APRIL 2006 VOL14 NO4

NSC

NEW STEEL CONSTRUCTION

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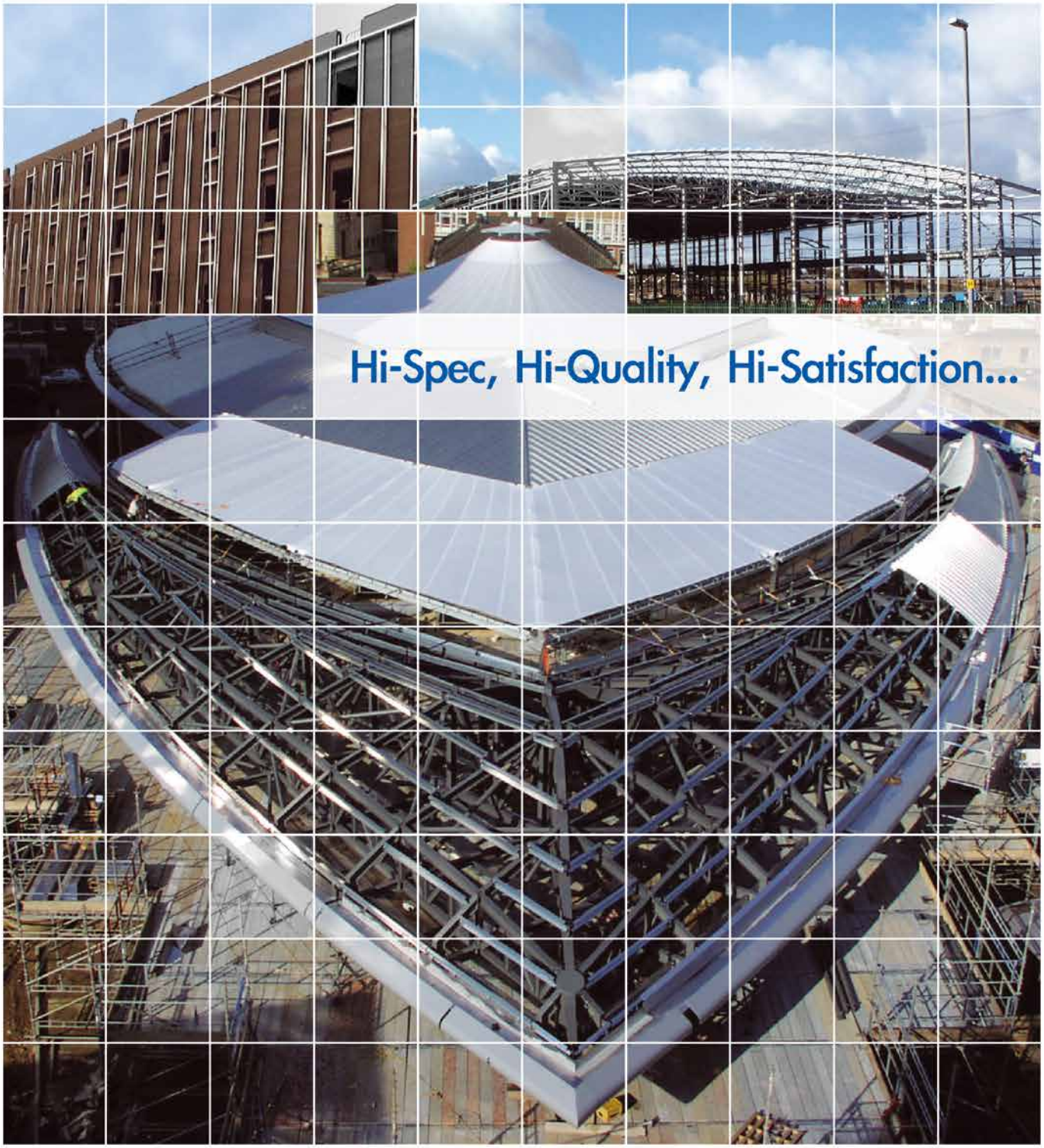
Tower takes control
Belfast trusses to ship out
Steel for Sunderland residential







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Steelwork Contractor: Watson Steel

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corus

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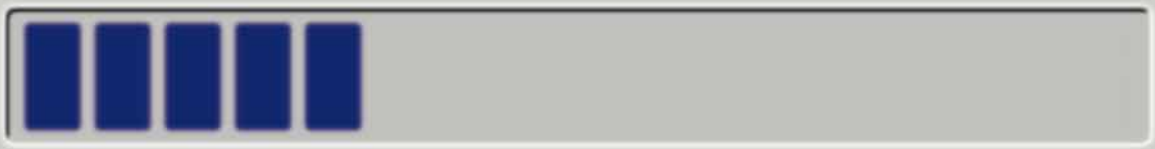
The Steel Construction Institute



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Spreading the sustainability message

Nick Barrett - Editor

Spring is in the air, at long last, and it is already clear that the main message for the coming season is going to concern sustainability. Corus has announced its seminars programme for the rest of 2006, as you can read in this issue of NSC, and it focuses heavily on getting sustainability messages across.

Also in this issue, we have a profile of a major client, British Land, which has nailed its colours very firmly to the sustainability mast. British Land's Richard Elliott reveals that having a well developed approach to sustainability has helped swing crucial planning permissions for major developments. All ultimate clients for buildings want to know that they have been designed and built in a sustainable way and they expect to see the proof; British Land and other major industry clients make no bones about the fact that their suppliers will have to either keep up with them on sustainability or get left behind.

Clients and designers can already be sure that by using steel they can tick all the sustainability boxes. The Corus seminars will spell out what the steel construction sector has already achieved and that it understands what it has yet to do. Regulation and legislation will demand that certain standards are achieved, but to be fully taken on board the sustainability message means a lot of voluntary and proactive effort.

Companies that have signed up to the BCSA's Sustainability Charter are already streets ahead of others when it comes to being able to demonstrate not only adherence to rules but also that they realise how important sustainability is to their clients own businesses. So if you haven't done it yet, sign up to the Charter.

Centenary Dinner takes stock

The BCSA Centenary Dinner was a good opportunity for the steel construction industry and its associated supply chain to take stock of its achievements. Things have come a long way since five fabricators in Manchester got together to form a Steelwork Society. They could hardly have foreseen the success that their industry has become. Donal McCormack is the latest in a long line of Presidents, but he was the first to be able to tell this annual gathering that steel's share of the key multi storey non-residential buildings market had reached 70%.

This level of performance was acknowledged by Principal Guest, Construction Minister Alun Michael, who noted that the industry's achievements are all around us, and "steel is more than ever the material of choice." Mr McCormack was able to tell guests about a host of recent achievements such as the industry's health and safety performance which was being promoted by the publication of six Best Practice guides on safe ways of working.

Work underway included producing guidance on project information requirements, reviewing industrial training with Metskill/SEMTA, joint projects with colleagues in the Specialist Engineering Contractors Group and in Metals Forum, and developing a worldwide steel construction network. All signs of a vibrant and healthy organisation representing a successful industry eager to cooperate with related organisations and sectors to improve delivery of service to clients. Which allowed Mr McCormack to confidently declare that the industry and the BCSA could look forward to the next hundred years with no little confidence.

Minister pays tribute to steel industry

Construction Minister Alun Michael paid tribute to the BCSA's 'many achievements and the enormous contribution' that the steelwork industry makes to the economy and society as a whole in an address to the Centenary Dinner.

Mr Michael was Principal Guest at the dinner which was attended by over 400 members and their guests at London's Savoy Hotel. Mr Alun said: "You have provided the very fabric of a vibrant and dynamic national and local economy in this city which will be further enhanced by preparations for the 2012 Olympics."

BCSA members were to be congratulated on their drive, global competitiveness and innovation. A major challenge at the start of the next 100 years would be the Olympics, which the government and the industry were working closely together on. "Lets demonstrate the capacity and talent of the UK steel construction industry and work together to drive markets for your innovative products and services."

He added: "I look forward to our partnership continuing to flourish as we embark on the next hundred years."

In his President's speech Donal McCormack outlined the origins of the BCSA from first a Steelwork Society of Manchester fabricators. Members' order books were healthy and the Olympics was expected to add about 5% a year to demand in each of the next five years.

Mr McCormack urged the Minister to take the opportunity of the current Construction Act review to ensure that the industry's cash flow would be smoother in future. He said that a new document for steelwork to sit alongside the National Structural Steelwork Specification was being produced in cooperation with other organisations, like the Association for Consultancy and Engineering, that would help improve the flow of timely and detailed project information.

Mr McCormack concluded by reaffirming BCSA's commitment to serving the steel construction industry and looked forward to the next 100 years.

