is expected to become operational from early 2010 when it will begin providing heated water to the Olympic Stadium.

SSDA shortlist highlights teamwork

Corus and the BCSA have announced a 22 strong shortlist of projects for the 2009 Structural Steel Design Awards (SSDA), the 41st year they have been held.

The shortlisted projects reflect the geographical spread of steel's appeal for projects large and not-so-large, including single storey and multi storey buildings, bridges and other structures. The sectors of the construction market represented by shortlisted projects include sports, airports, commercial, leisure, retail, education, industrial, energy and transport.

David Lazenby CBE, Chairman of the SSDA Judging Panel, said the judges were impressed this year by the diversity of project selected for the shortlist, as well as their very high quality. He said: "Once again steel has shown that it is the construction material of choice, to achieve outstanding results, with responsiveness, economy and satisfaction to the client.

"The judges have been particularly impressed by the constructive teamwork which has contributed so much to the success of all these steelwork projects. Well done to all concerned."

The winners of the awards will be announced at a reception at the Science Museum, London, on 9 July.

The full short list is:

The Weather Room
White Lodge, Monken Hadley
Cabot Circus Roof
Bristol Broadmead
Ryanair Hangar, Stansted
The Tank Museum
Bovington, Dorset
Hafod Eryri
Snowdon Summit, Snowdonia National Park
No 2 Spinningfields Square
Deansgate, Manchester
Unilever House, Leatherhead
New Academic Building, LSE
Lincoln's Inn Fields, London EC2
Bridge Academy
Hackney, London
201 Bishopsgate and The Broadgate Tower
Broadgate, London
30 Crown Place, London EC2
5 Aldermanbury Square, London
40 Portman Square, London W1
Biochemistry Building
Oxford University
The Factory of the Future
AMRC, Sheffield
Lakeside Energy from Waste Plant,
Colnbrook
Performing Arts Complex
Leicester
Xstrata Aerial Walkway
Kew
Cabot Circus MSCP Footbridge
Bristol Broadmead
A2/A282 Dartford Improvement Scheme
Dartford
River Aire Footbridge, Castleford
Wimbledon Centre Court Redevelopment
Wimbledon

Automation of steel processing to dominate IPS Fair

Steel processing equipment specialist Kaltenbach will be launching new products and processes at the IPS (International Partners in Steel) Fair 2009, which is held from May 11-15 at the company's headquarters in Lörrach, Germany.

Debuting at the fair will be a Kaltenbach fully integrated automation concept for the complete processing of structural steel and plate from raw material input to final plant output. Included in the uninterrupted continuous process is the automatic cutting and sorting of end cuts.

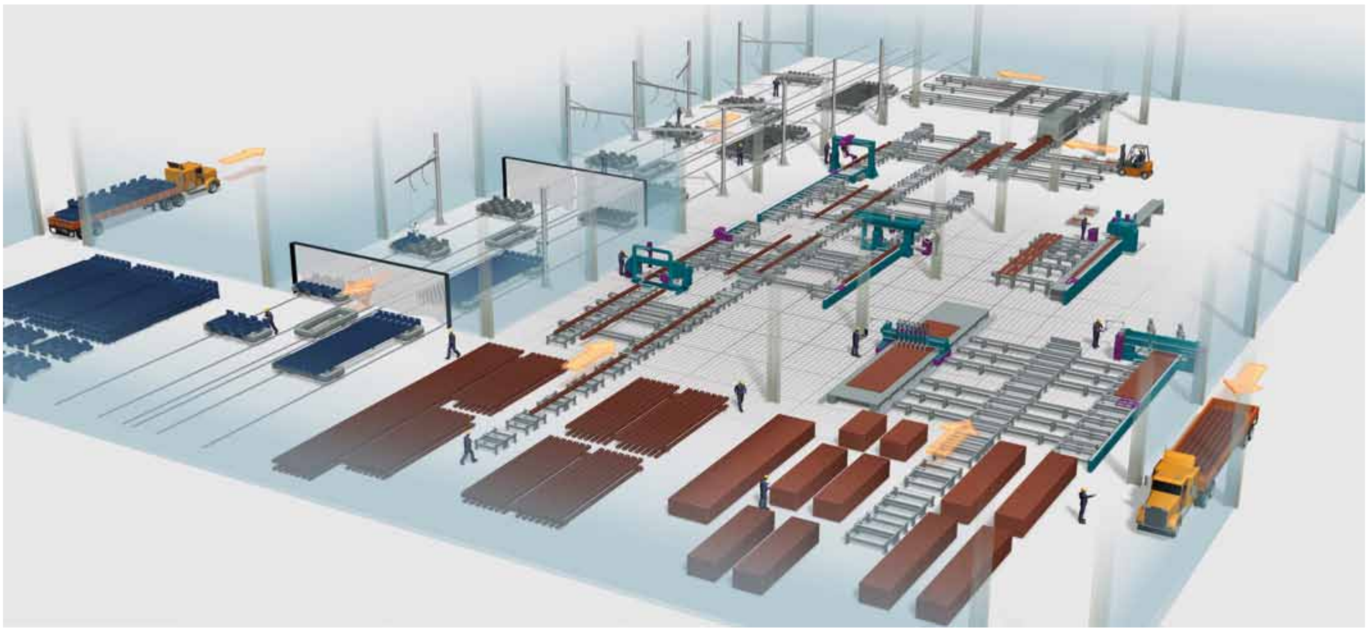
Kaltenbach says huge economic benefits are predicted for this new concept, with early customer installations showing 30% improvement in plant utilisation and productivity.

Also to be introduced for the first time at IPS 2009, is the MSK 471 NA an ultra-fast, high performance straight sawing machine for cutting hard metals. Key features include, the processing of minimal cut-off lengths, short cycle times and fully automated section sorting.

A new fully automated band sawing and drilling system will also debut at the fair. The KBS1010/KDXS 1015 incorporates the new AS1000 auto sorter for the automatic sorting of usable parts, first cuts and remnants.

Other notable new innovations to be displayed include the T13 transport system, new visualisation software and the world's fastest plate, angle, punching and shearing system.

Right: The new Kaltenbach KBS1010/KDXS 1015.
Below: The fully automated processing concept.



AROUND THE PRESS

Construction News
26 February 2009
Exchange wins green accolade
All three buildings (Exchange Place, Edinburgh) were based around a steel frame structure. Long spanning, cellular primary and secondary beams were incorporated with columns generally arranged on the internal cores and external facade.

Contract Journal
18 March 2009
Costain keeps traffic flowing
The temporary A34 southbound viaduct was begun in the summer of 2008, with piling work and piers cast prior to steelwork erection beginning. The steel deck was then completed in an 11-week programme beginning in October.

Financial Times
16 March 2009
Shard reaches for the sky amid office sector gloom
"This will be a landmark building and we've already let out 40 per cent of it," said Bernard Ainsworth, Project Managing Director.

New Civil Engineer
26 February 2009
Glaze of glory
The rectangular steel and glass superstructure was lowered into place across three rail lines by contractor Fitzpatrick's Rail Civils division during an overnight possession of the London bound Eurostar route.

The Structural Engineer
17 March 2009
Dramatic roof for new multi-purpose centre in Liege
The roof's steel ribs splay into dramatic arches and interweaving steel ribbons, each 200mm wide and varying between 1.2m and 400mm in depth. The ribs cross over each other in a distorted grid-shell-like formation and terminate in a perimeter beam.

Building
6 March 2009
Zaha rising
Watson Steel is near to completing the skeleton of Zaha Hadid's Riverside Transport Museum in Glasgow. The £74M project's cladding has begun and it is scheduled to be completed in August 2010.

Clients specify Sustainability Charter membership

The BCSA is in dialogue with Arup and the Highways Agency about the possibility that its Sustainability Charter's requirements can be implemented in their 'green' specifications.

The Sustainability Charter was established as a way for the steel construction supply chain to demonstrate its commitment to sustainability's triple bottom line, serving economic, social and environmental objectives.

"Client's are increasingly looking to specify such requirements, so we have begun talking to other organisations and companies about adopting the same sustainable issues," said BCSA Technical Consultant, Roger Pope.

Steelwork contractors who have achieved Sustainability Charter membership Gold status are able to offer clients demonstrable commitment to a complete suite of sustainability objectives. This includes a requirement for them to source at least 60% of their steel from mills with environmental management systems that are certified to EN ISO 14001. It also requires them to undertake carbon footprinting of their operations using the tool that SCI has developed for the BCSA, based on PAS 2050.

Steel construction is able to offer specifiers a responsible "cradle-to-grave" supply chain. Sustainability Charter members can provide responsible sourcing of "cradle" supplies, and steel's scrap value at end-of-life ensures that only an unavoidable minimum will ever be lost to a landfill "grave" – whereas assumptions about responsible disposal are a key concern when specifying structural timber.

In addition steel's unique advantage over concrete is its ability to be multi-cycled with no loss of performance, or even to be re-used – rather than having to be down-cycled into rubble.

Retail expansion with steel

TJ Morris, also known as Home Bargains, the fast growing retailer of discounted branded goods is constructing a major extension to its distribution centre in Liverpool.

The company has plans for a further 300 UK stores, predominantly in the North and the Midlands. To aid this growth an enlarged distribution centre is needed and Caunton Engineering has supplied and erected 1,500t of structural steel for the project.

The main building consists of a central warehouse which is 116m long and includes four 28.5m spans and a 32m height to the eaves. On either side of the main building there are two ancillary structures, one a 12m high x 27m single span unit and the other a 12m high x twin 22m span portal unit.

The depot also includes a 20m span x 80m long loading canopy, while the project also consists of a new training centre, a vehicle maintenance unit and a transport office and gatehouse.

Lansdowne Road reborn as Aviva Stadium

Irish international football and rugby will soon have a new state-of-the-art 50,000 all seater stadium in which to play as the multi-million pound redevelopment of Dublin's Lansdowne Road (recently renamed the Aviva Stadium) nears completion.

Work started on site in May 2007 with the demolition of the old stadium, some parts of which dated back to the nineteenth century. More than 5,000t of structural steelwork is being erected for the new bowl and the stadium's roof by a joint venture which includes SIAC Butlers Steel.

Redeveloping an existing stadium, as opposed to building a new venue on an out of town site, has brought a host of challenges. There are railway tracks and underpasses to the west, a culvert to the north and training pitches that had to be maintained to the east of the site.

Space for the redevelopment was created by a realignment of the pitch and by the creation of a new access podium over the railway line. The former pitches were also realigned and combined into one training pitch.

The stadium's suburban location had the biggest impact on the final undulating roof design. The height of the structure can not overshadow the residential areas to the north. So the stadium features a 15m high north stand with just one tier of seating, this rises to 40m high east and west stands, both with four tiers and then a slightly lower south stand.

The stadium is on schedule for completion in April 2010

CE Marking to deliver consistent quality

The BCSA recently attended a briefing from the Department of Communities and Local Government about progress on the proposed changes to the Construction Products Directive (CPD) that mandates the use of CE Marking for steel products and steelwork components.

Currently the UK permits CE Marking under the CPD but does not make it mandatory under UK regulations. The new proposals provide for a common set of pan-European regulations under which CE Marking would become mandatory.

BCSA's policy is to support and encourage its members to adopt CE Marking as a means of demonstrating to clients the capability of the sector to deliver products with consistent and reliable quality. Corus also CE Marks for all its structural sections.

The European proposals were for the new regulations to become law in 2011. The proposals seek to widen the scope to include sustainability as an essential requirement. Agreement on a common interpretation of this objective and provision of the necessary supporting standards requires significant debate.

Aircraft hangar gets a lift

A whole raft of equipment, including two 100t capacity mobile cranes, have been used to lift the 90m long trusses for a new hangar at Kent's Biggin Hill Airport.

Working for main contractor Civils Contracting, the five month project, which began in January, will see John Reid & Sons constructing a stylish new aircraft hangar to house jets for private charter.

The equipment is on hire from Hewden and also included five 80-foot mobile access platforms and a 13m telehandler.

Hewden has been involved from the outset of the job, helping to plan all plant equipment requirements. This has included factoring in the site's ground conditions, the weight of the beams and the lift height to specify the ideal equipment type, size and reach.

Lattice beams go on air in radio studios

Specially manufactured triangular lattice structures are providing visible upright support for essential equipment in a temporary radio broadcast studio in London.

The lattice structures are positioned inside three glass walled pod-type radio studios, while 11m long lattice trusses with 50mm diameter bottom chords create a framework for overhead lighting.

The pod-type studios are built within the station's open plan offices, allowing close interaction between presenters and production teams. Architect Sheppard Robson specified Metsec to provide lightweight framing for the studios with designs that meet strict requirements for acoustics.

Matthew King of Sheppard Robson said: "The new studio has four glass walls in the shape of a trapezium on plan, the back wall with acoustic treatment. The Metsec frame is free standing to avoid noise from the soffit above. There is a 3.5m lattice column at each corner to mount display screens and web cams."

NEWS IN BRIEF

Lindapter has released the comprehensive resource for designing weld-free steelwork connections, featuring specification data, technical diagrams, and installation guidance. The guide has been created to assist specifiers designing steelwork connections, providing a wealth of technical data with supporting 3D models, clearly illustrating the vast examples of potential connections that can now be achieved. Expanding beyond this, Lindapter offer a free design service for the specifier's convenience and the research and development of bespoke solutions.