Corus banks New York supply deal


© dbox for Cook + Fox Architects LLP

Corus will supply more than 3,000t of steel beams and plates to developer and main contractor Douglas Durst, for the construction of the new Bank of America (BAC) tower in New York.

The 52-storey 300m-tall tower is scheduled to open in 2008 and will consist of more than 2m/m² of floorspace, half of which will serve as BACs headquarters.

On completion the building will be the second tallest tower in the city, and as well as office space for other tenants it will house the reconstructed Henry Miller Theatre.

Designed by Cook + Fox Architects, the steel, glass and aluminum skyscraper will incorporate a number of environmental features such as wind turbines, floor-to-ceiling insulating glass and LED lights.

Peter Joyce, Sales Manager for Corus said: "The tower is a showcase for environmentally friendly design and, as a material, steel naturally lends itself to structurally efficient and flexible buildings."

New control tower for Newcastle Airport

Newcastle International Airport has announced plans for a new £8.2M control tower, as part of its on-going redevelopment programme. The tower will be the latest in a line of control towers that have been built in steel

The 46m-high steel tower has been designed by Reid Architecture, following an industry competition. The project is currently out to tender, although Arup has been awarded the contract for all structural and engineering work.

Reid Architecture said the proposal is for a single tower construction of circular plan form. The tower expands to encompass the high level of accommodation in an integrated unit at the top and splays out to house the base building facilities in a unified geometry at the bottom.

Peter Farmer, team leader at Reid Architecture said: "To harmonise the relatively large elements at the top and bottom of the tower, compared to the narrow stem, and to protect the plant, staircase and service risers, a net of stainless steel tension wires is proposed."

"Each strand of mesh is straight but the effect of the full pattern is to create a curved profile to the tower."

The circular base-building geometry, compared with linear or square options, is said to generate significant cost savings: base-building footprint - 7% saving; circulation - 32% saving; wall surface area - 36% saving; roof area - 65% saving.

Construction work is expected to begin in April/May 2006 and completion has been set for late 2007.

National Meeting debates Eurocodes

BCSA's annual National Meeting heard that the cost of adopting Eurocodes for a small design practice might be about £254,000. The estimate, based on calculations made by Professsor David Nethercott, was made in a presentation to the meeting by Rollo Reid who argued for retaining the National Steelwork standards.

Dr Roger Pope gave a presentation on the development of Eurocodes which are now intended to replace National Standards in 2010. Professor Haig Gulvanessian argued for accepting and adopting the Eurocodes, saying whether you love them or hate them, they are coming anyway.

During a debate it was suggested whereas overall, Eurocodes would give similar answers to National Standards, in some cases they might result in heavier steel structures. One questioner from the floor asked why make the change if there will be little difference.

It was explained that the government signed the UK up to the Eurocodes as part of its policy to remove barriers to trade and create a level playing field within the European Union.

Following the Eurocodes debate presentations were made by Mr Eddie Hole of Corus Tubes on the CE Marking of steel sections and by BCSA's Dr David Moore on the CE Marking of bolts and fabricated steelwork. Both speakers made it clear that while CE Marking is not mandatory in the UK, it is the only practical way to demonstrate compliance with both the Construction Products Directive and the Construction Products Regulations.

During the debate that followed it was clear that most people were unfamiliar with the processes of setting up a Factory Production Control system and obtaining 3rd party certification from a notified body. Chairman Richard Barrett brought the discussion to a conclusion by suggesting that BCSA should develop a strategy and a step by step procedure for CE Marking.

BCSA members can obtain copies of the presentations from David Moore (tel: 0207747 8122, email: david.moore@steelconstruction.org).

Steel bridge for A228

More than 60t of steelwork has been designed, manufactured and erected by Nusteel Structures for a 55m-long bridge over the A228 in Kent.

Nusteel fabricated all steelwork at its Port Lympne, Kent depot and erected the bridge in one week. The steel consisted of eight 7m-long span sections, five arch sections, two support beams and 10 hangers.

Birse Civils South East completed the installation of the three-span pedestrian and bridleway bridge as part of its £29M Leybourne and West Malling bypass contract with Kent County Council.

Metsec makes light work of long trusses

Lightweight steel trusses spanning 35m have been erected for a new manufacturing plant in Norfolk. Metsec supplied 33 of the trusses to the project which is expected to be completed in May.

Spaced at 6m centres, the pitched trusses are 1100mm deep at the ends rising to 3000mm at the ridge. Each one was supplied to site in three sections for bolting together. Once complete the new facility will provide client Milbank Floors with 7140m^2 of new manufacturing space.

Bolted on top of the lattice trusses are 4.5km of 172mm deep Metsec galvanised steel zed purlins to support the roof covering.

Metsec trusses were specified for the project because of their long span capability and their light weight, with each one weighing approximately 2200kg. "The profile of the cold rolled sections used for the chords ensures that they can be designed 100 per cent effective, they are also rolled from a high grade steel providing excellent strength to weight ratios and this allows the sections to be lighter," said Sales Director of Metsec's Lattice Beams division Darren Bird.

The trusses were designed and detailed in-house by Metsec's team of engineers using the company's LatticeSPEC software and were supplied in three phases to suit the clients erection sequence.

AROUND THE PRESS

Financial Times
8 March 2006
Industry builds on firm foundations
The UK is the world's most steel-intensive construction market, but the sector is far from resting on its laurels.

Financial Times
8 March 2006
Rising to the challenge
Corus says steel has taken off in particular because the industry has been keen to work with designers and architects on technical development.

Construction News
16 March 2006
Rebar prices set to top £450 per tonne
Rebar fabricators are warning of a summer of record reinforcement prices thanks to spiralling demand and increased raw material costs.

Daily Telegraph
16 March 2006
Steel maker's multi-storeys of success
Just down the road, in the shadow of the stadium's symbolic arch, Wembley Arena and its steel fabricator Bourne Steel are on track to be ready in time for the opening concert headlined by electro-pop band Depeche Mode. Grand opening and public plaudits.

Construction News
2 March 2006
Monumental decisions
The steel frame is being erected during Kazakhstan's savage winter, when temperatures can plunge to –40°C.

Building
17 March 2006
Business parks are not the only prosaic building type to go green. Sustainable construction has hit the big shed sector, too. Logistics property developer Gazeley is making its huge warehouses more environment-friendly with a policy it calls EcoTemplate. The idea is to progressively improve the environmental performance of its buildings with the ultimate objective of developing a carbon neutral shed, or even one that generates power.

Sustainability focus for seminars

Corus' seminar programme for 2006 will have a heavy focus on sustainability, with seminars in June in Leeds and London. Other seminars in the programme will include a continuation of the successful 2005 event Steel: The Show starting on 5 May in Derby, with other shows in Belfast, London, Chester and Cardiff. There will also be a steel bridges design conference in May in County Durham.

The sustainability seminars are expected to attract a lot of interest as the construction industry and its clients increasingly have to place these issues at the top of the agenda. Clients report that sustainability issues increasingly determine what planning permissions are granted.

Corus Construction Development Manager John Dowling, who will chair the sustainability seminars said: 'We aim to put across the message that sustainable design and construction is not just about being sexy and modern, but it is about good design and doing what we have always known to be good practice, with a commitment to continuous improvement. It is not difficult to be sustainable, but it does need commitment."

The steel sector understands its responsibilities and its place in the sustainable development framework, Mr Dowling added. The seminars will aim to keep designers and others abreast of the implications of the current and planned regulations relating to sustainable buildings, and how these requirements are being met on real world projects. Case studies will be used to show sustainable best practice.

"Legislation and regulation will ensure that sustainable construction is here to stay," said Mr Dowling. "The seminars will inform designers how by using steel they can be sure that they are able to meet the most stringent sustainability requirements."

Calendar: p34

Heathrow Terminal 5, one of the major projects Severfield-Rowen is involved with

Severfield-Rowen win Company of the Year award

Severfield-Rowen has recently picked up the prestigious 'Company of the Year' award at the 2005 PLC awards, held at Le Meridien Grosvenor House Hotel in London.

The award goes to a company that has clearly demonstrated that its success is not just a short term phenomenon. The organisers added that Severfield-Rowen had been successful in share price terms and professionally managed, and development to date has been soundly financed.

The PLC awards event was founded in 1987 to reward excellence in the smaller company sector. This year's event was attended by 1,500 guests which included investment banks, fund managers, investment analysts and corporate advisors.

Steel to access all areas

A new website offering a fast and easy route to Eurocode information for steel construction will be launched on 13 June 2006.

The site, **www.access-steel.com**, was recently unveiled by six leading European steel institutes and is primarily targeted at the needs of practising designers, architects and their clients.

The technical guidance available in June will be harmonised, quality assured and in English, French, German and Spanish. There will also be comprehensive coverage of single and multi-storey buildings and residential construction.

Steel is currently the only sector investing in an integrated approach to the Eurocodes and steelmakers are keen to encourage use of the website to help promote the materials use in existing EU countries as well as accession states.

Special attention will also be given to the new opportunities for fire safety engineering in the Eurocodes.

Gerhard Sedlacek, Chairman of the ECCS Technical Management Board commented that a special task force set up by the EU Enterprise Directorate would be keen to use the site to facilitate the adoption of the Eurocodes in countries outside of Europe.

Further information on Eurocode 3 will be put on the web site when the National Annexes, without which Eurocodes cannot be used in the UK, become available in 2007.

New mill to deliver consistent quality

As part of a £130M facility investment at the Scunthorpe site, Corus is enhancing its medium Section Mill to deliver a first in steel rolling technology.

The major enhancement will result in the world's first mill able to roll high-quality rails up to 120m-long in a single pass through a 10-stand finishing mill at speeds of up to 6m a second.

In total, the enhanced mill will roll approximately 700,000t of steel a year, made up of 500,000t of sections and 200,000t of rail products.

David Edwards, Corus Construction and Industrial Director of Engineering said: "Customers will benefit from better customer service and enhanced product quality. The extended mill will be more reliable and help improve our global competitiveness,"

The project also includes the introduction of a walking beam furnace, which is being transfered from the Heavy Section Mill and will be housed in a new extension to the mill building.

Another part of Corus' investment is the construction of a new Automated Distribution Centre to serve the new enhanced mill. Approximately 40,000 individual pieces of structural steel will be brought together to create the Centre which will benefit the company's sections customers.

After being cut to length and bundled, more than 300,000t of the mill's sections production destined for domestic customers will pass through the Centre, stored and retrieved by one of four automated stacking machines.

"All works are going well," Mr Edwards said. "We anticipate starting up on time."

Sculpted roof tops shops

Severfield Reeve will supply more than 10,000t of steel for the construction of the £70M Silverburn shopping centre in Glasgow.

Working for main contractor Bovis Lend Lease, Severfield began steelwork erection in January for the 1 million m^2 project which is due for completion in late 2007.

Situated on the site of the former Pollok Shopping Centre and the South Pollok playing fields, the development consists of a braced steel framed building, split into independent areas along its 600m length, curved in plan and two-storeys high.

Joe Stuart, Director of Stuart McTaggart, the project's structural engineers, said the centre will have a dynamic sculptured roof profile that will be illuminated at night, highlighting the roof shape and the supporting complex steelwork frame.

To provide environmentally friendly and cost efficient air conditioning, Stuart said a series of 6m-high 'roof pods' will run the length of the mall.

The pods will be supported off a series of long-span shallow depth steel trusses and Fabsec deep beams spanning the mall.

Adjoining the shopping centre, a multi-storey car park for 1,975 vehicles is already nearing completion.

NEWS IN BRIEF

In conjunction with BCSA's Centenary, the "Financial Times" has published its first **Special Report on Steel Construction**. (see: *http://news.ft.com/reports/steel-construction2006*) Over 130,000 copies of the report were printed and included in the newspaper on 8 March 2006.

The Department of Trade and Industry has invited some 150 construction industry leaders to debate its analysis of consultation responses and proposals for **changes to the Construction Act**. DTI's detailed proposals, primarily regarding payment and safe guards against insolvency, are currently being prepared. .

MSW(UK) Ltd has won the British Safety Council's international **safety award** for the tenth year running. As well as low accident rates, winners must have good safety policies and a solid commitment to health and safety at the highest board level.

BCSA, in conjunction with the Metals Forum, is holding a **Health and Safety Seminar** & Exhibition for members on Thursday 6 April at the National Metalforming Centre, West Bromwich.

The Health and Safety Executive has announced that the revised **Construction (Design and Management) Regulations** will be implemented in April 2007. The Regulations will revise and bring together provisions in the existing CDM Regulations 1994 and the Construction (Health Safety and Welfare) Regulations 1996 into a single regulatory package.

Leading structural designers have called for the Institution of Civil Engineers to run **bridge design competitions** instead of the Royal Institute of British Architects (RIBA). They say RIBA run competitions consistently produce solutions which fail to give value for money and concentrate on extreme designs to gain attention.

Full marks for fossil-shaped school

Caunton Engineering has supplied 95t of steelwork for the construction of an innovative primary school building whose design is inspired by the shape of a pre-historic sea creature.

The school in West Hunslet, Yorkshire was designed by Architectural Design Services, part of Leeds City Council, and it's intricate spiral design has been dubbed the ammonite.

Andy Bailey, Project Engineer for Caunton said every steel member supplied to the project was different.

"As the building spirals out from the centre, every grid line slightly differs from the last," Mr Bailey said. "This meant every column and beam also had to be slightly different."

According to Mr Bailey the entire steel frame was basically a giant roof structure as the school is single storey. However, the large number of steel members required for the job meant some in-depth planning.

Caunton supplied and erected more than 2,000 steel members including SHS 140mm columns, and beams of various sizes up to 356mm.

Mr Bailey said the erection process was completed successfully without any hitches as all steel members were numbered and delivered in assembly batches.

Main contractor Kier Northern is scheduled to finish the project by the end of the year.

Lincoln floats steel restaurant

Spalding based D.A Green is supplying and erecting 30t of steelwork for the construction of a 'floating' restaurant at the Burton Waters marina, on the outskirts of Lincoln.

D.A. Green Contract Manager Sean Clark said the restaurant is being built on a number of existing pile caps adjacent to the riverfront which will give the impression the structure is floating.

"The piles were originally installed a number of years ago for a job which was cancelled," Mr Clark said. "After a thorough survey of the piles we were satisfied they could support the new structure."

D.A Green has erected a steel base with 460mm deep beams to form an octagonally shaped grid which has a 25m diameter at its widest point. This has been covered with metal decking to support a concrete slab. Eight steel columns were also erected to support the steel clad roof.

Main contractor is Linpave, and it is scheduled to complete the restaurant by late Summer.

Car Park of the Year

The steel framed St Andrew's Car Park in Norwich has won the 'Best New Car Park' award at the annual Parking Review Awards held at London's Dorchester Hotel.

Located in Norwich city centre, the structure replaced a decaying 1960s concrete multi-storey car park.

David Rogers, Strategic Parking Officer, Norwich City Council said the building has a bright metallic exterior - brave for such a historic city.

The City Council received their award from architectural and design journalist Jeremy Stewardson, who commented: "The judges thought this car park had a great facade. It's bright and dynamic rather than a monolith and it provides as many spaces as the old car park, but in half the footprint.

Chris Whapples, Senior Partner of structural engineers Hill Cannon said: "Steel was used because it has good sustainability and can be fabricated off site."

"It also allowed for a quicker and quieter construction time, which was important due to the city centre location," Mr Whapples said.

Diary

23 – 27 April 2006
Interbuild 2006
Exhibition showcasing best practice, recent technological advances and new product development in the building industry. NEC, Birmingham
www.interbuild.com

15 – 17 May 2006
Steel, Space & Composite Structures
The 8th international conference promotes international communication, new ideas, developments and innovations. Kuala Lumpur, Malaysia.
For details email: cipremie@singnet.com.sg

22 June 2006
Structural Steel Design Awards Luncheon
Winners of the 2006 awards sponsored by Corus, the BCSA and the SCI, will be announced. Savoy Hotel, London.
Contact Gillian.Mitchell@steelconstruction.org

8 – 9 November 2006
Steel Construction Conference
The conference coincides with the 50th Anniversary of the Southern African Institute of Steel Construction (SAISC) Johannesburg
For details email renee@saisc.co.za

Steel frames British Land's sustainability strategy

Many of the biggest projects in the busy City of London property development scene are overseen by one of the smallest client in-house construction teams in the market – only three people strong - including Richard Elliott, Head of Construction for British Land. Nick Barrett reports.