Later this year the **BCSA** will be launching a training course for Responsible Welding Coordinators. This will be a two day course aimed at those candidates wishing to become RWC for structures designated as Execution class 2. The two day course will cover basic metallurgy, welding processes, standards and specifications and the welding procedure requirements of BS EN 3834. Successful candidates will receive a certificate. The course will be held at a number of locations in the UK and the RoI. Further details of this course, the dates, venues and cost will be circulated to BCSA members.

Easi-edge has achieved Gold member status from the Steel Construction Sustainability Charter in recognition of its commitment to sustainability. Angela Hayward, Commercial Director at easi-edge, said: "We are absolutely delighted to achieved Gold charter status. Sustainability is important to the overall easi-edge mission."

Fisher Engineering has signed a frame agreement to replace all of its current structural design and detailing software licenses with Tekla Structures' Building Information Modelling (BIM) software licenses. "The deal with Fisher shows that they're confident in the market and want to invest in their long term future with Tekla," said Andrew Bellerby, Tekla UK Managing Director.

CBI backs Working Time Directive opt-out retention

The BCSA's campaign to stiffen the government's resolve to maintain the UK's opt-out of the Working Time Directive now has the CBI's full backing.

John Cridland, CBI Deputy Director General, said: "The CBI has been actively calling for the opt-out to remain, both in the media and behind the scenes, in the UK and in Brussels. This is an important issue for business.

"Ending the opt-out would stop people making their own choice about whether they want to work longer hours. At the current time it would be particularly unwise to remove the opt-out."

Simon Boyd, Contracts Director of steelwork contractor John Reid & Sons, who is spearheading the industry's campaign, said: "The whole industry was taken by surprise in December; it was believed that a deal had been done with the EU to ensure the permanent retention of this valuable and essential opt-out."

BCSA's survey statistics (calculated on 1,036 employees, with 90.347% in support of opt-out retention) was used in a debate at the House of Commons on 10 March by the Shadow Minister for Europe, Mark Francois MP, in a debate in support of retaining the UK's opt-out of the Directive.

Skanska's landmark office for City of London

A new and prestigious office development is rapidly taking shape in the heart of the City of London. The Walbrook comprises ten above ground floors and three basement levels offering 38,090m^2 of office space and a further 3,251m^2 for retail.

The project, which occupies a prime 1.6 acre site near Cannon Street railway station, has been designed by Foster and Partners. The site was formerly occupied by three buildings, Walbrook House, St Swithin's House and Granite House.

Working on behalf of main contractor Skanska, steelwork contractor William Hare will erect more than 4,500t of steelwork for the project, which amounts to more than 4,900 pieces.

Work started on site during June 2007 and the completion date for this eye-catching structure is December this year.

Diary

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

2 April 2009
Portal Frame Design
Cardiff

21 & 22 April 2009
Essential Steelwork Design (2 day)
Manchester

28 April 2009
Steel Frames & Disproportionate Collapse Rules
Joint with ISE, London

7 May 2009
Floor Vibrations
Croydon

12 May 2009
Preparation for Eurocodes
Joint with ISE, London

13 & 14 May 2009
Essential Steelwork Design (2 day)
Birmingham

21 May 2009
Steel Building Design (2 day)
Cardiff

3 June 2009
Seminar
Introducing both the CE Marking version of the National Structural Steelwork Specification and the Standard Welding Procedures publication on Wednesday 3rd June at BCSA's Yorkshire office, Carrwood Park, Selby Road, Leeds

Countdown to Eurocode Implementation

March	April	May	June	July	August	September	October	November	December	January	February	March	April	May
2008	2008	2008	2008	2008	2008	2008	2008	2008	2008	2009	2009	2009	2009	2009

What's stopping you?

Probably plenty of reasons, but for steel design at least, the key Eurocode documents are published and available. There is nothing to stop a Eurocode design if you wish. With such a vast array of documents covering Eurocode design, here are the key Parts that will be needed for the design of orthodox steel buildings. Every Eurocode Part has a National Annex – the National Annex for the country where the construction is to take place is required. In all cases it is vitally important to make sure that the NA is followed.

Basis of Design

BS EN 1990, with the NA
This is a key Standard, covering load combinations. Essential for design in any material, and the NA has crucial information about what partial and combination factors should be used.

Loading

BS EN 1991-1-1, with the NA
Imposed floor loads, roof loads etc are found in this Standard. The UK NA is important, as it contains reduction factors for floor area and numbers of storeys, and imposed loads on roofs.

BS EN 1991-1-3, with the NA
Snow loads are covered in this Part, so important for drifted snow cases

BS EN 1991-1-4, with the NA
Wind loads. Note that the coefficients for roofs should be taken from BS 6399-2.

Resistance

BS EN 1993-1-1, with the NA
This Standard is the primary document for steel design. Frame stability, cross sectional resistance and member buckling checks are all to be found in this Part.

BS EN 1993-1-5, with the NA
This Part will be important for plate girder design, but also contains the web checks under local loads (when checking if stiffeners are needed, for example)

BS EN 1993-1-8, with the NA
This Part covers connection design – so includes the resistances of bolts, welds etc.

PD 6695-1-10
Not a Eurocode, nor a National Annex, but a "Published Document". This PD is for use in the UK alongside BS EN 1993-1-10, and covers the selection of a suitable steel sub-grade. The PD presents a straightforward approach, and is recommended.

The above Parts might represent a "starter's pack". Other important parts include those covering accidental actions (BS EN 1991-1-7), fire (BS EN 1991-1-2 and BS EN 1993-1-2), composite design (BS EN 1994) and bridges (BS EN 1992).

Following the recent publication of the NAs to BS EN 1993-1-1 and 1993-1-8, printed guides and software can be finalised. Design guides and the new "Blue Book" will be available in the next few months. The Access Steel website already contains much useful information, though note that this has not yet been modified to include the influence of the UK National Annex.

More
for prestigious south bank development

Steel construction has played an integral role in the development of More London on the capital's south bank. Martin Cooper reports from Plot 7, the last structure of the scheme to be completed.

FACT FILE
More London Plot 7
Main client: More London Developments
Architect: Foster & Partners
Construction manager: Mace
Structural engineer: Arup
Steelwork contractor: Severfield-Reeve Structures
Steel tonnage: 5,200t

Above: Plot 7's atrium opens out along the northern Thames facing facade.

"The atrium provided an ideal area for the erectors to get at the internal areas of the project, and we also used it as a lay down area for incoming steel."

Left: The atrium will feature a glazed rooflight at level three.

One of the capital's largest mixed use developments is nearing completion. Stretching along the south bank of the River Thames from Tower Bridge to London Bridge, the More London scheme occupies a 13 acre site and is home to the Greater London Authority as well as a host of prestigious and high profile companies.

More London Plot 7 represents the last building to be completed in a masterplan that commenced in 1999. Designed by Foster and Partners, Plot 7 has achieved an 'Excellent' BREEAM rating, and will be the first commercial building in London with bio diesel combined cooling, heating and power plant.

Offering more than 60,000m^2 of office space, the building will be the new London headquarters of Price Waterhouse Coopers. The building is predominantly 10-storeys high, although due to planning restrictions to keep sightlines of St Paul's clear, the southern elevation facing Tooley Street has seven floors. The site's footprint also includes a listed Victorian fire station, which is currently being used as site offices and will be refurbished as part of the overall scheme. Keeping the southern elevation to seven floors, adjacent to the fire station, also ensures the old structure is not overshadowed.

Externally Plot 7 will feature a combination of aluminium curtain walling and glazing, in keeping with the gleaming facades of the surrounding buildings. Internally the block is a shell and core development with four concrete cores and a steel frame requiring some 5,200t of structural steelwork.

There are more big numbers associated with the project, such as 132,000 bolts have been used, 75,000m^2 of intumescent paint has been applied to the steelwork - the majority of which was done pre-erection at Severfield-Reeve's North Yorkshire yard - and more than 4,000t of Fabsec cellular beams have been erected.

These beams, with their regimented series of holes, are one of the most prominent features of the uncompleted project. They have been used on all floors to accommodate services within the structural void and for the long 18m internal spans.

Plot 7 is roughly square in plan, with a large atrium cut out of the middle and then open to the north elevation facing the Thames. The opening into the atrium means that the building's northern and eastern elevations end with pointed fins. The atrium itself offers a large open internal space, containing a podium at level 1, while a glazed skylight covers the atrium at level 3. Above this there are footbridges linking levels 5 and 8 across the atrium, and these structures complete the circular shape of the upper atrium.

Supporting the atrium's glazed skylight are a series of large raking columns which start at ground level. Two 20t 18m long beams are connected to the raking columns and then support the glazed roof along with secondary steelwork.

The four raking columns each fan out into V-sections, meaning the glazed atrium roof has eight supporting steel members. The horizontal loads from these large columns are transferred into the ground floor slab, while vertical loads are carried further down to the basement slab as the rakers are supported on below-ground vertical steel columns.

Left: Footbridges across the atrium connect the eastern and western parts of the building.

Right: 4,000t of cellular beams have been used on all floors

"Steelwork was erected to the full height of the building before we infilled the atrium," explains Steve Swift, Project Manager for Severfield-Reeve. The site had four tower cranes during the peak erection process last year, and Severfield's erection company Steelcraft used the atrium area for access during the construction process. "The atrium provided an ideal area for the erectors to get at the internal areas of the project and we also used it as a lay down zone for in-coming steel."

From Tooley Street a service tunnel provides access to all of More London's buildings and steel deliveries went via this tunnel to be deposited in the atrium area. This subterranean road was already in place when construction work began on Plot 7, and as it runs beneath part of the new building's footprint it influenced the design of the steelwork frame.

The perimeter line of columns on the structure's western elevation sit directly above the tunnel. Erecting steelwork inside the service tunnel was obviously not an option, so Severfield-Reeve and Arup came up with an ingenious solution involving temporary transfer structures, to allow the column line to remain intact.

"The position of two columns would have meant they would have gone straight through the tunnel," explains Mr Swift. "When we erected these two steel members we founded them on ground level, instead of basement level and erected a temporary transfer structure, consisting of diagonal 600 x 600 Fabsec sections placed between the adjacent columns. This then supported the columns while the frame was going up."

Once the western elevation steelwork was topped out, two similar permanent transfer structures were erected on the roof. A jacking operation then allowed the loads to be transfered from bottom to top, turning the columns effectively into hangars. Once the jacking process was complete the large temporary diagonals on the ground level were then removed.

"This procedure meant the tunnel was closed for a minimal amount of time," says Jonathan Portlock, Arup Engineer. "The column grid pattern was able to remain constant while the internal 18m long

Right: A rooftop 50t jib crane, with a 35m reach, has been installed for window cleaning.

spans meant the next column line was outside of the tunnel's footprint."

The western and eastern elevations of Plot 7 feature an eye-catching sawtooth cantilever with four recesses per 9m bay. This skewed cantilever presented a number of unique challenges to the design team as the deflection limits on these elevations were quite onerous.

Severfield installed the sawtooth cantilevers in prefabricated sections, each one 9m long and one storey high. This not only speeded up the erection process, as the units arrived fully assembled and only had to be bolted into place, but being manufactured off-site they helped with the overall rigidity of the cantilevers.

With four large glazed elevations as well as internal glazing around the atrium and recess, keeping the windows clean will be a full time job. No hanging baskets for the window contractors here, Foster and Partners design for Plot 7 includes a rooftop jib crane with a 35m reach, when fully extended. This large piece of equipment - the biggest of its kind in the UK - can reach all of the atrium's glazing as well as the majority of the external elevations.

The sawtooth cantilevers were installed in prefabricated sections, each one 9m long and one storey high

"The jib crane weighs approximately 50t and so it had a direct influence on the steelwork design," explains Mr Portlock. "Such a large piece of equipment sitting permanently on the roof has a direct bearing on the upper levels of steelwork."

Larger 800mm deep sections - instead of 670mm deep used elsewhere - have been installed on the uppermost level of Plot 7 to accommodate the extra weight generated by the crane.

Severfield began its steelwork erection in February 2008 and completed the task in a 10 month programme. The fit-out of Plot 7 has already reached an advanced stage and completion of More London's newest and last flagship structure will be this August.

University challenge

Forming part of a new campus extension, a three storey steel structure, dubbed the ziggurat, has been inserted inside a former aircraft hangar. Martin Cooper reports from Cranfield University.

Located deep in the Bedfordshire countryside Cranfield is a renowned postgraduate university for aeronautics and advanced technology. Housed on a former RAF airfield used during the Battle of Britain, Cranfield's collection of buildings - some of which were left by the air force - has recently been added to by a structure very much of this century.

The Vincent Building is a new four-storey, fully glazed and contemporary laboratory block designed by Sheppard Robson. Adjoining the back elevation of this building, a steel-framed atrium has been constructed which then links the new building to an existing hangar which was previously used as a sports hall.

The north east corner of this hangar, representing about an eighth of the structure, has been converted with the insertion of a new three-storey administration structure spanning a ground floor lecture theatre.

This steel-framed building within a building has been dubbed 'a ziggurat' by Sheppard Robson and all three of its floors have an individual layout which allows natural daylight to penetrate down into them from all sides. The irregular configuration also means there are open terraces on the upper two floors of the ziggurat which serve as break-out areas for members of staff.

As Jason Daniels, Engineer for Scott White Hookins, explains: "The concept for the three-storey structure was for varying floor plans to give the entire area an open plan feel." Consequently, no supporting columns in the ziggurat line up as each floor plate is at a different angle.

There are not too many columns within the upper two floors as the design concept required a column free floorspace. However, structurally the second floor had to have two internal columns in full view, while the majority have been secreted into perimeter walls. The ziggurat is also free-standing and stability is derived from a braced frame, with bracing again secreted in walls.

The three-storey ziggurat has fully glazed partition walls, but these too are set at a slight angle on plan to the adjacent rectangular laboratory block. Where the upper two levels step back, their glazed perimeter walls are also set at different angles.

"There are no internal columns in the upper floor as the rooms are completely open plan," adds Mr Daniels. "The design concept here was for an open glass box which gives the impression that it's floating."

The floor of the upper level of the ziggurat is supported from the floor below, while the roof of this 'glass box' is actually hung from a series of steel trusses which form the roof of the original

FACT FILE
Vincent Building, Cranfield University, Bedfordshire
Main client: *Cranfield University*
Architect: *Sheppard Robson*
Main contractor: *Haymills*
Structural engineer: *Scott White Hookins*
Steelwork contractor: *Midland Steel Structures*
Steel tonnage: *110t*

A new steel-framed atrium joins the laboratory block to the former hangar containing the ziggurat.

Left: The 'floating glass box' of the ziggurat's upper level is hung from the hangar's original green steelwork.
Above: Each floor plan is set at a different angle.
Below: Floor plan of ziggurat showing steel skeleton.

hangar. Painted a vivid lime green, this complex web of beams and ties are clearly visible as new rooflights have been inserted into the hangar's original sawtooth roof.

Welded connection plates from the new steel ziggurat to the hangar's original steel roof trusses wasn't a problem for steelwork contractor Midland Steel Structures. However, the roof trusses were extensively assessed during the design stage to make sure they were able to support and take the loads from the new structure below.

"Aircraft maintenance was carried out in the hangar and so the trusses originally supported overhead machinery. We were pretty sure the old steelwork was able to support the ziggurat, but we had to be certain," adds Mr Daniels.

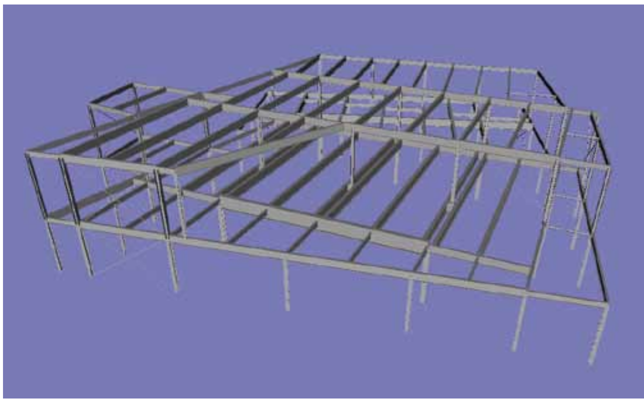
"The design concept here was for an open glass box which gives the impression that it's floating."

Located directly below the ziggurat a new raked 200-seat auditorium (lecture theatre) has been constructed. To achieve the required heightened headroom the hangers existing floor was excavated out to a depth of 1.5m.

Main contractor Haymills initially came on site in early 2007 and while construction work began on the new laboratory block, work also started on taking out the hangar's innards as well as lowering the ground floor. Then, while it was building the predominantly concrete framed laboratory block, bases for the steelwork were also being installed for the ziggurat.

Spanning the lecture theatre and forming the underside of the first floor of ziggurat are a series of 14m long cellular beams. Cellular members were used where services needed to be kept within the structural void.

The ziggurat is connected to the rectangular



laboratory block via three steel footbridges which stretch across the atrium. The bridges are cantilevered off of a lift shaft which has been formed with large meaty 219mm diameter columns, used primarily as architectural features.

The connecting atrium, which serves as an open light-filled space between the new four-storey block and the ziggurat is mostly formed with steel. A series of curved 193mm CHS fabricated sections span between the hangar's original roof steelwork and the concrete walls of the laboratory block for the glazed roof.

Midland's steelwork package did not begin and end with the highly innovative ziggurat and the attached atrium roof. The company also erected hanging steelwork onto which a rainscreen has been fixed which covers up an exposed steel framed plant area that is attached to one end of the laboratory block.

Interestingly the extension's plant area has been stacked up alongside the new building, rather than located on the roof. All supply pipes and ducts then run horizontally into the labs. The services' and plant area's cladding, (hung from steelwork) is a perforated aluminium panelling which offers partial views of the contents as well as providing a stylish exterior to the building.

A slice of the action for steel

FACT FILE
Domino's Pizza distribution centre, Milton Keynes
Client: *Domino's Pizza*
Architect:
Q2 Architects
Main contractor:
Buckingham Group
Structural engineer:
Broughton Beatty
Steelwork contractor:
Barrett Steel Buildings
Steel tonnage: *1,100t*
Project value: *£20M*

A steel framed solution was the answer for a new production and office building for Domino's Pizza, where 60m long internal spans were a requirement.

The British public cannot get enough pizza, or so it seems. The disc-shaped Italian dish is probably the most popular take-away food in the UK. So popular in fact, that the Domino's Pizza Group is planning to have 1,000 stores across the country by 2017.

To serve this grand expansion plan Domino's is building a new purpose built office and production facility for the chain in the West Ashlands area of Milton Keynes.

Being built to the highest environmental standards, the facility will be approximately 13,099m^2 and will house a state-of-the-art commissary. This will service over 500 Domino's stores, providing them with the fresh dough and ingredients to ensure each pizza has a consistent taste.

Domino's Food Service Director, Gareth Franks, says the new commissary will make a real difference to the company's operation. "Combined with our other two commissaries in Penrith and Naas in Ireland, this will give us the capacity to support our expansion plans."

Due for completion in mid 2010, the steel-framed building measures 60m x 142m and also features an external two storey office block which is attached to one elevation.

The project is located on a greenfield site which did have a severe sloping topography of 1:25. "This may not seem like a troublesome slope but with a building of this size the site had to be levelled which meant a large cut and fill operation," explains Justin Wearring, Engineer for Broughton Beatty. A series of 13m deep piles were then installed with a suspended floor cast on top before steelwork erection was begun.

The main part of the building consists of a production area, and this part of the structure requires a large open column free zone. To achieve this the steel design incorporates a series of 17 x 60m long trusses based on a 8m grid. The trusses are tapered - from a depth of 1.8m to 4.7m - to form the sloping profile of the roof. The building has a 11m clear height to the underside of the trusses.

"The trusses are the main steel feature of the project as there is no other way of giving the building the required clear spans," says Tony Walker, Barrett Steel Buildings' Project Designer.

However, these steel sections' maximum width meant they could not be transported in complete sections. Eighty percent of each truss was welded up at Barrett's Bradford facility and then transported to site in four sections. "The 4.7m depth, at one end, is too wide for transporting by truck so the final section was delivered piecemeal and bolted together on site," explains Mr Walker.

Once each truss was fully assembled the entire 10t truss was then lifted into place in a tandem lift involving two 35t capacity mobile cranes. Having the majority of the truss prefabricated also meant a considerable time saving for Barrett's steel erection gangs.

Barrett's Site Manager Michael Bryars, says

A series of 60m long trusses form the open column-free zone.

Above: The building's rear elevation features a two storey office block.

Above: A steel overhang protects the building's loading bays.

the lifting operation was also a lot easier, not only because there was less assemblage of steel sections, but the prefabricated sections also meant there was less movement during the lift.

As well as supporting the structure's roof and providing the clear open spans, they will also support refrigeration machinery, pipework and chillers. "By optimising the truss depth we have been able to keep the members small even though there is a high loading," adds Mr Walker. From inside the building the trusses will be exposed and consequently they are an architectural feature.

Along one of the building's two 142m long elevations there is a series of loading bays and the roof overhangs this entire side of the structure by 8m. This overhang was also prefabricated as a fifth section of the roof truss and was lifted into place in a separate operation.

On the opposite elevation, the building features an attached two-storey office block. This protrudes 12m from the main structure, is 56m long and unusually is entered at first floor level via a feature steel footbridge from the car park. The office block has precast stairs, precast planks and a precast lift shaft, all of which was installed by Barrett.

Another feature of the building is an internal 60m x 16m mezzanine floor which will be used for housing plant. This also provides the overall structure with some stability in this location, but generally stability is derived by bracing which has been secreted along all of the main elevations.

Barrett began steel erection during January and completed its programme in early March. Mr Bryars says the entire job went to plan, even allowing for a couple of days which were snowed off during February's inclement period.

The company had two erection gangs on site during the programme. They initially erected half of the main structure, then one gang completed the office block while the other erected half of the roof overhang. Once this was complete, both gangs then worked as one to complete the main building along with the rest of the overhang.

"The trusses are the main steel feature of the project as there is no other way of giving the building the required clear spans."

The project also includes two smaller steel-framed structures which were erected as part of the programme. One is a two storey ancillary office block with plant room, and the other is the site's gatehouse.

Milton Keynes Partnership (MKP), which is responsible for growth, development and investment in the city is obviously extremely upbeat about the project. Tim Roxburgh, Projects Director for MKP, says: "The Dominos project is great news for Milton Keynes, showing the confidence that major companies have in the city. Despite the difficult market conditions that are being experienced nationally, Milton Keynes remains one of the most attractive places for business in the South East."

The completed Domino's Pizza facility.

Putting a step into education

FACT FILE
Bideford College, Devon
Main client:
Devon County Council
Architect:
NPS South West
Main contractor:
Morgan Ashurst
Structural engineer:
Parsons Brinckerhoff
Steelwork contractor:
William Haley Engineering
Steel tonnage: *1,500t*

Locality and making the best use of existing topography influenced the design of a new BSF college in Bideford. Martin Cooper reports from the north coast of Devon.

The Building Schools for the Future (BSF) programme is continuing apace with a new technology college in the north Devon town of Bideford being built by Morgan Ashurst. The college, for 11 to 18 year olds, will replace the present school which currently occupies an adjacent site and when complete it will accommodate 1,800 students and staff.

As a BSF pathfinder project, the design team believes the job offers the opportunity to create "an institution of learning that cultivates the knowledge, skills and values that will enable children and young people to contribute to a future where the environment is restored and sustained."

To achieve these worthy aims a number of sustainable features have been incorporated into the design of Bideford College which is on target to achieve a BREEAM 'Excellent' rating. Emission reductions will be achieved by using a biomass boiler plant as well as micro wind turbines on site. Approximately 70% of the school roof will be covered in a green sedum covering which will attract wildlife and limit rainwater run-off.

The topography of the site however, has played an important role in the final design of the college. The college is being built on former playing fields which slope, giving the site an approximate 20m disparity between the northern and southern perimeters.

"The nature of the site and the difficulties associated with excavating the underlying rock strongly influenced the design of the college on three terraced levels, which made the best possible use of the existing topography," explains Michael Baughan, Parsons Brinckerhoff Project Engineer.

The college building comprises a 105m long central 'spine' which incorporates a central thoroughfare and winter garden along with a separate sports hall, gymnasium, main hall, kitchens and dining hall, and a drama studio all orientated along the slope of the site. Terraced steps formed by two reinforced concrete retaining walls achieve the changes in level.

The need to use sustainable materials, Bideford's locality, as well as the site's slope, all influenced the decision to construct the college with a steel frame.

The terraced steps mean the blocks at the front have three levels, with blocks on the middle step having two storeys and the upper tier of school building's generally one-storey high. This then creates a school with a level roof line.

Seven wings, each between 50m and 65m long and 8m wide,

Above: The sports hall contains 29m clear spans.

Below: Circular staircase towers are an external feature of all blocks.

Above: The central 'spine' building with blocks A and B.

Above: Two steps have been incorporated into the school's design.

provide the teaching accommodation and join the central 'spine' (also known as Block H) at right angles and are consequently perpendicular to the site's slope.

The school's narrow plan design allows natural ventilation, while classrooms are located to the north side to allow maximum use of daylight and at the same time avoiding the problems of glare and summertime overheating.

The need to use sustainable materials, Bideford's locality as well as the site's slope, all influenced the decision to construct the college with a steel frame. A number of materials were initially looked at, in-situ concrete was discounted because of supply chain issues, while a glulam/steel option was discarded because the timber beams would have been too deep, while not easily accommodating services.

"Steel was the most efficient and flexible option because of the locality," says NPS Architect Steven Western. "Some materials would have been difficult to source in north Devon and steel was the most cost efficient option."

To accommodate all of the services, while keeping the floor to ceiling heights to a minimum cellular beams with 200mm diameter holes have been used throughout the project.

The winter garden has been described as the "heart of the school" as it is the primary circulation route through the college. "With this long spine building connecting to all other blocks it will be easy for students to find their way around, especially those new to the school," says Mr Western.

The eastern end of block H contains a sports hall featuring 29m spans formed with spliced cellular beams. The initial design envisaged one cellular beam spanning the sports hall, but logistically such a long steel member would have been difficult to transport to site along north Devon's winding roads.

A compromise was reached and steelwork contractor William Haley Engineering has erected the 29m roof span with three individual sections spliced together on site and then lifted into position as one long member.

"We had to use both of our on site mobile cranes to place these cellular beams with a tandem lift," explains William Haley Engineering Project Manager Richard Duddridge. "These beams represented the biggest lifts on the entire project."

The sports hall is a double height zone with changing rooms situated beneath at ground floor level. The remaining two thirds of block H is given over to the winter garden which also features large spans and will accommodate a dining hall and a general meeting area.