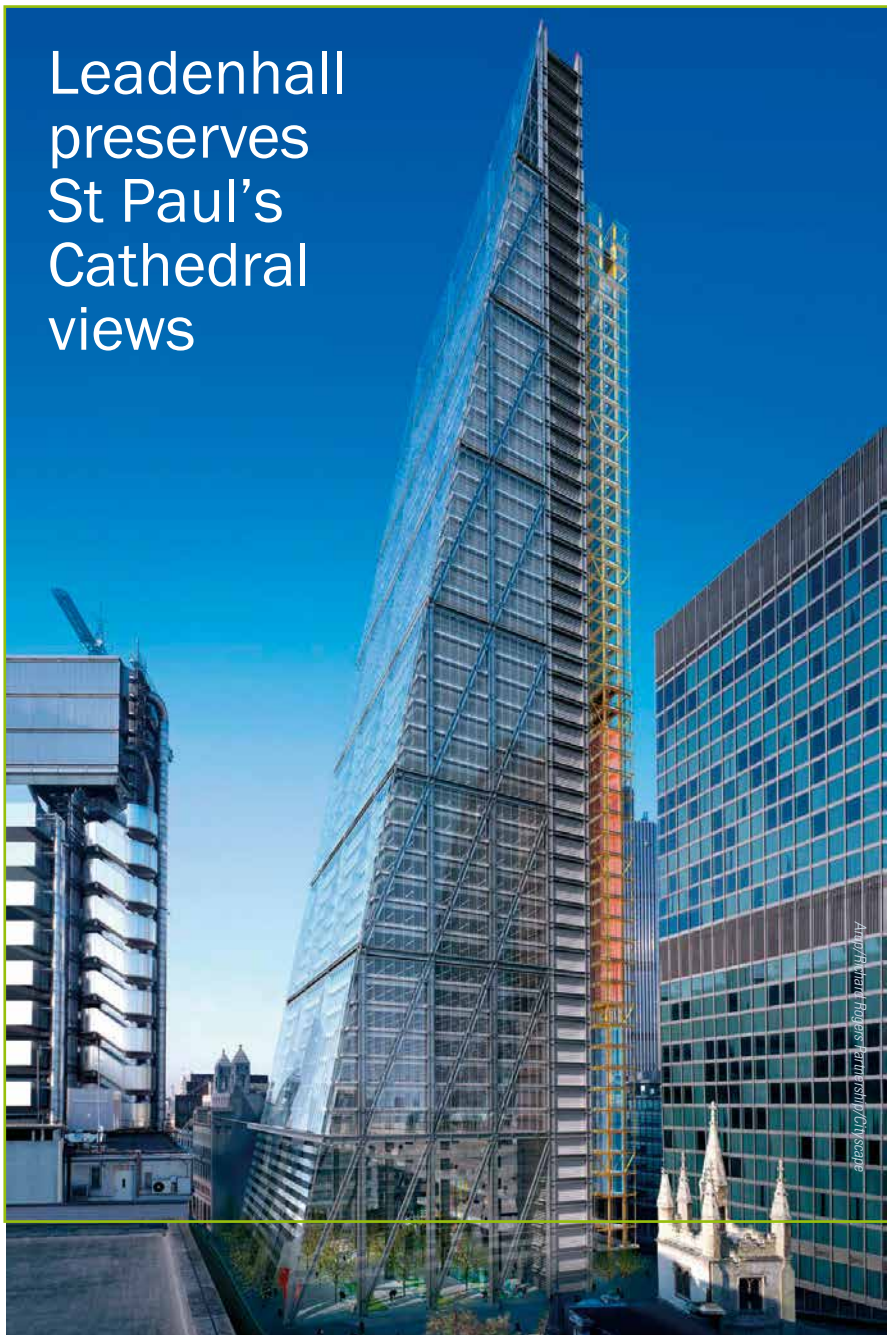
Backed up by a strategy of outsourcing most services, the British Land construction team manages a current works programme of some £850M, making it one of the biggest active developers in the country. The FTSE 100 listed British Land as the second biggest property company in the UK, with a £14,600M property portfolio of which 57% is in retail and 37% offices of which 95% is in central London, the rest being residential and industrial. British Land is currently one of the most active developers, with two major City buildings on site and a number of others in the pipeline.

It is striking how much of British Land's current and recent development portfolio is steel framed. Steel framed projects on site now include the Willis Building, a 29 storey tower, in the City that featured in NSC in March, and a two building scheme comprising the 35 storey Broadgate Tower and 12 storey 201 Bishopgate, both designed by Chicago based Skidmore, Owings & Merrill. Both of the towers have started on site and they will be joined by another big steel framed development, Ludgate West, in June this year.

There is no company policy about using steel and other materials will be considered where appropriate, says Richard. "But some projects just demand steel. There are some types of project that you couldn't do in anything other than steel. On our Broadgate Tower building we have a five storey high steel "A" frame that spans four railway lines below. It is hard to imagine that in concrete.

"On our Broadgate Tower building we have a five storey high steel 'A' frame that spans four railway lines below. It is hard to imagine that in concrete."

"From an economic point of view steel usually wins out when compared to alternatives, after taking into account all factors including the costs of



Andrew Wall, Rogers Stirk Harbour + Partners


Richard Elliott

foundations. We like the predictability of the lead time that steel offers. Steel is also flexible and our architects value the greater freedom to express themselves that steel can give them."

"Our architects value the greater freedom to express themselves that steel can give them."

Richard and his team oversee these projects, and much more, from within a soon to be vacated warren of offices facing London's Regents Park. If Richard's office ever featured on the television programme Through the Keyhole the panel would quickly pin down his likely occupation from the construction paraphernalia like models of construction plant, and project photographs on the walls. That he has a liking for steel can be seen from the calendar of a well known steelwork contractor on the wall.

Project management rather than property development was Richard's original chosen career path, which took him from a degree in Construction Economics at Trent Polytechnic to Mowlem, as a deputy project manager, in 1986. After two years working on London docklands projects he made his first move into the development world, joining Rosehaugh where he stayed for four years.

After a year off, working for Hong Kong Land followed, including a spell in Vietnam where he managed two projects from offices in Hanoi with joint venture partners. Back in Hong Kong after a few years he worked on infrastructure schemes including container ports and CHP plants.

Returning to the UK in late 2000 he went to work for property development managers M3 Consulting before joining British Land in May 2004, taking on the role of Project Director on the City's Plantation Place development. "I decided I wasn't cut out for a consultancy role and when I was offered the job by British Land I was attracted by the prospect of managing the delivery of a diverse portfolio of development activity.

London's skyline will be changed dramatically with the 48 storey Leadenhall building that will rise to a height of 736 ft, providing 55,870m² of high quality office space.
The unusually tapered building comprises a number of distinct structural elements. It will be stabilised by an external mega- frame consisting of a seven storey closed tube steel bracing. Each floor plate will be connected to the mega frame and will diminish in size by 750mm at every level towards the apex. The tapering design is to ensure conservation of one of London's world famous 'views of importance', of St Paul's Cathedral.
The first seven storeys at the base of the building provide a large public space, made possible due to the seven storey bracing frame which will support the building above the galleria. This will be a unique space for a City development and will include a range of retail and amenity areas.
Structural Engineer Arup is currently carrying out detailed and extensive wind tunnel tests. The detailed scheme design is being refined and is expected to be completed later this year, with construction of the tower expected to begin in 2007.

Best Practice Sustainability

During his year off Richard went to Nepal as a volunteer helping to build water supply pipelines under the auspices of the Ghurkha Welfare Trust. A property developer with a social conscience? That fits well with the image British Land and other major property developers are keen to promote. The company's Sustainability Brief is a model of current best practice, that forces contractors and other suppliers on its projects to jump through the sustainability hoops if they want to work for British Land.

The success of major developments is increasingly being measured in life cycle costs, which brings sustainability issues to the fore. Tenants and funding institutions are consistently asking developers for evidence of sustainability credentials of their schemes.

'Corporate social responsibility and sustainability are sound objectives from a moral standpoint, but they also make good business sense," says Richard.

The challenge is to build sustainable buildings that are commercially viable, offer long-term profitability and build British Land's reputation and relationships with the communities they operate in. British Land aims to improve the environmental and social performance of the supply chain, by using more sustainable resources and materials and developing criteria against which to review supply chain members.

The British Land Sustainability Brief has been devised to help project teams realise these objectives. The Brief, launched in November 2004, is now used on all British Land developments.

Richard explains: "The Brief is a methodology that embeds sustainability into every development project from inception through construction and into occupation. It contains key design and construction parameters, notes on good practice, areas that require discussion and agreement and indication of where additional reference information can be sourced."

It aims to guide the design and construction process by creating objectives and targets to achieve continuous improvement. It aims to raise awareness of staff, joint venture partners and suppliers. It also aims to define the process, standards, guidance and responsibilities of management at each stage of a project. The Brief is used in conjunction with other British Land documents like the Office Design Brief, Waste Management Plan and Corporate Responsibility Handbook.

"It is vital to use the Brief from the outset as you can't inject sustainability into a project at a later stage," says Richard. "Recycling, climate control impacts, appropriate materials and energy conservation all need to be addressed early on."

Steel scores high on sustainability measures. Among the benefits noted by British Land are that off-site fabrication contributes to safer working environments and development of local skill bases; off-site modular construction and prefabrication increase productivity and reduce waste; waste and transportation are reduced, lessening the impact on the local environment near the construction site; future modification and adaptation are relatively easy, which helps extend the working life of structures; some 94% of construction steel can be recovered, with 84% recycled.

Paybacks have already been seen. A sustainability review on the Broadgate Tower and Leadenhall schemes included the quality of relationships with potential tenants, suppliers and opinion formers as well as local communities and authorities. "Our approach to environmental issues and the local community helped secure first time planning consents for two significant multi-storey schemes."