The sports hall floor features a suspended slab supporting under floor heating and a timber sprung floor with changing rooms facilities and stores beneath. To maintain acceptable floor to ceiling heights in the changing rooms a shallow construction depth was required. "This together with a desire for minimal formwork, a flat soffit, minimum dead weight, a high load capacity and a stiff construction led to an asymmetric beam, precast concrete floor and a structural topping design," says Mr Baughan.

Stability for the 'spine' is provided by a combination of braced bays and moment frames which was dictated by the fenestration of the block's elevations and the nature of the large uninterrupted open spaces needed in the winter garden and sports hall.

The layout of the important circulation areas between the wings and the 'spine' meant that the simple approach of using double columns could not be used and so sliding movement joints incorporating proprietary resilient bearings was incorporated.

Half of block H and all of the three storey blocks A and B were the first areas to be erected by William Haley's steel erectors. As the project features no large cores, all structural stability comes from bracing and the composite flooring. To allow the slabs to be poured in the sports hall, only half of block H was initially erected. This was then temporarily propped, while the concreting was done.

"There are a lot of individual steel members on this project - approaching 1,500t in total," adds Mr Duddridge. "But most of the steelwork is based around a 7.5m x 8.5m grid, so the majority of steelwork is fairly repetitive and on the small side."

Getting steel to site has not been a logistical problem for William Haley. The roads from its Somerset yard to Bideford are good, although the last few miles are a little winding and narrow as the approach takes in a small residential area.

The project is on schedule and when it opens for the autumn term of 2011, Bideford will have a school built for the future.

Long Eaton School, Derby
Howes Replacement Primary School, Coventry
Woodvale School, Northampton
University of Bangor, Wales
Boldon Nursery
Joseph Chamberlain College, Birmingham
Holmesdale Technology College, Kent
North Street School, Ashford
Milton Keynes Academy
Abbeyfield School, Chippenham
Sunnyside Primary School, Northampton
Withington Girls School, Manchester
Pioneer School, Basildon
Edlington School, Doncaster
Queen Eleanor School, Northampton
The Bridge Schools, Holloway, London
St Bede's School, Redhill
York University
New Fairfield School, Huddersfield
Arden Primary School, Birmingham
Beacon Hill School
The Business Academy, Bexley

Carnbroe Primary School
Oasis Academy, Enfield
Filton College, Bristol
New Windsor Nursery School, Wolverhampton
Glenboig Primary School, Coatbridge
Buttershaw School, Bradford
John Bright School, Llandudno
Avon Valley Secondary School, Nottingham
East Riding College, Bridlington
St Giles Secondary School, Retford
Usworth Sixth Form College
Failsworth School, Oldham
Haverstock School, Camden
Thomas Deacon Academy, Peterborough
Kesh Primary School, Co Fermanagh
Arthur Terry Secondary School, Birmingham
Performing Arts Studio, Bath Spa University College
La Salle Secondary School, Belfast
Bankton Primary School, Livingston
Greenbank High School, Southport

Steel meets stringent NHS vibration requirements

Above: The new Birmingham Acute and Adult Psychiatric Hospitals, the largest NHS development outside of London, is using more than 12,000t of structural steel.

Below: The need for varying room and ward sizes meant that steel was used for the extension to the main hospital in Guernsey.

The latest in our Case for Steel series highlights how steel frames meet vibration and acoustics requirements.

All structures are susceptible to vibration, whatever material they are built from. Floors of steel framed buildings have always performed in line with requirements of the varying and demanding uses to which they are put. Physical tests on finished steel framed buildings show that the measured vibration is generally less than predicted by current calculation methods, and no special measures need be adopted for vibration on any steel framed buildings.

The most exacting vibration standards for floors are demanded by the UK's National Health Service for operating theatre areas. The same design of floor that commands over 70% of the multi storey buildings market delivers the health service what it wants.

Intensive studies have shown that steel framed buildings provide floors with vibration performance that surpasses those stringent specifications, while still delivering all the advantages of steel like cost effectiveness and flexibility to the UK's vitally needed health investment programmes. Health service professionals value the 'future proofing' that the easy adaptability of a steel framed building provides.

Designers have on occasion opted for a 'belt and braces' approach and provided additional strengthening in sensitive areas of hospitals, but in these cases the steel framed structure still emerges as the more cost effective option. The long span solutions that only steel can provide can in fact be even more appropriate for vibration sensitive areas as the greater mass that participates in the vibration motion tends to reduce the dynamic response, so there is less vibration.

Designers and contractors providing healthcare facilities of all types, whether being procured through traditional contracting or Private Finance Initiative type routes, are specifying steel framed buildings so that the cost, programme and other advantages of steel can be captured.

Above: The need for a quick construction programme makes steel the preferred method for hospital construction.

Detailed guidance is available from Corus and the SCI on how steel structures can be checked to ensure compliance with vibration performance criteria.

Careful detailing solves acoustic issues

The acoustic performance requirements of Part E of the Building regulations are easily satisfied by steel framed buildings without any special measures. It is sometimes thought, naively, that heavy concrete construction is an easy way to ensure acoustic performance. Careful detailing is required with any framing material to ensure compliance with Part E, including floor finishes, service penetration and flanking details.

Compliance with Part E must be demonstrated by post-completion testing, or by the use of approved details known as Robust Details.

Robust details of proven reliability are available for floors, walls and flanking connections. Details are continuously being developed. Construction details are available for:

- Composite floors
- Slimdek
- Steel columns in blockwork walls
- Light steel framing systems, including infill walls

Infill steel construction easily meets the criteria for acoustic and thermal insulation. Infill steel solutions do not suffer, as does blockwork for example, from having to be carefully constructed on site without gaps, particularly where it meets the main structure.

Steel hospitals outperform

Tests on floors in steel framed hospitals show that they out-perform the National Health Service requirements on vibration response.

The research, carried out by the Steel Construction Institute in 2005, confirms that good vibration performance can be achieved from composite floors in steel framed hospital buildings without any additional measures being taken.

The tests followed release of new design guidance from the Steel Construction Institute (SCI) in 2004 that laid to rest out-dated notions that uneconomically heavy steel sections would be needed to provide the vibration performance demanded by health professionals in sensitive areas like operating theatres.

SCI carried out tests on five composite floors in four hospitals with overall slab depths of between 175mm-337m. The measurements surpassed the NHS requirements by a factor of between two and four. On a fifth floor tested it was found that an 80mm screed could have been omitted and the slab reduced theoretically from 325mm to 240mm, and an acceptable response factor would still have been achieved. The hospitals tested included the Slimdek floors at the Treatment Centre at St Richard's Hospital, Chichester, and the Sunderland Royal Hospital extension, both built within the previous four years.

The test results conclusively rebut allegations made by the Concrete Centre suggesting that steel framed floors would need to be significantly deeper to achieve the NHS required response factor of 1.0 (equivalent to a slab depth of 420mm plus a 50mm screed). The new tests showed a response factor of only 0.29 being achieved on a floor that was in fact 14% thinner.

Measurements from five floors have showed that steel framed floors are capable of achieving the strict vibration requirements for operating theatres. The implications of these test results are that designers can be confident that Slimdek floors in the health sector do not have to be designed any differently from floors in commercial buildings. There is no need to do anything extra to achieve good vibration response factors.

Hospitals and other healthcare buildings now routinely benefit from the full range of benefits of using steel frames that have brought steel a dominant share of the commercial market, says Corus General Manager Alan Todd. 'Hospitals have to be built quickly because there is such a pressing need for them, which brings steel's fast construction time into its own. Health professionals also want flexibility built into hospital designs to accommodate changing needs, which steel with long, clear spans can easily offer. Steel is still also the most cost effective framing option, as recent Cost Comparison studies have showed.'

FACT FILE
One Tudor Street, London
Main client: *Stockland*
Architect: *TP Bennett*
Main contractor: *Balfour Beatty Construction*
Structural engineer: *Upton McGougan*
Steelwork contractor: *Bourne Steel*
Steel tonnage: *845t*
Project value: *£20M*

Steel provides architect's vision

Above and below: One Tudor Street is situated on a confined site formerly occupied by Unilever House's annexe.

Cost, efficiency as well as a number of challenges associated with existing foundations were all overcome with the use of a steel frame on a new commercial block in the City of London.

New commercial buildings are continuing to top out in the City of London despite the current doom and gloom associated with the credit crunch. An example is One Tudor Street, a new six-storey office building, with two basement levels, situated on the site of the former north wing of Unilever House which will offer 6,555m^2 of grade A office space.

The structure is steel framed and based around a large 10.5m x 9.5m grid pattern, which gives the building the required open plan environment. Stability is predominantly derived from one braced core and an eight level high moment frame located one grid line back from the structure's Tudor Street elevation.

Many high-rise commercial developments are steel framed for reasons of cost, efficiency and speed of construction. One Tudor Street is no exception as Patrick Fisher, Associate at Upton McGougan explains: "During the initial design stages we looked at a number of framing solutions and a steel frame quickly emerged as the most economic solution for this particular grid arrangement."

Once the design process was under way height became an issue as the site falls within sight lines of St Paul's Cathedral and consequently there was a limit imposed on the number of allowed floors. To maximise the number of floors cellular beams - approximately 290t in total - have been used to allow the services to run within the structural zone.

Interestingly, the cellular beams have been slightly modified with a crank detail attached to the end of the member, and so reducing the section size from a 533 beam to a 305. This was done to form a thin structural junction, at each floor level, along the external elevations.

"It was a feature developed with the architect," explains Mr Fisher. "It forms a visually thin floor zone when viewed from outside and also creates a raised ceiling zone adjacent to the external facade."

The crank detail consists of a smaller end section positioned level with the top of the concrete floor and butt welded to the main cellular floor beams.

Also for architectural and aesthetic value, the building's two street-facing facades are adorned with a single row of 12.2m high feature columns which begin at upper basement level and top out at first floor level.

Another major consideration during the design

Above: The crank detail of the cellular beams which provides the thin floor level.

Above: A vierendeel truss was erected to cantilever over subterranean obstructions.

stage was below ground where existing piles had to be retained. Consequently new piled foundations had to be arranged around these piles and this led to the requirement for reduced foundation loads, which again favoured the use of steel.

Early works in the construction programme also included the demolition of the existing building which had a two level deep basement. New pile caps and ground beams were installed around these existing piles, adding to the complexity of the early works.

"Given the current drive in the industry for foundation reuse we undertook an extensive review into the possibility, the existing foundations are 20m long under-reamed piles, however more for commercial/insurance rather than technical reasons the reuse option was eventually discounted," adds Mr Fisher.

As the new steel frame starts at basement level and the design required the grid pattern to remain constant throughout the structure, a number of columns are positioned directly above existing piles. Bigger-than-normal ground beams, transferring the loads to the new pile caps had to be installed.

In one location, adjacent to the southern elevation, three piles could not be installed because of a series of major obstructions. These piles provided support to a major perimeter column and with the inability to provide support directly beneath it, an alternative structural solution needed to be found. The solution was a storey high braced vierendeel girder which was capable of cantilevering back to an area where new piles could be installed.

Along an adjacent party wall, in the north west corner of the site, an existing concrete stairwell core was also retained as it was structurally integral to the next building. This feature has been incorporated into the new building with the new steelwork coming off of it.

All steelwork was erected by Bourne Steel during a 16 week programme, which also included the installation of metal decking and stairs. Steel was erected two floors at a time with column splices at every 7m.

"The erection process went to plan and towards the end of February this year we just had to come back and infill the hole where the tower crane had been," explains Nick Hatton, Bourne Steel Divisional Operations Director.

Although as previously mentioned stability is mostly derived from a major braced core located in the south west corner of the site, the structural design also had to incorporate a large moment frame which was erected along with the main steelwork.

As the majority of the building is open plan with a limited number of internal columns, locations for bracing were extremely limited due to the glazed facades of the structure. Vertical bracing was used in the north west core, but with its small plan area the aspect ratio proved too great to keep building deflections within limits.

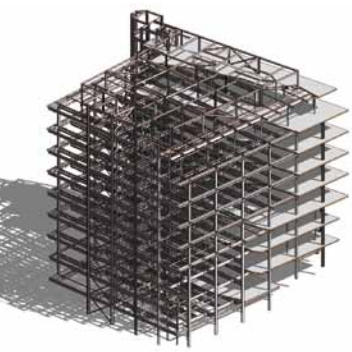
The solution was the introduction of an eight-storey moment frame to act in conjunction with the north west core's vertical bracing. "This reduced horizontal deflections to acceptable levels without losing floor space," adds Mr Fisher.

Completion of the project is scheduled for July 2009.

"A steel frame quickly emerged as the most economic solution."

Below:
The steel frame model.

Below right: Long 10.5m spans are a feature of all floors.



Kent's largest distribution centre

A host of sustainable features have been included in the construction of two large distribution warehouses for a major supermarket chain in north Kent.

Above: Spans of 30m and 36m are the main internal features of the warehouses.

FACT FILE
G.Park Sittingbourne
Main client: Morrison Supermarkets
Developer: Gazeley
Architect: DLA
Main contractor: VolkerFitzpatrick
Structural engineer: RPS Burks Green
Steelwork contractor: Atlas Ward Structures
Steel tonnage: 2,700t

More than 2,700t of structural steelwork has been erected for one of the largest ever pre-let distribution centres in the South East. Known as G. Park Sittingbourne and located close to the M2 motorway in Kent, the project consists of approximately 85,000m^2 of warehousing and distribution space for Morrisons split across two adjacent warehouse units.