New tower for Broadgate

Contractor Bovis Lend Lease began construction on the Broadgate Tower and 201 Bishopsgate in London in October 2005. The buildings together will create 820,000 sq ft of office space, using 14,000t of steelwork.

The development is being constructed on a flat slab raft built over a mainline railway in 2000, creating a tunnel which will run underneath the buildings. The 35 storey tower and adjoining 12 storey building are situated on a 2.3 acre site and will be linked together with a large steel and glass canopy suspended from the tower by steel cables. The canopy cantilevers out and upwards from the structure at the fifth floor. The canopy will provide a new public space and galleria containing a number of shops, bars and cafes.

Chicago based Skidmore Owings & Merrill is both the architect and the structural engineer. The tower will have a steel tube frame, with the perimeter steelwork forming the main structural support as there is no central core. It is externally braced with expressed steelwork.

At the fifth floor the tower frame converts to a steel A-frame to distribute the load over the raft and onto the foundations on one side and in the centre of the railway. The lower rise building will have an internal bracing with cell beam floor framing. Construction of the superstructures will begin in early summer and is programmed to be completed in Spring 2008, creating a grand entrance to the Broadgate Estate.

"I am still in essence a project manager. We use construction management a lot and we have back up from my old employers M3. We focus on managing the construction risk. I visit all our sites almost every week, touring the site and attending design and site meetings."

A major part of the task is to ensure that the design brief is met. 'We get very involved in procurement and we contract directly with specialists when we use construction management, which we use for the majority of our major projects.'

It is not unusual for us to negotiate significant packages of work. "We work very closely with our specialist contractors including steelwork contractors, especially William Hare, to make sure everybody knows what is coming. On Leadenhall for example there will be sections weighing 25t, so we are talking very early in the process about how we are going to do that."

What qualities are valued in a steelwork contractor? "We like to see up-front design input, an ability to produce details and be innovative in detailing. The quality of the manufacturing facility is also important. We need our contractors and other suppliers to be straightforward with us, and tell us their problems so we can work together to find solutions rather than wait until it is too late."

"We like to see up-front design input, an ability to produce details and be innovative in detailing."

The construction industry is becoming more sophisticated in delivering services to clients, Richard says, although there is still a lot to be done. 'The steelwork sector has reacted to client demands for improvements in the way we would like them to. William Hare for example has been willing to look at new ways of doing things and improving their service to us.

"One area I would like to see improvement is in communication between the designer and the steelwork contractor. There must be a better way of transmitting information between them. There seems to be a mismatch between what the designer thinks he is transmitting and what the steelwork contractor actually gets."

The 29-storey Willis Building in London is one of British Land's current portfolio

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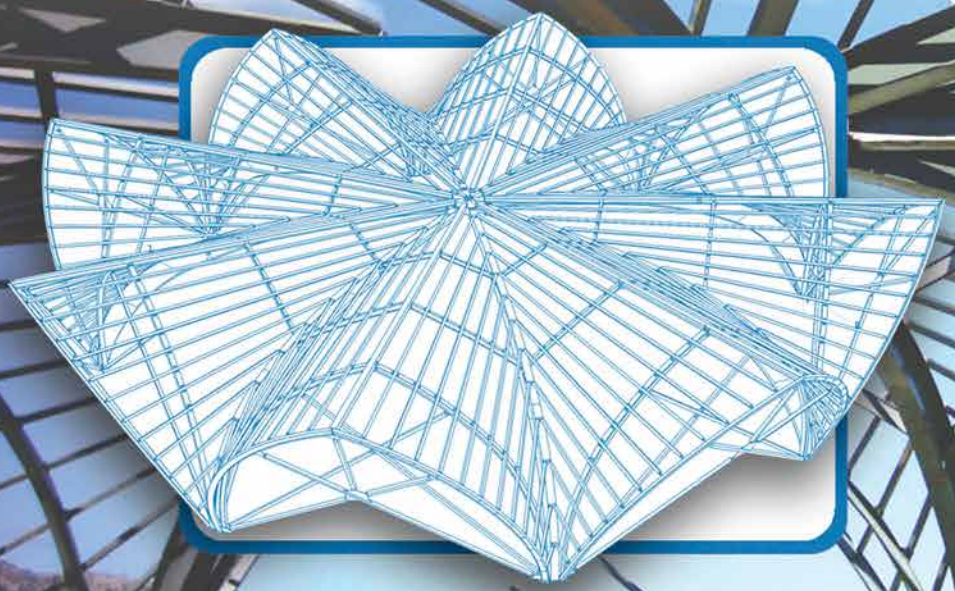
Hallmason Design Ltd



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Swindon's largest ever speculative build takes shape

Honda selects design and build

A prestigious business park is rapidly expanding with two new steel warehouses, one a design build unit for Honda and the other Swindon's largest ever speculative build.

FACT FILE
South Marston Business Park, Swindon
Main client: *ProLogis Developments*
Architect: *Michael Sparks Associates*
Main contractor: *Norwest Holst*
Steelwork contractor: *Atlas Ward Structures*
Steel tonnage: *1,800t*

The South Marston Business Park in Swindon is firmly established as the area's key distribution centre with an impressive list of tenants including Aldi, BOC, Pentel and Royal Mail.

Two new steel warehouses, with a combined area of more than 60,000m^2, are set to increase the park's significance with one unit already occupied and housing Honda's UK-wide spare parts and motorcycle/power equipment units.

Atlas Ward Structures was awarded a steelwork design and build contract for both warehouses from main contractor Norwest Holst and client ProLogis Developments.

Atlas Ward designed, fabricated and erected a total of 1,800t of steel and decking for both developments. Known as warehouse A, this shed is now home to Honda Logistics and is its first turnkey facility in the UK. The other building, warehouse B, is due to be completed this month and is said to be the largest speculative development ever built in Swindon.

Warehouse A has a footprint of 32,750m^2. Vance Lamb, Atlas Structures' Project Designer says the company supplied approximately 900t of steel for the building.

This structure has five spans, with each span measuring 29.1m giving total length of 145.5m and a width of 211m.

The warehouse has a main portal frame design with a clear height of 11.5m

Mr Lamb says the warehouse has a main portal frame design with a clear height of 11.5m. Atlas prefabricated all beams and columns off site.

The construction of the building involved an alternate grid system. Every second frame has internal props giving the warehouse its open-plan design.

Mr Lamb says an unusual aspect of this warehouse were the two free-standing steel canopies along one side wall. Measuring 24m-long x 18m wide and 12m-long x 18m wide respectively, the canopies protect four loading bays and are

Approximately 1,800t of steel has been erected

This warehouse was entirely designed around Honda's specifications and requirements.

supported by steel beams.

As well as storage space, warehouse A also includes a three-storey 7,000m^2 office block which increases the width of the entire structure at one end by 16m.

A ProLogis spokesperson said this warehouse was entirely designed around Honda's specifications and requirements.

Honda's main UK manufacturing facility is situated at a nearby business park, and the company had a definite floorplan and office block requirement to deal with its nationwide spare parts and motorcycle businesses, ProLogis said.

Meanwhile, warehouse B has nearly the same design and structural elements as A.

However, Mr Lamb says the main difference is B has only four spans, measuring 33.54m each

The building houses Honda's UK-wide motorcycle and spare parts units

and giving a total length of 195m. It was designed with an identical alternate grid system.

"Warehouse B has the same clear height, includes a two-storey office block, but has a slightly simpler design as there are no free-standing canopies," Mr Lamb explains.

Bob Armstrong, Atlas Ward's project manager says both warehouses were relatively easy to erect as all steelwork was prefabricated at the Atlas facility and bolted together on site.

"The largest piece of steel was never heavier than 3t and no more than 20m-long," Mr Armstrong says. "In this way 900t of steel for both buildings didn't cause any transportation or erection problems."

All steelwork was prefabricated at the Atlas facility and bolted together on site.

"With one design and build warehouse sitting next to a speculative unit, this project is a perfect example of what ProLogis can do," the ProLogis spokesperson concludes.

Honda's main UK manufacturing facility is close to its new warehouse

New control tower checks in

The rotunda has two storeys

The new control tower is more centrally located

FACT FILE
Heathrow Control Tower
Main client: BAA
Architect: Richard Rogers Partnership
Construction manager: Mace
Structural engineer: Arup
Steel contractor: Watson Steel - a subsidiary of Severfield-Rowen
Contract value: £50M
Steel tonnage: 800t

Speed is everything at a modern airport which is why designers were swayed by the fast construction time of steel for a new control tower at Heathrow. Being able to produce a more slender structure was another major plus point, reports Martin Cooper.