Andrew Kilby, Construction Manager for steelwork contractor Atlas Ward, says both warehouses were erected concurrently during a 10 week programme. "It is a very exposed site and it can get extremely windy, but despite this we still completed the project on schedule."

The two warehouses, known as units 1 and 2, are 236m long and 200m long respectively. Unit 1 features four 36m spans, and unit 2 has five 30m spans. Both buildings also included attached ancillary blocks which are all one storey high, with the exception of a two-storey high office block on unit 2.

Sustainability is playing a key role in the development of the site and although early enabling works included a large earthmoving and cut and fill operation, no excavated material left the site. Overburden was used to create new wildlife ponds and grassland areas to replace drained areas of the site.

A number of cutting edge sustainable features are being incorporated into the project such as kinetic plates on estate roads, which will generate power from vehicles passing over them. Other ecological measures include rainwater harvesting and recycling as well as energy efficient lighting.

Main contractor VolkerFitzpatrick will complete its extensive on site work in April. Ian Catterick, VolkerFitzpatrick Project Manager, says prior to the steel framed sheds being erected groundworks included draining the former marshland site and installing a network of haul roads for facilitating plant and equipment to all areas of the site.

"We had a dry summer in 2008 and this really helped us get all the roads ready on time," he explains. "The site is on an existing marsh estuary and the water table is relatively close to the surface, so without haul roads nothing could have got done easily."

The two warehouses will provide Morrisons with its entire distribution and warehousing for the South East and both units have in excess of 35 trucks docks each. The units are 12m high to eaves and both feature external pods containing offices and canteen areas.

"Because of the ground conditions the piling programme required more than 7,000 piles," explains Mr Catterick. "Once this was complete the steel was erected and both units were watertight before Xmas, with a distinctive blue composite cladding installed by the end of January."

Below: The site was formerly an estuarine wetland and a major landscaping project will return part of the site to wildlife ponds.

Designing Structural Stainless Steel Members To Eurocode 3

Nancy Baddoo, SCI Manager, Materials, explains the engineering techniques required to design stainless steel sections to Eurocode 3.

Structural stainless steel at Gent Sint Pieters railway station in Belgium. Photo: Patrick Lints.

1. Structural stainless steel grades

Stainless steels have been used for structural applications ever since they were invented. They are attractive and highly corrosion resistant, whilst at the same time having good strength, toughness and fatigue properties alongside low maintenance requirements. They can be fabricated using a wide range of commonly available engineering techniques.

Both austenitic and duplex stainless steels are used for structural applications. Austenitic stainless steels provide a good combination of corrosion resistance, forming and fabrication properties, with design strengths around 220N/mm^2. The most commonly used grades are 1.4301/1.4307 (widely known as 304/304L) and 1.4401/1.4404 (widely known as 316/316L). Grades 1.4301/1.4307 are suitable for rural, urban and light industrial sites whilst grades 1.4401/1.4404 are more highly alloyed grades and will perform well in marine and industrial sites. Duplex stainless steels such as grade 1.4462 have high strength (around 450 N/mm^2), good wear resistance with very good resistance to stress corrosion cracking. The new 'lean duplexes' offer high strength combined with a leanly alloyed chemical composition, for example grade 1.4162 has a proof strength of around 450 N/mm^2, and a corrosion resistance between the austenitic grades 1.4301/1.4307 and 1.4401/1.4404.

The mechanical and physical properties for use in designing stainless steel structural members are given in EN 10088 *Stainless Steels*. Parts 4 and 5 of this standard are shortly to be issued which concentrate on grades for use in construction.

2. Development of a European design standard

Stainless steel structural members behave similarly to carbon steel members, although there are some important differences arising from the material's distinctive strength, stiffness and physical properties. The major difference between the mechanical properties of carbon and stainless steel is the stress-strain relationship: stainless steel has a continuous, but non-linear, relationship between stress and strain, whereas carbon steel has a clearly defined yield point. This means that different section classification limits and buckling curves apply, and a different approach to estimating beam deflections is necessary to account for the non-linear stiffness.

In recognition of the many desirable properties of stainless steel, SCI, with a number of European partners, have carried out a series of research projects to generate design guidance over the last 20 years. Based on the results of this work, CEN issued EN 1993-1-4 *Design of steel structures, Supplementary rules for stainless steels* in 2006 and the accompanying UK National Annex has just been published by BSI. EN 1993-1-4 extends the application of EN 1993-1-1 (covering general rules for the structural design of hot rolled and welded carbon steel sections) and EN 1993-1-3 (covering design of cold-formed light gauge carbon steel sections) to a wide range of austenitic and duplex stainless steels.

As EN 1993-1-4 has supplementary status, it only contains expressions where the carbon steel rules are unsuitable, and as such it cannot be used in isolation but alongside EN 1993-1-1, EN 1993-1-3, EN 1993-1-5 etc. To provide designers with one guidance document containing nearly everything needed for designing structural stainless steel, the Third Edition of the Euro Inox *Design Manual for Structural Stainless Steel* was published in 2006 (*www.steel-stainless.org/designmanual*). Aligned to EN 1993-1-4, the recommendations in the Design Manual cover member and joint design, fatigue and fire resistant design, supported by design examples and a detailed commentary. Free online design software is also available at *www.steel-stainless.org/software*.

EN 1993-1-4 contains three informative annexes which give guidance on:

- grade selection and durability of different grades
- special design rules for work hardened stainless steel
- how to model material behaviour in finite element analyses.

3. Classification of cross sections

Stainless steel members are classified in the same way as carbon steel members although the actual limits differ to suit the particular stress-strain characteristics of the material (generally the limits are lower). A more conservative approach is adopted for taking into account the reduced resistance of Class 4 stainless steel cross sections which depends on whether the element is internal or external, and welded or cold-formed.

The reduction factor ρ is calculated as follows:

Cold formed or welded internal elements: $\rho = \frac{0.772}{\bar{\lambda}_p} - \frac{0.125}{\bar{\lambda}_p^{2}}$ but ≤ 1

Cold formed outstand elements: $\rho = \frac{1}{\bar{\lambda}_p} - \frac{0.231}{\bar{\lambda}_p^{2}}$ but ≤ 1

Welded outstand elements: $\rho = \frac{1}{\bar{\lambda}_p} - \frac{0.242}{\bar{\lambda}_p^{2}}$ but ≤ 1

where $\bar{\lambda}_p = \frac{\bar{b}/t}{28.4\varepsilon\sqrt{k_\sigma}}$ is the element slenderness, defined as for carbon steel.

4. Resistances of cross sections

Cross section design is generally the same as that for carbon steel in EN 1993-1-1 and EN 1993-1-3.

5. Resistances of compression members

When considering the buckling of stainless steel columns, it is necessary to take into account the effect of the low proportional limit, residual stresses and the gradual yielding behaviour of stainless steel. The buckling curves in EN 1993-1-4 were derived by calibration against experimental data; based on the initial modulus, they take a similar form as the equivalent expressions for carbon steel. It was considered preferable to have this explicit design solution as opposed to using the tangent modulus corresponding to the buckling stress which would have required an iterative solution.

As for carbon steel, the reduction factor to be applied to the squash load to account for flexural buckling, χ is given by:

$$\chi = \frac{1}{\varphi + \left[\varphi^2 - \bar{\lambda}^2\right]^{0.5}} \leq 1$$

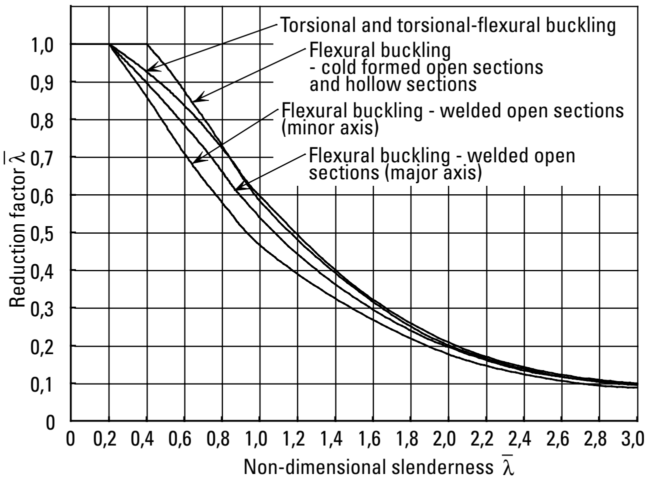
in which

$$\varphi = 0.5\left(1 + \alpha\left(\bar{\lambda} - \bar{\lambda}_0\right) + \bar{\lambda}^2\right) \quad \text{and} \quad \bar{\lambda} = \frac{l}{i}\frac{1}{\pi}\sqrt{\frac{f_y \beta_A}{E}}$$

where:

- f_y is the yield strength
- l is the buckling length
- i is the radius of gyration of the gross cross section
- β_A is the ratio of the effective cross section area to the gross cross section area
- α is the imperfection factor
- $\bar{\lambda}_0$ is the limiting slenderness
- E is the initial modulus, given in EN 10088-1 as 200 000 N/mm² for the typical grades of structural stainless steel

The values for α and $\bar{\lambda}_0$ depend on the mode of buckling and the type of member and the buckling curves are shown in Figure 1.



Type of member	α	$\bar{\lambda}_0$
Flexural buckling:		
Cold formed open sections	0.49	0.40
Hollow sections (welded and seamless)	0.49	0.40
Welded open sections (major axis)	0.49	0.20
Welded open sections (minor axis)	0.76	0.20
Torsional and torsional flexural buckling		
All members	0.34	0.20

Figure 1: Buckling curves for flexural, torsional and torsional-flexural buckling

6. Resistance of flexural members

The guidance for calculating the lateral torsional buckling resistance of stainless steel beams is the same as for carbon steel except that $\bar{\lambda}_0$, the limiting slenderness, is taken as 0.4 and α_{LT}, the imperfection factor, is taken as 0.34 for cold formed sections and hollow sections and 0.76 for welded open sections.

When it comes to shear buckling, the expression for χ_f , the contribution to shear buckling resistance from the flanges, is modified for stainless steel to suit the results of tests on stainless steel plate girders.

7. Determination of deflections

The deflection of stainless steel beams may be estimated by standard structural theory, except that the secant modulus of elasticity E_s should be used instead of the initial modulus. Although E_s varies with the stress level in the beam, as a simplification, this variation may be neglected and the minimum value of E_s for that member may be used throughout (corresponding to the maximum values of the stresses σ_1 and σ_2 in the member). The value of E_s may be obtained as follows:

$$E_s = (E_{s,1} + E_{s,2})/2$$

where:

- $E_{s,1}$ is the secant modulus corresponding to the stress σ_1 in the tension flange
- $E_{s,2}$ is the secant modulus corresponding to the stress σ_2 in the compression flange

$$E_{s,i} = \frac{E}{1 + 0.002\,\frac{E}{\sigma_{i,Ed,ser}}\left(\frac{\sigma_{i,Ed,ser}}{f_y}\right)^n} \quad \text{and } i = 1, 2$$

where:

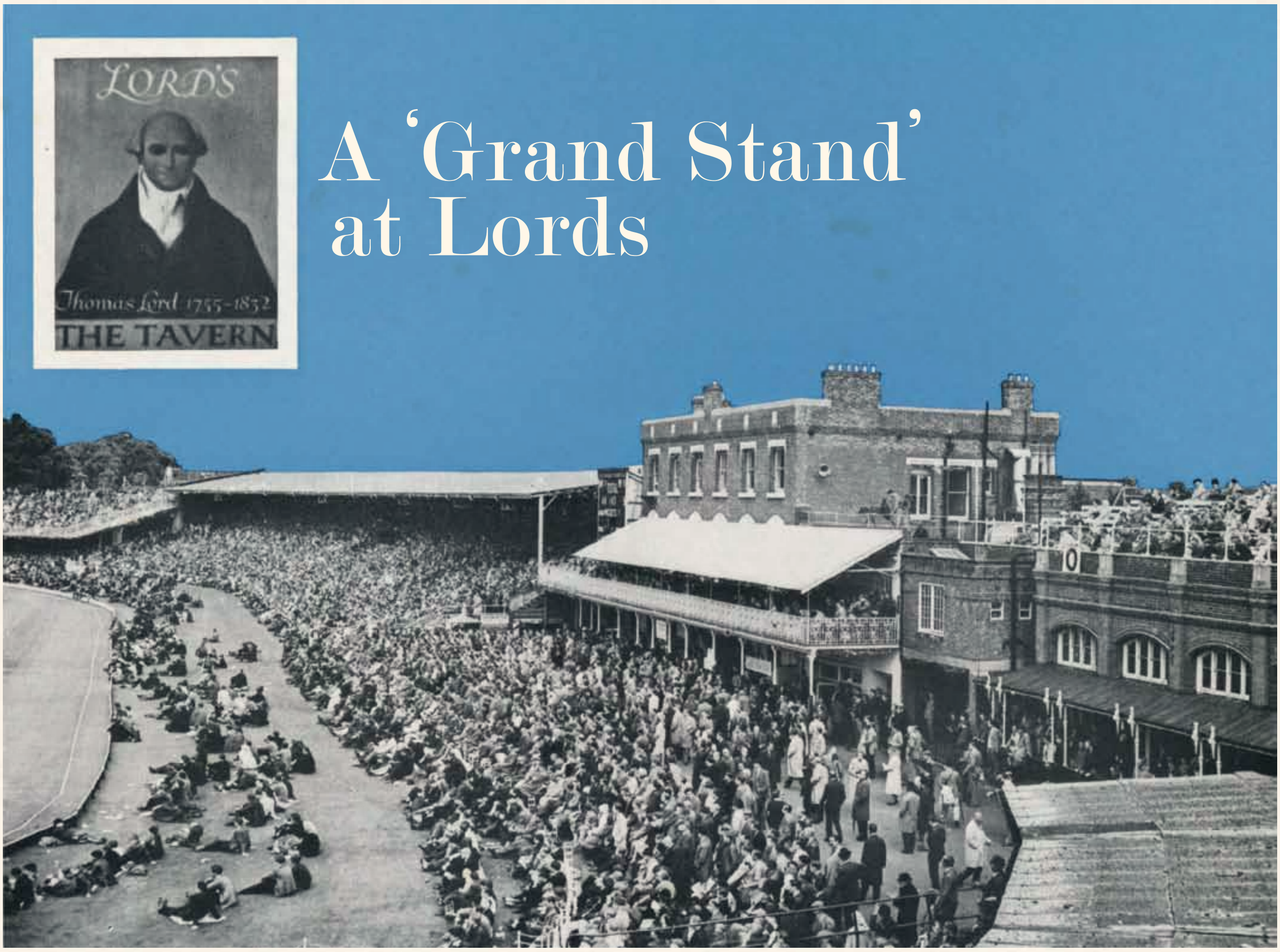
$\sigma_{i,Ed,ser}$ is the serviceability design stress in the tension or compression flange

EN 1993-1-4 gives values for *n*, the Ramberg Osgood parameter.