Heathrow Airport has a new control tower. Standing 87m tall, the new structure, situated close to Terminal 3, was officially handed over to NATS (National Air Traffic Control Service) in March this year and replaces the airport's original 50-year old tower.

Designed by Richard Rogers Partnership, the £50M air traffic control tower is set to become one of west London's most distinctive landmarks. It is said to feature the very latest in air traffic technology and offers controllers a 360-degree cone vision - said to be the best viewing of any control tower in the world.

According to NATS, the old tower was basically in the wrong place and too small to meet the increased demands expected once Terminal 5 opens in 2008.

Taking the new terminal into consideration, a more centrally located tower was deemed necessary, one that could overlook the entire expanding airfield. So a position close to Terminal 3 was picked as the airport's most geographically central position.

Tony Whitten, Contracts Director for steelwork contractor Watson Steel, says the tower's construction presented a whole range of unique challenges.

"Most of the work could only be carried out at night, when the airport wasn't functioning, Mr Whitten says. "Logistically we had to assemble parts of the tower individually overnight, trucking in steel sections each time."

Mr Whitten explains that any other material, such as concrete would have resulted in a much larger tower mast and a longer construction process requiring huge numbers of deliveries airside to tower site.

Richard Matthews of Arup and Engineering Leader for the project says during the planning stage a slender design was chosen to lessen the environmental impact.

"A cable stayed structure lends itself to steel," Mr Matthews says. "If we had used a traditional cantilever concrete tower the mast would have been much wider."

"A cable stayed structure lends itself to steel."

The finished control tower has a base diameter of 4.8m, and Mr Matthews reckons with concrete the base would have been closer to 15m.

The weight of the structure also played a critical role. To minimise any impact on the airport's busy operation the tower's cab was pre-fabricated on a remote site just inside Heathrow's southern boundary. Once complete it was transported 2km across the airfield to its permanent position. Weighing 862t, the fully equipped cab's journey by specially equipped lowloader was one of the heaviest transportation jobs ever to have taken place at an airport.

"Constructing the cab and then moving it would never have worked with concrete," Mr Whitten explains. "It would have been too heavy."

"Building the cab off site allowed the foundations to be laid at the same time."

"And building the cab off-site allowed the foundations to be laid at the same time; the project was a model in parallel construction," Mr Matthews adds.

Importantly, building the cab at its permanent location would have meant taking a number of aircraft

The tower's cab was prefabricated off-site

Moving the cab across the airport was one of the heaviest transportation jobs ever attempted on an airfield.

stands out of operation and resulted in considerable impact on the day-to-day operations of the airport. Prefabricating it at a separate site caused minimal disruption and allowed steel to be delivered throughout the day, something which wouldn't have been possible close to Terminal 3.

The 30m-tall cab's insulated membrane roof structure was also assembled at ground level to reduce the risk associated with working at height and to allow concurrent assembly of the supporting structure.

A specially designed temporary steel frame attached at the base to lower its centre of gravity and provide the stability was used to transport the tower's roof safely. It was lifted into position using a 500t capacity mobile crane, and the temporary works enabled appropriate controls to be introduced for its safe installation. Once in position, the prefabricated roof was supported by temporary hydraulic jacks situated inside the cab. This allowed the load to be transferred from the crane to the permanent steel glazing mullion supports prior to being bolted into place.

The tower's steel cab and tripod (the tripod takes the supporting stay-cables) was fabricated and assembled in late 2003 and then moved into positioned in November 2004.

Then during the spring of 2005, the tower was progressively erected to its 87m height using a hydraulic jacking system that allowed seven steel mast sections to be installed beneath the cab.

The seven steel mast sections consisted of one 80t 14m-long section - the base - and six 60t 12m-long pieces. Each of these mast sections was individually trucked into the site during the night when the airport operations are reduced.

Each individual jacking process allowed one mast section to be inserted and bolted into position. In this way, the mast was progressively erected to its final 87m height, with the tower's cab already in position.

Every one of the steel mast sections has a triangular profile with a maximum dimension of 4.8m. Fabricated initially by Watson Steel, the giant hollow "Toblerone" shaped pieces were then fitted out with an internal steel staircase, associated landings and lift shaft at Kvaerner in Sheffield. All of this internal steel work was also supplied by Watson Steel. Kvaerner were also employed by Watson for the final assembly and machining to length of the mast sections.

Mr Whitten explains that each section had to be road transportable, and consequently the longest section is 14m. "Each mast section also includes a myriad of service holes of varying sizes."

Once the final mast section was bolted into position the temporary guys remained in place while the three-storey base building was erected.

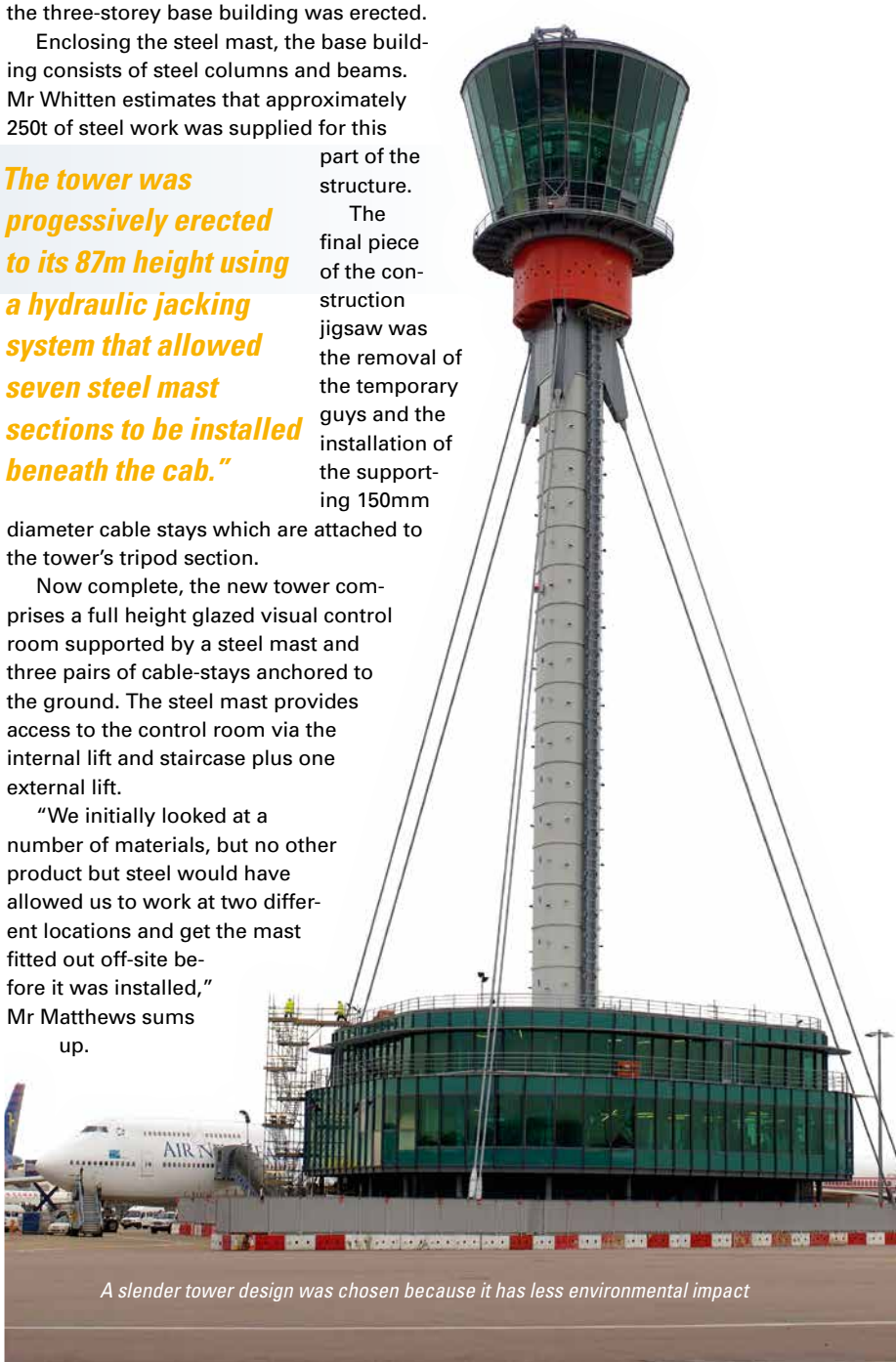
Enclosing the steel mast, the base building consists of steel columns and beams. Mr Whitten estimates that approximately 250t of steel work was supplied for this part of the structure.

The tower was progessively erected to its 87m height using a hydraulic jacking system that allowed seven steel mast sections to be installed beneath the cab."

The final piece of the construction jigsaw was the removal of the temporary guys and the installation of the supporting 150mm diameter cable stays which are attached to the tower's tripod section.