8. Design aids for structural stainless steel

Euro Inox *Design Manual for Structural Stainless Steel* (with design examples and a background commentary, available in seven languages).
www.steel-stainless.org/designmanual
European software for designing structural stainless steel (including fire resistant design, recently extended to cover hot rolled and welded sections as well as cold formed sections and including an online database of sections).
www.steel-stainless.org/software
Online Information Centre for Stainless Steel in Construction which contains resources about the design, specification, fabrication and installation of stainless steel in construction.
www.stainlessconstruction.com

A 'Grand Stand' at Lords



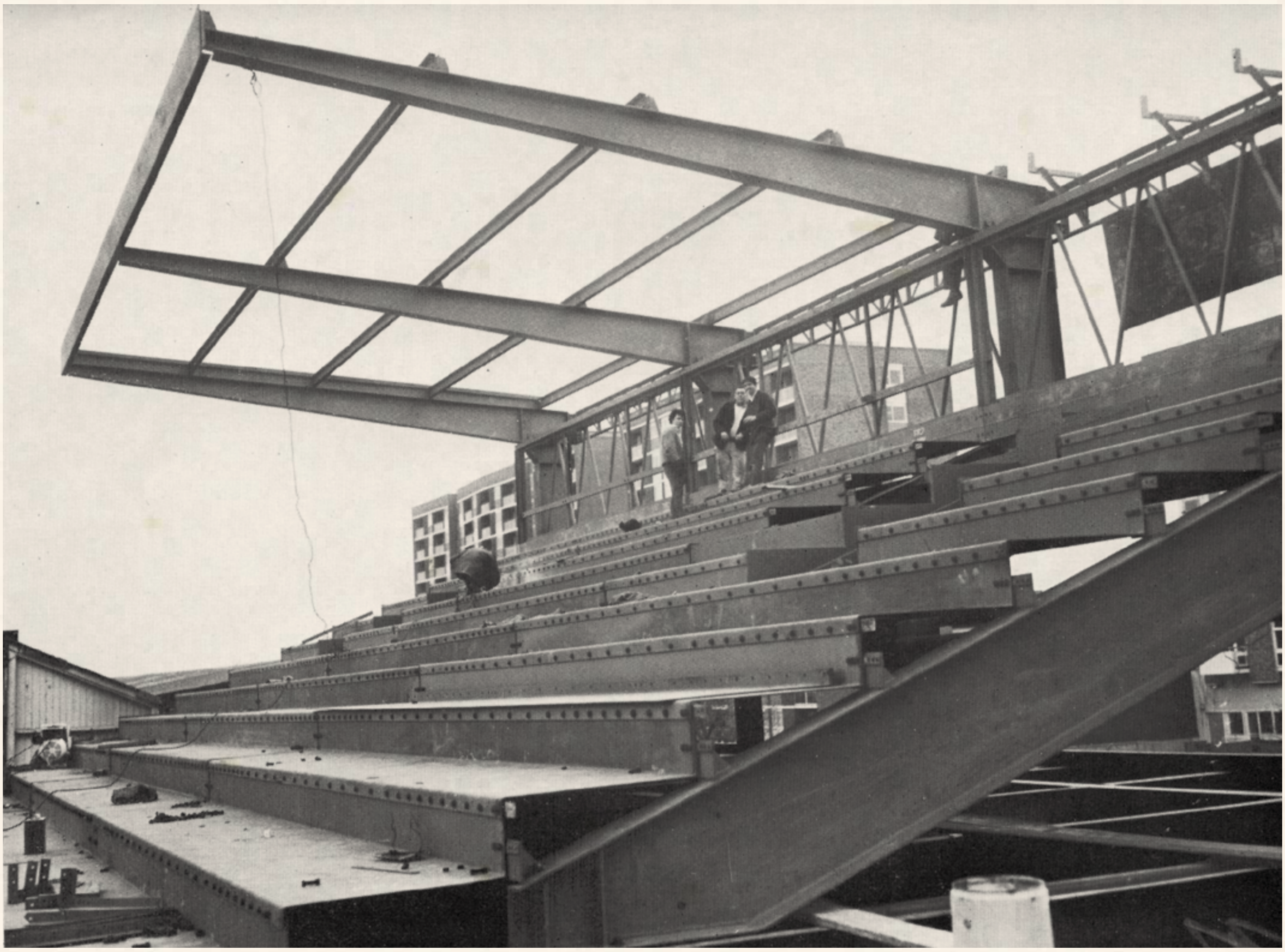
Above: A familiar scene on a great occasion at Lord's showing the now vanished stand and tavern – not forgetting the well known sign of the old tavern.

It was in 1814 that Mr T Lord leased the now famous ground to the Marylebone Cricket Club and the story of Cricket made way for Wisden. This was not the first ground owned by Mr Lord and used by the Club. This was in Dorset Fields where Dorset Square now stands and was in regular use from 1787 until the ground was developed for building in 1808. Mr Lord then leased a ground at North Bank, Regents Park and took the club there in 1811. The decision of the authorities to cut part of the Regent Canal through the ground forced another move: Mr Lord, carefully removed the turf from the playing pitch and took it to the present Lord's which began its cricket life in the year mentioned above.

All cricket grounds are famous for some individual or team achievements: Lord's being as it were among the cradles of the game claims more than most. Contemporary players need no introduction but living memory brings back in haphazard order, W. G. Grace, 'Plum' Warner, F. T. Mann, Hearne and Hendren, Don Bradman with his phenomenal scoring, Percy Holmes making 300 plus runs, and so many others. The present writer enjoyed the unparalleled thrill of seeing for the first time Macdonald the Australian fast bowler just after he had joined Lancashire and was therefore in his prime. That smooth swift gazelle-like run up to the wicket and beautiful action made and makes any other bowler seem clumsy and laboured. A permanent imprint on the memory.

All these have passed into history and their successors carry on the bright tradition of the game. As with players so with the surroundings: it seemed to an older generation of cricket lovers that the Clock Tower – smacked heavily on one occasion by the F. T. Mann mentioned above – and the tavern were indestructible. And yet today they have gone and it has to be admitted that the replacements are better than the originals. Exciting though it may have been – and one was young and vigorous in those days – to be pushed and shoved around with a milling crowd all struggling to get into the small tavern for a ham sandwich and a half pint of bitter, the elegant atmosphere of the new Tavern is a marked improvement.

Dr Grace may squirm slightly in his grave at the moving farther down the road of his memorial gates to make room for the new tavern, but surely even his critical eye would approve of the grand new two-level stand which now stands on the site of the old tavern, members' dining room and Clock Tower. The stand holds a total of 2,462 spectators with 1,550 accommodated on the upper terrace and in addition contains twenty 12-seater boxes for private parties. The whole redevelopment is costing £1m, which includes a large 13-storey block of flats as well as the new Tavern and stand. The stand itself is of steel construction and covers an area of 9,150 sq ft: It makes available 11,500 sq ft of terraced decking. An interesting feature of the design is the use of $\frac{5}{16}$-in thick steel plate for this decking. This was made possible by using the steel fabricators' giant steel press and this yielded useful



savings on the original estimated cost.

The main support frames weigh nearly 9 tonnes each and are set at 23 ft 3 in centres, each frame being assembled from eight pieces. The floor support members, in the shape of deep channel sections, were also pressed from steel plate. The stand is of two level layout, main floor levels being 14 ft and 25 ft rising to 36 ft above ground with the roof at a height of 49ft, falling 2 ft 5 in to a pressed steel gutter at the rear. A glazed screen protects spectators in the upper portion of the stand.

The main frames were designed with moment connections to transmit the wind loads and asymmetric vertical loading. All moment connections were made with high strength friction grip bolts.

Gutters at the front of the stand are in fact the front deck pressings, butt welded at all joints with sumps connected to galvanised steel down pipes. Galvanised gutters at the rear are pressed out from ¼-in thick plate. In order to maintain the very popular spectator and refreshment facilities that existed in front of the old tavern, a large ramped spectator concourse served by a 92ft run of bar is sited in its original position. A similar but smaller concourse and bar are also provided for Members, all this accommodation being at ground level.

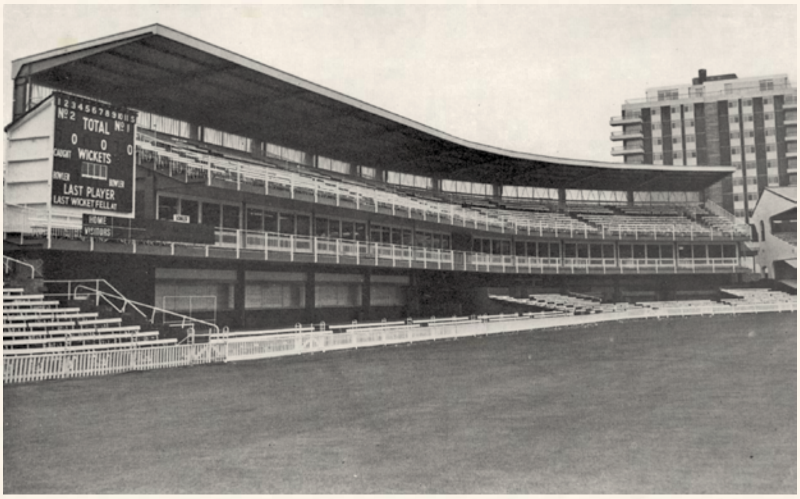
The very large spans over the first floor reception and dining rooms of the tavern made it more economical to use steel for the roof construction though the main structure was of reinforced concrete.

This took the form of lattice girders spanning over 70 ft which cantilever 12 ft beyond the outer columns on one side of the building. The concrete first floor also projects 12 ft beyond the columns and is in fact suspended from the ends of the cantilever roof girders by ¾-in square solid steel rods. This unusual roof construction is expressed in the design with the large roof girders clad in ribbed metal sheeting.

Architects for the New Tavern, Stand and Flats – Louis de Soissons, Peacock, Hodges, Robertson & Fraser. Consulting Engineers for the Stand – R. T. James & Partners.

Above: A close up view of the new stand showing the iteresting roof structure; also the terraced decking in course of construction. The use of $^{5}/_{16}$ in thick steel plate for the decking is an unusual feature.

Below: The new stand, including spectator concourse and 92ft run of bar.



Steel Construction Books

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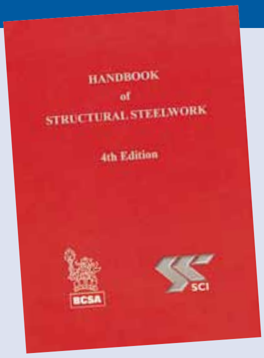
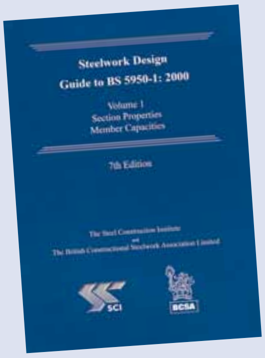


DESIGNING - The Red Book

The Handbook of Structural Steelwork

This handbook gives practical design advice, worked examples, section properties and member capacities. This edition includes the additional 21 new Advance sections produced by Corus and the section property and member capacity tables have been dual titled to reflect the relationship between BS 4 sections and the Advance range of sections. The tables for hot formed tubes have also been dual titled. The handbook is in accordance with the recommendations given in BS 5950-1: 2000.



DESIGNING - The Blue Book

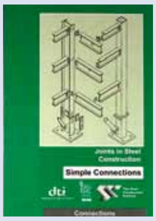
Steelwork Design Guide to BS 5950-1: 2000

This edition of the Blue book gives a comprehensive range of member property and capacity tables in accordance with BS 5950-1: 2000. It includes the 21 new Advance sections produced by Corus and the section property and member capacity tables have been dual titled to reflect the relationship between BS 4 sections and the Advance range of sections. This edition also includes a wider range of hollow sections. The tables for hot finished hollow sections have also been dual titled to show the relationship between BS EN 10210-2 sections and the Celsius range of sections.