Now complete, the new tower comprises a full height glazed visual control room supported by a steel mast and three pairs of cable-stays anchored to the ground. The steel mast provides access to the control room via the internal lift and staircase plus one external lift.

"We initially looked at a number of materials, but no other product but steel would have allowed us to work at two different locations and get the mast fitted out off-site before it was installed," Mr Matthews sums up.



A slender tower design was chosen because it has less environmental impact

FACT FILE
Victoria Square, Belfast
Main client: *AM Development*
Architect: *Foster & Partners*
Project value: *£300M*
Structural engineer and architect: *BDP*
Main contractor: *Farrans/Gilbert-Ash joint venture*
Steelwork contractor: *Fisher Engineering*
Steel tonnage: *4,030t*

Trusses create Belfast collision free zone

Use of a shipyard for fabricating trusses has enabled the construction team to meet a tight construction programme on a major commercial and retail development. Martin Cooper reports that steel is playing a key role in the transformation of Belfast's waterfront.

Victoria Square will provide Belfast with a new focal point

A hundred years ago Belfast was Ireland's largest city and boasted a thriving economy based on shipbuilding, heavy engineering and linen production. However, as many of the UK's major industrial cities have found out, prosperity doesn't last forever as modern technology has replaced many traditional trades and jobs.

Years of under investment, a steady industrial decline and the well-publicised Troubles, combined to undermine Belfast's confidence. However, during the last decade the city has experienced something of a renaissance. Northern Ireland's capital city is currently in the process of reinventing itself as a weekend getaway destination and venue for trade and business conferences.

Northern Ireland's capital city is currently in the process of reinventing itself.

Central to Belfast's grand plan is a vast regeneration project incorporating the Laganside waterfront, areas of the Harland & Wolff shipyard and the city's main retail district.

Part of this overall scheme is the £300M Victoria Square project which will eventually consist of 75,000m^2 of retail space, basement parking for more than 1,000 vehicles, leisure facilities including a multi-screen cinema and 90 residential apartments. Main contractor for the project is a joint venture between the Province's two leading contractors, Farrans and Gilbert-Ash.

According to Finbarr McMeel, Project Design Manager for the joint venture, the job is essentially divided into five zones, three of which benefit from the quicker construction programme made possible by using steel.

Seven large trusses were fabricated at the Harland & Wolff shipyard.

Above: the largest truss weighs 100t and is 28m long

Mr McMeel says that one of these areas, Zone 10, is the integral anchor of the whole project and incorporates the future House of Fraser department store, which on completion will be Northern Ireland's largest department store. Being constructed entirely with steel from the lower ground level up, the building consists of four floors and a steel roof, sitting on two concrete formed park levels.

"We need to hand over the store by February 2007, a year before the rest of the project is scheduled for completion," explains Mr McMeel. "They need the extra time to do their own fit-out."

"We could never have expected to meet this deadline without using steel."

By using steel the House of Fraser store will not only be completed ahead of the rest of the Victoria Square project, but it also gets the desired open plan design throughout its four retail levels.

Paul Johnston, Civil and Structural Engineering Director for BDP - the project's structural engineer - backs this up and says the client was advised at a very early design stage that steel columns and beams were the only way to deliver his requirements.

"The store itself is basically a traditional steel structure, although there is a steel elliptically-shaped rotunda to be built into the building's roof at the corner of Victoria and Chichester street," says Mr Johnston.

Main steel contractor Fisher Engineering says it has supplied 2,500t of steel for the store's beams and columns, while a further 17,000m^2 of metal composite flooring has also been delivered.

Another crucial element of the scheme, which also relies on steel, is the retail service yard. Situated adjacent to the House of Fraser, the yard will have four levels of residential units built above it, but to allow trucks to enter an unobstructed area with no supporting columns, seven large trusses will support the cavernous structure.

According to Mr Johnston the project's funder, German bank Commerz Grundbesitz, insisted the yard contained no columns, thereby eliminating any chance of a truck hitting an obstruction.

"Supporting four levels of flats, the steel trusses are huge," comments Mr Johnston. "There is no other material we could have used to get the required spans."

"There is no other material we could have used to get the required spans."

The steel trusses are in fact so big they are being fabricated at the nearby Harland & Wolff shipyard (famous for building the RMS

Below: the House of Fraser store will be the province's largest department store

Titanic). Fisher Engineering says delivering the complete trusses from its yard in Enniskillen - which is approximately 90 miles away - would have proven to be a logistical nightmare. As space on-site is at a premium, the truss elements were delivered to the shipyard and welded together there.

Once complete, the plan is to truck them en-masse to Victoria Square over a couple of weekend nights. A 1,000t capacity mobile crane will be on-hire for the weekend to lift and place the units. According to Fisher Engineering, the local authority has already agreed to close all relevant roads for two nights.

"This isn't the first time we've utilised the shipyard," says Fisher Engineering, Managing Director Ernie Fisher. "It's conveniently located close to the city centre and they've the craneage and space to carry out this kind of steel fabrication work."

The seven I-beam trusses vary in size, from the largest which is 28m-long x 6m deep and weighs close to a 100t, down to the two smallest units with 16m x 6m dimensions and weighing in at 35t each. The remaining four trusses weigh 65t and will measure 24m x 6m.

Once on site the trusses will all be positioned 12m above ground level, giving a 6m clearance below, and all will be positioned 90-degrees to the adjacent road.

The trusses are mounted on bridge bearings. This was decided at the design stage as the best way of providing free movement without transferring tension to other parts of the structure.

Known as Zone 50, a distinctive dome (Faberge egg-like) will be the final piece of the project to be completed. Situated in the middle of the pedestrianised scheme, the glass dome will offer a focal point to the entire retail development, as three glass-covered streets within the development converge beneath it.

A glass dome will offer a focal point to the entire retail development as three glass-covered streets converge beneath it.

Supported by ten sets of double braced 24m tall steel columns, the dome's glass is held in place by twin 356mm x 406mm steel rings giving a total circumference of 44m.

According to Mr McMeel, the dome support and outer rings were originally designed to be formed with concrete. However, this proved to be very problematical and using steel, he says, has not only simplified the job, but the time scale for completion has been shortened.

Housed within the dome will be a striking modern steel sculpture. Five lily pads will be arranged around a tripod stand, to a height of approximately 20m. Each steel lily pad weighs 3t and measures 7m x 5.5m. Fisher Engineering estimates it is supplying in the region of 200t of steel for the dome and sculpture alone.

The top lily pad will also act as viewing gallery, offering shoppers a vista of Belfast city centre and the adjacent Lagan River.

Top: More than 2,500 t of steel has been delivered for the store.

Above: The shipyard was the only nearby location with enough space to fabricate the trusses.

The third zone making extensive use of steel is the project's leisure complex. Although this area is essentially a mixture of concrete and steel construction, Mr McMeel says steel trusses were essential to provide the open plan design and roof needed for the multi-screen cinema complex. Consequently everything from the second floor up is constructed with steel columns, beams and trusses.

According to Mr McMeel the steel trusses will speed up the construction process for this area as they will be trucked on to site in small sections and spliced (bolted) together on-site.

These trusses, once complete, weigh approximately 15t each and are 24m-long x 6m deep. "We are supplying nearly 900t of steel for this zone," says Brian Keys, Fisher Engineering Contracts Manager.

Although these units are being fabricated at Fisher's depot, Mr Keys says for logistical reasons the trusses have to be delivered in small sections. The only slight problem Mr Keys foresees is supporting the sections before they're erected so as not to damage the flooring.

"We'll probably have to erect a temporary structure for the trusses and we're also conscious of having to keep the sections within the tower cranes lifting capacity," he adds.

All in all, Mr Keys says the job will go to plan, and by using steel on this area of the job, will again speed up the whole construction process.

The entire Victoria Square development is scheduled for completion by early 2008.

Sunderland scores with prestige apa

Rising up on the site of a former newspaper office, a new steel framed residential block is set to become one of Sunderland's most prominent landmarks. Martin Cooper reports from Wearside.

FACT FILE
Echo Building, Sunderland
Main client: *Echo Buildings Ltd*
Architect: *Mario Minchella*
Structural engineer: *Clancy Consulting*
Construction manager: *Tolent Construction*
Steelwork contractor: *Billington Structures*
Value: *£2.4M*
Steel tonnage: *1,500t*

The name Sunderland was once synonymous with shipbuilding and football. Although the city's once proud shipyards ceased manufacturing twenty years ago, and the local football team has known much better seasons, Sunderland is currently undergoing an image makeover.

Sunderland is currently undergoing an image makeover

High-tech industries have moved in to replace traditional manufacturing trades, the local university has expanded with the construction of a new campus and new theatres and art galleries have all contributed to give the city a new vibrancy.