SPECIFYING - The Black Book

National Structural Steelwork Specification

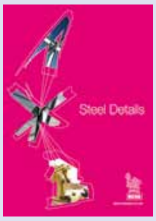
The 5th edition is a half-way house between the 4th edition and requirements of the forthcoming European standard EN 1090-2. Some of the changes include updating the specifications for steel sections, bolts and welding, the introduction of BS EN 3834 for the management of welding activities, a section on LMAC, an updated table on hold times and a new annex giving guidance on visual inspection of welds.



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.



STEEL DETAILING - The Magenta Book*

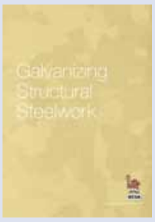
Steel Details

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.

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.



GALVANIZING - The Beige Book

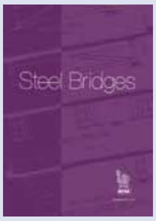
Galvanizing Structural Steelwork

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.

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.



BRIDGES - The Purple Book

Steel Bridges

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

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 1887; guidance on assessment of existing structures.

Code of Practice for Erection of Multi-Storey Buildings

The document provides guidance to clients, planning supervisors, principal contractors, designers and steelwork contractors on management procedures and methods, erection method state-ments, site preparation, delivery, storage, stability, lifting etc and aids compliance with the Health and Safety at Work Act.

Code of Practice for Erection of Low Rise Buildings

Invaluable guidance on the safety aspects of: site management & preparation; delivery, stacking & storage of materials; structural stability; holding down & locating arrangements for columns; lifting & handling; interconnection of components.

Code of Practice for Metal Decking & Stud Welding

Clear, unambiguous and practical information for Clients, Planning Supervisors, Principal Contractors, Designers and Steelwork Contractors about the systems of work to be employed on site together with the required site safety attendances.

Guide to the Erection of Steel Bridges

Cover all aspects in the planning and implementation of the safe erection of a steel bridge so that personnel in the whole team will benefit from a better understanding of the erection process. The guide is complementary to the publication Steel Bridges.

Guide to Steel Erection in Windy Conditions

Covers issues as the maximum wind speed in which steelwork should safely be erected, the role of management and supervision of controlling work etc. Advice is also provided for designers concerning aspects raised by the effect of wind on steelwork during erection.

Guide to Work at Height during the Loading and Unloading of Steelwork

The aim of this guide is to improve health and safety during loading and unloading of steelwork from lorries and trailers that takes place either at the steelwork factory or on sites. It describes the management procedures and methods to be adopted for access and working at height and is intended to serve as a standard reference when drafting site-and project-specific method statements.




Health and Safety in the Office
The booklet covers all hazards found in offices and the precautions that must be taken to avoid injury and ill health. It provides basic Health & Safety information for employees.

Health and Safety in the Workshop – A Guide for Steelwork Contractors
It is intended that it should be given to each employee in the workshop, thereby assisting the company to discharge part of its legal responsibilities under Health & Safety Regulations.

Health and Safety On Site
The booklet covers a range of Health and Safety topics that site-based personnel need to understand in order to carry out work safely.

Health and Safety: a Pocket Guide for Managers & Supervisors
This booklet covers topics such as risk assessment, method statements, policies, setting up the workplace, inspections, training, statutory test etc and provides a useful, easy to understand, reference on Health & Safety Law.

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

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AD 333
Equivalent Horizontal Forces in BS EN 1993-1-1

This Advisory Desk note offers clarification on the calculation of the factor ϕ when evaluating the effect of frame imperfections in clause 5.3.2 of BS EN 1993-1-1 and in particular gives guidance on determining the value of the parameter m used in the calculation of α_m.

The effects of frame imperfections (such as lack of verticality of columns) should be allowed for in frame analysis by means of either:

(1) An equivalent geometric imperfection, expressed in the form of a global initial sway imperfection ϕ (clause 5.3.2 (3) (a)) or

(2) A set of equivalent horizontal forces ϕN_{Ed} at each floor level (clause 5.3.2 (7))

In the Eurocode, equivalent horizontal forces perform the same function as "Notional Horizontal Forces" in BS 5950-1. The calculation of the equivalent imperfection forces is covered by clause 5.3.2(3) of BS EN 1993-1-1. In that clause, the global initial sway imperfections ϕ are given as:

$\phi = \phi_0 \, \alpha_h \, \alpha_m$

where ϕ_0 is the basic value: $\phi_0 = 1/200$.

The basic value of 1/200 will be familiar to BS 5950 designers, where it is expressed as the value 0.5%, applied to factored vertical dead and imposed loads.

In 5.3.2(3), the value α_h is given as:

$$\alpha_h = \frac{2}{\sqrt{h}} \text{ but } \frac{2}{3} \leq \alpha_h \leq 1.0$$

where h is the height of the structure in metres

The parameter α_m is defined as "the reduction factor for the number of columns in a row" and its value is given as:

$$\alpha_m = \sqrt{0.5\left(1 + \frac{1}{m}\right)}$$

Where m is defined as "the number of columns in a row … in the vertical plane considered".

This definition is at best unclear, and appears to presume that every row is braced (or has an equivalent support system, such as a rigid frame). In practice, it is far more common to have a few discreet bracing systems, which means that the bracing system must carry the equivalent horizontal forces from many columns, not simply the number of columns in a single row.

The equivalent clause in BS EN 1992-1-1 (clause 5.2) has a similar expression for evaluation equivalent horizontal forces and defines m as the "number of vertical members contributing to the horizontal force on the bracing system."

The definition in BS EN 1992-1-1 should be followed in preference to that in BS EN 1993-1-1.

Thus, as examples, if stability were provided by a single core, then m would be the total number of columns in the structure and in the common case with two equal bracing systems providing stability in a particular direction, m would be half the total number of columns.

In calculating ϕ, it is conservative to assume α_h and α_m are both 1.0.

Contact: Abdul Malik
Tel: 01344 636525
Email: advisory@steel-sci.com

Acoustic performance – Case Studies

"Steel residential buildings demonstrate excellent acoustic performance"

Four new case studies have been added to the previous four published in Feb 2008. These new case studies, provide actual acoustic test data from developments using steel construction of various forms. Each case study includes details of project, construction, walls and floor, junctions and acoustic testing. Also, included is a list of useful publications. The Building Regulations and Approved Document E set minimum standards of acoustic performance for the walls and floors in multi occupancy residential developments; in each case they were significantly exceeded.

Case Study 5: Zero4, Plymouth: Hot-rolled steel frame with Slimdek floors

- Major new residential and commercial development.
- A hot-rolled steel frame with *Slimdek* floors allowed flexibility of layout to accommodate the different size apartments. The *Slimdek* solution also offered a fast construction programme, which was necessary for the city centre site, and minimum floor-to-floor heights.
- Exceeded Building Regulation performance by 10 dB for airborne sound and 19 dB for impact sound.

Case Study 6: Basingstoke: Modular steel frame construction

- The Vision modular system from Vision Modular Structures provided 160 apartments for private and social tenure in the Houndsmill area of Basingstoke.
- The development, consisted of 3, 6 and 11 storey buildings, constructed from load-bearing modules.
- Exceeded Building Regulation performance by 8 dB for airborne sound and 10 dB for impact sound.

Case Study 7: Riverview, Hereford: Hot-rolled steel frame with composite fibre-reinforced slab floors

- Riverview is a Perfection Homes development of 23 luxury apartments in the heart of the city of Hereford with accommodation provided over five storeys. The project includes new-build, renovation and conversion.
- There are three main parts to the Riverview development. The largest part is a new-build five-storey steel frame structure with composite beams and slabs. The slabs are reinforced with the Corus *FibreFlor* system rather than traditional mesh reinforcement. The west side of the development consists of an existing steel frame that has been renovated and supplemented with new steel sections.
- Testing has shown that the walls satisfied the acoustic performance standards required by the Building Regulations and Approved Document E.

Case Study 8: Brightwell Court and Minerva Lodge, London: Fusion light steel structural framing

- Brightwell Court and Minerva Lodge are both 4-storey, light steel framed care homes constructed in London by Fusion Building Systems. Brightwell court contains 35 apartments and Minerva Lodge contains 54.
- The walls and floors, which form the structural frame, are constructed from light steel framing. Large open space was achieved on the ground floor of Brightwell Court by incorporating hot-rolled steel transfer structures above the ground floor. The bathrooms at Minerva Lodge were fully integrated prefabricated pods.
- Exceeded Building Regulation performance by 7 dB for airborne sound and 10 dB for impact sound.

Catalogue Reference: P371
Author: A G J Way and R M Lawson

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Codes & Standards

New and Revised Codes & Standards

(from BSI Updates February 2009)

BRITISH STANDARDS

NA to BS EN 1993:-

UK National Annex (informative) to Eurocode 3. Design of steel structures

NA to BS EN 1993-1-10:2005

Material toughness and through thickness properties

No current standard is superseded

PUBLISHED DOCUMENTS

PD 6695-1-10:2009

Recommendations for the design of structures to BS EN 1993-1-10

No current standard is superseded


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Steelwork contractors for buildings

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

Gillian Mitchell MBE, Deputy Director General, BCSA, 4 Whitehall Court, London SW1A 2ES
Tel: 020 7839 8566 Email: gillian.mitchell@steelconstruction.org

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

- **C** Heavy industrial platework for plant structures, bunkers, hoppers, silos etc
- **D** High rise buildings (offices etc over 15 storeys)
- **E** Large span portals (over 30m)
- **F** Medium/small span portals (up to 30m) and low rise buildings (up to 4 storeys)
- **G** Medium rise buildings (from 5 to 15 storeys)
- **H** Large span trusswork (over 20m)
- **J** Tubular steelwork where tubular construction forms a major part of the structure
- **K** Towers and masts
- **L** Architectural steelwork for staircases, balconies, canopies etc
- **M** Frames for machinery, supports for plant and conveyors
- **N** Large grandstands and stadia (over 5000 persons)
- **Q** Specialist fabrication services (eg bending, cellular/castellated beams, plate girders)
- **R** Refurbishment
- **S** Lighter fabrications including fire escapes, ladders and catwalks
- **QM** Quality management certification to ISO 9001

Notes

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●		●										Up to £1,400,000
ACL Structures Ltd	01258 456051			●	●		●				●						Up to £3,000,000
Adey Steel Ltd	01509 794561				●	●	●	●		●	●			●	●		Up to £3,000,000
Adstone Construction Ltd	01905 794561			●	●	●											Up to £4,000,000
Advanced Fabrications Poyle Ltd	01753 531116				●		●	●	●	●	●				●	✓	Up to £400,000
Andrew Mannion Structural Engineers Ltd	00 353 90 644 8300		●	●	●	●	●	●			●	●		●		✓	Up to £6,000,000
Angle Ring Company Ltd	0121 557 7241												●				Up to £800,000
Apex Steel Structures Ltd	01268 660828				●		●			●	●						Up to £800,000
Arromax Structures Ltd	01623 747466			●	●	●	●	●	●		●	●					Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●		●			●	●			●	●		Up to £800,000*
ASD Westok Ltd	01924 264121												●				Up to £6,000,000
ASME Engineering Ltd	020 8954 0028				●					●	●			●	●	✓	Up to £1,400,000*
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✓	Above £6,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●		●							●			Up to £2,000,000
AWF Steel Ltd	01236 457960				●					●				●	●		Up to £100,000
B D Structures Ltd	01942 817770			●	●	●	●				●			●			Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✓	Up to £2,000,000
Barnshaw Section Benders Ltd	01902 880484												●			✓	Up to £800,000
Barrett Steel Buildings Ltd	01274 266800			●	●	●	●									✓	Up to £6,000,000
Barretts of Aspley Ltd	01525 280136				●					●	●						Up to £3,000,000
BHC Ltd	01555 840006	●	●	●	●	●	●							●			Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Bone Steel Ltd	01698 375000	●	●	●	●	●	●			●	●	●		●			Up to £6,000,000*
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Browne Structures Ltd	01283 212720				●			●							●		Up to £400,000
BSB Structural Ltd	01506 840937			●	●												Up to £800,000
Cairnhill Structures Ltd	01236 449393				●	●	●	●		●	●			●	●	✓	Up to £1,400,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●			●	●		●		✓	Up to £6,000,000
Chieftain Contracts Ltd	01324 812911			●	●										●		Up to £400,000
Cleveland Bridge UK Ltd	01325 502277	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000*
CMF Ltd	020 8844 0940				●		●	●		●	●				●		Up to £6,000,000
Compass Engineering Ltd	01226 298388			●	●		●		●								Up to £2,000,000
Conder Structures Ltd	01283 545377		●	●	●	●	●				●	●		●	●	✓	Up to £6,000,000
Cordell Group Ltd	01642 452406	●			●	●	●	●	●	●	●					✓	Up to £3,000,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●		Up to £1,400,000
Cronin Buckley Fabrication & Construction Ltd	00 353 21 487 0017			●	●	●	●				●						Up to £6,000,000
Crown Structural Engineering Ltd	01623 490555			●	●	●	●		●		●			●	●	✓	Up to £1,400,000
D A Green & Sons Ltd	01406 370585		●	●	●	●	●	●	●	●	●	●		●		✓	Up to £6,000,000
D H Structures Ltd	01785 246269				●						●						Up to £200,000
Discain Project Services Ltd	01604 787276				●					●	●				●	✓	Up to £1,400,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●			●						Up to £6,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✓	Up to £6,000,000
Emmett Fabrications Ltd	01274 597484			●	●	●	●							●			Up to £1,400,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✓	Up to £3,000,000
F J Booth & Partners Ltd	01642 241581			●	●		●				●				●	✓	Up to £4,000,000
Fairfield-Mabey Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Fisher Engineering Ltd	028 6638 8521			●	●	●	●	●	●	●	●	●				✓	Above £6,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**Contract Value (1)**

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●			●						Up to £3,000,000
Frank H Dale Ltd	01568 612212		●	●	●	●										✓	Up to £6,000,000
Gibbs Engineering Ltd	01278 455253				●		●	●		●	●				●	✓	Up to £800,000
Glentworth Fabrications Ltd	0118 977 2088				●	●		●	●	●	●	●		●	●		Up to £800,000
GME Structures Ltd	01939 233023			●	●		●	●		●	●			●	●		Up to £800,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●			Up to £1,400,000
Graham Wood Structural Ltd	01903 755991		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000
Grays Engineering (Contracts) Ltd	01375 372411				●			●		●	●				●		Up to £200,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●				✓	Up to £4,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●			●						Up to £2,000,000
Had Fab Ltd	01875 611711								●		●				●	✓	Up to £1,400,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✓	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●					Up to £2,000,000
Harry Peers Steelwork Ltd	01204 558500			●	●	●	●	●	●	●	●			●		✓	Up to £4,000,000
Henry Smith (Constructional Engineers) Ltd	01606 592121			●	●	●	●	●									Up to £4,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●		Up to £3,000,000
Hills of Shoeburyness Ltd	01702 296321									●	●				●		Up to £800,000
J Robertson & Co Ltd	01255 672855									●	●				●		Up to £200,000
James Bros (Hamworthy) Ltd	01202 673815			●	●		●			●	●	●			●	✓	Up to £2,000,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●			Up to £6,000,000*
John Reid & Sons (Strucsteel) Ltd	01202 483333		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●						Up to £1,400,000
Leonard Cooper Ltd	0113 270 5441				●		●		●		●			●			Up to £800,000
Leonard Engineering (Ballybay) Ltd	00 353 42 974 1099			●	●	●	●				●						Up to £3,000,000
Lowe Engineering (Midland) Ltd	01889 563244									●					●	✓	Up to £800,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✓	Up to £3,000,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		Up to £1,400,000
Maldon Marine Ltd	01621 859000				●			●	●	●					●		Up to £1,400,000
Midland Steel Structures Ltd	024 7644 5584			●	●	●	●										Up to £800,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						Up to £3,000,000
Milltown Engineering Ltd	00 353 59 972 7119			●	●	●	●	●									Up to £6,000,000
Newbridge Engineering Ltd	01429 866722			●	●	●	●									✓	Up to £1,400,000
Newton Fabrications Ltd	01292 269135			●	●	●				●	●	●			●	✓	Up to £4,000,000
On Site Services (Gravesend) Ltd	01474 321552				●		●	●		●	●				●		Up to £400,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		Up to £800,000
Paddy Wall & Sons	00 353 51 420 515			●	●	●	●	●	●	●	●					✓	Up to £6,000,000
Pencro Structural Engineering Ltd	028 9335 2886			●	●		●	●			●					✓	Up to £2,000,000
Peter Marshall (Fire Escapes) Ltd	0113 307 6730									●	●				●		Up to £800,000
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		Up to £1,400,000
Remnant Engineering Ltd	01564 841160				●		●	●		●					●	✓	Up to £400,000*
Rippin Ltd	01383 518610			●	●	●	●	●									Up to £2,000,000
Roberts Engineering	01482 838240				●					●				●	●		Up to £100,000
Robinson Construction	01332 574711		●	●	●	●	●		●	●	●	●		●	●	✓	Above £6,000,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Rowen Structures Ltd	01773 860086		●	●	●	●	●	●	●	●	●	●		●			Above £6,000,000*
RSL (South West) Ltd	01460 67373			●	●		●				●						Up to £1,400,000
S H Structures Ltd	01977 681931						●	●	●	●							Up to £3,000,000
Selwyn Construction Engineering Ltd	0151 678 0236									●	●				●	✓	Up to £200,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Shipley Fabrications Ltd	01400 231115			●	●	●	●		●	●	●				●		Up to £200,000
SIAC Butlers Steel Ltd	00 353 57 862 3305		●	●	●	●	●	●			●	●				✓	Above £6,000,000
SIAC Tetbury Steel Ltd	01666 502792			●	●	●	●				●	●				✓	Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●		●								●		Up to £2,000,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		Up to £800,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●	●			●		Up to £400,000
Terence McCormack Ltd	028 3026 2261			●	●		●	●								✓	Up to £800,000
The AA Group Ltd	01695 50123			●	●	●	●			●	●				●		Up to £4,000,000
The Steel People Ltd	01622 715900				●					●					●		Up to £100,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●	●		●		✓	Up to £3,000,000*
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●		Up to £4,000,000
W I G Engineering Ltd	01869 320515				●					●					●		Up to £400,000
W S Britland & Company Ltd	01304 831583				●		●	●	●		●				●	✓	*Accounts outstanding*
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✓	Up to £6,000,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●			●			●	●	●	●				●	✓	Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●					✓	Up to £2,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**Contract Value (1)**

Associate Members

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9
AceCad Software Ltd	01332 545800		●							
Advanced Steel Services Ltd	01772 259822								●	
Albion Sections Ltd	0121 553 1877	●								
Alternative Steel Co Ltd	01942 610601								●	
Andrews Fasteners Ltd	0113 246 9992									●
Arro-Cad Ltd	01283 558206			●						
ASD metal services - Biddulph	01782 515152								●	
ASD metal services – Bodmin	01208 77066								●	
ASD metal services - Cardiff	029 2046 0622								●	
ASD metal services - Carlisle	01228 674766								●	
ASD metal services - Daventry	01327 876021								●	
ASD metal services - Durham	0191 492 2322								●	
ASD metal services - Edinburgh	0131 459 3200								●	
ASD metal services - Exeter	01395 233366								●	
ASD metal services - Grimsby	01472 353851								●	
ASD metal services - Hull	01482 633360								●	
ASD metal services – London	020 7476 0444								●	
ASD metal services - Norfolk	01553 761431								●	
ASD metal services - Stalbridge	01963 362646								●	
ASD metal services - Tividale	0121 520 1231								●	
Austin Trumanns Steel Ltd	0161 866 0266								●	
Ayrshire Metal Products (Daventry) Ltd	01327 300990	●								
BAPP Group Ltd	01226 383824									●
Barnshaw Plate Bending Centre Ltd	0161 320 9696	●								
Barrett Steel Services Ltd	01274 682281								●	
Bentley Systems (UK) Ltd	0141 353 5168		●							
Cellbeam Ltd	01937 840600	●								
Cellshield Ltd	01937 840600							●		
Celtic Steel services	01443 812181								●	
Combisafe International Ltd	01604 660600							●		
Composite Metal Flooring Ltd	01495 761080	●								
Composite Profiles UK Ltd	01202 659237	●								
Computer Services Consultants (UK) Ltd	0113 239 3000		●							
Cooper & Turner Ltd	0114 256 0057									●
Corus	01724 404040				●					
Corus Bellshill	01698 748424								●	
Corus Blackburn	01254 55161								●	
Corus Bristol	01454 315314								●	
Corus Dartford	01322 227272								●	
Corus Ireland Service Centre	028 9266 0747								●	
Corus Newcastle	0191 414 2121								●	
Corus Panels & Profiles	01684 856600	●								
Corus Service Centre Dublin	00 353 1 405 0300								●	
Corus Stourton	0113 276 0660								●	
Corus Tubes	01536 402121				●					
Corus Wednesfield	01902 484100								●	
Daver Steels Ltd	0114 261 1999	●								
Development Design Detailing Services Ltd	01204 396606			●						
Easi-edge Ltd	01777 870901							●		
Fabsec Ltd	0845 094 2530	●								
Ficep (UK) Ltd	0113 265 3921					●				
FLI Structures	01452 722260	●								
Forward Protective Coatings Ltd	01623 748323						●			
GWS Engineering & Industrial Supplies Ltd	00 353 21 4875 878									●
Hempel UK Ltd	01633 874024						●			
Hi-Span Ltd	01953 603081	●								
Industrial Shotblast & Spraying Ltd	0845 130 6715						●			
International Paint Ltd	0191 469 6111						●			
Interpipe UK Ltd	0845 226 7007								●	
Jack Tighe Ltd	01302 880360						●			
Kaltenbach Ltd	01234 213201					●				
Kingspan Structural Products	01944 712000	●								
LaserTUBE Cutting	0121 601 5000								●	
Leighs Paints	01204 521771						●			
Lindapter International	01274 521444									●
Metsec plc	0121 601 6000	●								
MSW (UK) Ltd	01355 232266	●								
MSW Structural Floor Systems	0115 946 2316	●								
National Tube Stockholders Ltd	01845 577440								●	
Northern Steel Decking Ltd	01909 550054	●								
Northern Steel Decking Scotland Ltd	01505 328830	●							●	
John Parker & Sons Ltd	01227 783200									
Peddinghaus Corporation UK Ltd	01952 200377					●				
Peddinghaus Corporation UK Ltd	00 353 87 2577 884					●				
Portway Steel Services	01454 311442								●	
PP Protube Ltd	01744 818992	●								
PPG Performance Coatings UK Ltd	01773 837300						●			
Profast (Group) Ltd	00 353 1 456 6666									●
Rainham Steel Co Ltd	01708 522311								●	
Richard Lees Steel Decking Ltd	01335 300999	●								
Rösler UK	0151 482 0444					●				
Schöck Ltd	0845 241 3390	●								
Site Coat Services Ltd	01476 577473						●			
South Park Steel Services	01925 817000								●	
South Park Steel Services	01724 810810								●	
Steel Projects UK Ltd	0113 253 2171		●							
Steelstock (Burton-on-Trent) Ltd	01283 226161								●	
Structural Metal Decks Ltd	01202 718898	●								
Structural Sections Ltd	0121 555 1342	●								
Struthers & Carter Ltd	01482 795171								●	
Studwelders Ltd	01291 626048	●								
Tekla (UK) Ltd	0113 307 1200		●							
Tension Control Bolts Ltd	01948 667700									●
Trailerpal Ltd	01743 446666							●		
Voortman UK Ltd	01827 63300					●				
Wedge Group Galvanizing Ltd	01909 486384						●			
Wells Protective Coatings Ltd	01302 733611						●			

Company name Tel 1 2 3 4 5 6 7 8 9
Company name Tel 1 2 3 4 5 6 7 8 9

Corporate Members

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

Company name	Tel
Balfour Beatty Utility Solutions Ltd	01332 661491
Griffiths & Armour	0151 236 5656
Roger Pope Associates	01752 263636
Highways Agency	08457 504030

Steelwork contractors for bridgework

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

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

FG Footbridge and sign gantries
PG Bridges made principally from plate girders
TW Bridges made principally from trusswork
BA Bridges with stiffened complex platework (eg in decks, box girders or arch boxes)
CM Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)
MB Moving bridges
RF Bridge refurbishment
QM Quality management certification to ISO 9001

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

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

Company name	Tel	FG	PG	TW	BA	CM	MB	RF	QM	Contract Value (1)
'N' Class Fabrication Ltd	01733 558989	●	●	●	●		●	●	✓	Up to £800,000 *Operating under CVA*
Allerton Engineering Ltd*	01609 774471	●	●	●	●	●	●	●	✓	Up to £1,400,000*
Briton Fabricators Ltd*	0115 963 2901	●	●	●	●	●		●	✓	Up to £2,000,000
Cimolai Spa	01223 350876	●	●	●	●	●	●		✓	Up to £6,000,000
Cleveland Bridge UK Ltd*	01325 502277	●	●	●	●	●	●	●	✓	Above £6,000,000*
Concrete & Timber Services Ltd	01484 606416	●	●	●		●	●		✓	Up to £800,000
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*
Nusteel Structures Ltd*	01303 268112	●	●	●	●	●		●	✓	Up to £4,000,000*
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	✓	Up to £3,000,000*
Remnant Engineering Ltd*	01564 841160	●							✓	Up to £400,000*
Rowecord Engineering Ltd*	01633 250511	●	●	●	●	●	●	●	✓	Above £6,000,000
Taylor & Sons Ltd	029 2034 4556	●	●	●	●	●	●	●	✓	Up to £1,400,000
W S Britland & Co Ltd*	01304 831583	●							✓	*Accounts outstanding*
Watson Steel Structures Ltd*	01204 699999	●	●	●	●	●	●	●	✓	Above £6,000,000

* Denotes membership of the BCSA

SCI Members

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:

- Technical Support for Architects
- Bridge Engineering
- Building Interfaces
- Civil Engineering
- Fabrication
- Health & Safety — best practice
- Information Technology
- Fire Engineering
- Light Steel and Modular Construction
- Offshore Hazard
- Codes and Standards
- Composite Construction
- Connections
- Construction Practice
- Corrosion Protection Engineering
- Offshore Structural Design
- Piling and Foundations
- Specialist Analysis
- Stainless Steel
- Steelwork Design
- Sustainability
- Vibration

Details of SCI Membership and services are available from:
Sandi Gentle, Membership Manager, SCI (The Steel Construction Institute), Silwood Park, Ascot, Berks.
Telephone: +44 (0) 1344 636544 Fax: +44 (0) 1344 636510
Email: s.gentle@steel-sci.com Website: www.steel-sci.com

SCI would like to welcome the following new Corporate Members:

UK
Hyder Consulting

Ireland
McAvoy