Sunderland is also undertaking a regeneration programme, primarily along the Wear River which bisects the city.

A number of river front businesses have relocated to out-of-town locations in recent times, including the Sunderland Echo. The local newspaper vacated a large and unloved 1960s concrete building which has recently been demolished to clear the way for the new Echo Building which is set to become one of the most prestigious residential addresses in the North East.

Covering a plot approximately 100m x 20m, the site is adjacent to the Wearmouth Bridge and within easy walking distance of most of the city's amenities.

Provisionally named Echo 24, the building will consist of 179 apartments on 11 storeys, a single commercial level at ground level and three underground floors of car parking.

The block has been designed as a braced steel frame with multi-deck composite floors, sitting on top off three steel framed car park levels, which are partially underground as the structure is built on a sloping site.

Steelwork contractor Billington Structures began erecting steel at the end of January and expects to complete the main structure in August. The company will eventually fabricate and erect more than 1,500t of steel for the job. Billington's contract also involves erecting a curved steel roof, which will be bolted together from fabricated steel sheets.

Once the old building was demolished and new

The Echo building will boast views across the River Wear

The building is being constructed in phased developments, three levels at a time

foundations installed, the three car park levels were constructed. Apart from concrete retaining walls, the car park levels are part of the overall steel framed building.

Above the car park, at ground level, there is a retail level. Dave Thompson, Project Manager for main contractor Tolent Construction says from here on up the building is being constructed in a series of phases.

"Once the ground level concrete slab was formed, steelwork for residential levels one to three began," explains Mr Thompson. "After these levels are complete the slab for level four will be poured allowing steelwork to be erected to level seven while simultaneously Tolent can work on the floors below level four."

Each poured slab acts as a 'crash barrier' stopping any objects falling on workers pouring and fitting out the slabs below, and giving machinery such as access platforms a firm base to work on for steel erection.

Working in this way, Billington and Tolent are able to organise the infrequent concrete deliveries around the more frequent steel deliveries. "This is very important," Mr Thompson says. "There's only one access road to the site and any infringement or traffic disruption isn't looked on kindly by the local authority."

The phased construction method will continue in this manner, with residential levels seven to ten being completed next and finally level 11, which is in fact two levels as it contains 11 duplex apartments. Mr Thompson estimates each construction phase is completed every five weeks.

The approximately 100m-long building is architecturally split in half by a glass atrium which extends from ground level to the roof on the south face, but only up to level three on the north facing river facade.

Barry Horne of structural engineers Clancy Consulting, and the Project Designer, says the structure incorporates a more open-plan design at ground level.

"To give the ground level retail floor a more open feel, the building is braced in lateral directions and intermediate columns begin on the first residential floor," Mr Horne explains.

Echo 24 is set to be a Sunderland landmark

This results in a 10.2m grid on the ground level, while the 11 residential floors have 4.4m x 5.8m grids. "In other words the retail level has two columns every bay and the residential floors have four columns every bay," Mr Horne adds.

All columns supplied by Billington for the project are 356 x 406UCs at the lowest level, reducing floor-by-floor to 203 x 203UCs on the uppermost floor. A variety of steel beams will be used with the largest at 10.2m-long and weighing 3.5t each.

These large transfer beams hold the slab and columns above the retail level and in affect run beneath the first apartment floor, with rows of these 3.5tt members spanning the entire length of the building.

An interesting architectural feature of the building, Mr Horne says, is the fact that the north facing duplex level is slightly set back by 2.5m, and consequently internal columns become external columns for the uppermost floor.

At the beginning of 2007 Billington is scheduled to return to the site for the installaton of the curved steel roof and a 5m-wide galvanised steel balcony around the retail level to provide a pedestrian promenade.

Billington is also erecting 2m-wide steel balconies around all river facing (north face) apartments.

Although other materials for the structure were looked at during the planning stage, Mr Thompson of Tolent says steel has meant the project is progressing quickly and a phased hand-over of apartments is due to begin early next year.

"Access to the site is restricted and by using steel we have reduced deliveries," Mr Thompson says. "Concrete wasn't really an option as there wouldn't have been room for pumps, formwork and all the other associated kit."

"Access to the site is restricted and by using steel we have reduced deliveries

Comprising two and three-bedroom apartments and priced in the £200K and upwards bracket, the units have been selling off-plan like the proverbial hot-cakes.

A spokesperson for the appointed estate agent for the project, Sanderson Young, says more than 70% of the apartments have already been sold and the development is set to be a city landmark and one of the most desirable addresses in the area.

Liverpool vaults ahead

2,100 t of steel make up Gladman Developments latest distribution warehouse

A large distribution warehouse forms the centrepiece of a brand new, 2.5 million ft² business park on Merseyside. Victoria Gough reports on the latest sign of Liverpool's regeneration.

FACT FILE
The Vault
Developer:
Gladman Developments
Steelwork Contractor:
Conder structures
Steel tonnage: *2,100t*

Gladman Developments has completed construction of a large distribution warehouse situated in the centre of a brand new commercial development next to John Lennon Airport in Liverpool.

Offering 598,550 ft² of storage space, The Vault on Liverpool International Business Park, was constructed from a five-span portal, each of 36.5m span.

Conder Structures erected the 2,100t of steel in just 10 weeks. The warehouse measures 304m by 182m and is 15m high to the eaves, allowing for maximum flexibility in use. The Vault is completed with an adjoining office block providing a further 15,500 ft² of floor space over two floors.

The building is clad with Kingspan Goosewing Grey

The vault offers 598,550 ft² of storage space on Liverpool's International Business Park

feature panelling and exposed columns, ensuring an aesthetically pleasing finish that blends in with the surrounding buildings. Conder also supplied and erected 20, silver coloured, feature columns rising to 15m which complete the exterior. Similar columns were also erected outside of the offices. Conder's Managing Director Gordon Ridley said: "It is difficult to miss this structure, with its the 56 dock levellers along one side and the backdrop of the River Mersey."

The roof of The Vault – so called due to it being a secure box like structure – has been completed in Meadow Green coloured cladding to give the structure some degree of camouflage from the air, due to it being adjacent to the John Lennon Airport. This site was chosen as it is well placed to trade within the UK, Europe and in the global market and there is a large local workforce nearby.

The 26.5 acre development incorporates 110 trailer parking spaces as well as 400 car parking spaces around the perimeter of the building. There is also a further large 'yard' area to offer flexibility for a variety of uses.

"It is difficult to miss this structure."

Design of Cruciform Sections using BS 5950-1:2000

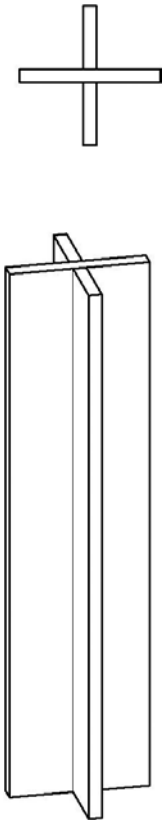


Fig1. Plain Cruciform

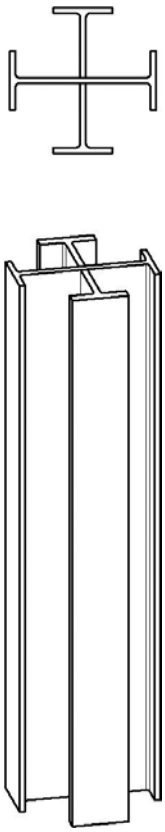


Fig 2. Flanged Cruciform

Many engineers will be relatively unfamiliar with torsional modes of buckling, but they are explicitly covered in the Eurocodes. Steel Construction Institute Senior Manager Charles King explains what designers of bi-symmetric cruciform sections need to know about buckling.

1. CRUCIFORM SECTIONS AND TORSIONAL BUCKLING

1.1 Who's heard of torsional modes of buckling?

There are several modes of buckling that affect structures. Most structural engineers are familiar with:

1. Flexural buckling, commonly referred to as strut buckling, column buckling, compression buckling or Euler buckling to distinguish it from the buckling of a beam due to a bending moment.
2. Lateral torsional buckling, commonly referred to as beam buckling
3. Plate buckling, which one might expect in slender components of box girders
4. Shear buckling, which is a type of plate buckling
5. Local buckling, which is a common term for plate buckling modes that might occur in members.

Many structural engineers working with hot-rolled members or fabricated plate members are less familiar with, or are even unaware of, torsional modes of buckling. Design codes for orthodox structures commonly do not explicitly mention these modes. However, codes do cover such modes; for example the checks in Annex G of BS 5950 1:2000 are for buckling modes that are close relatives of the torsional and torsional-flexural buckling modes described in this article. Torsional modes of buckling are explicitly covered in the Eurocodes.

Torsional buckling modes are better known to engineers designing cold-formed members, where these modes are often critical, and are addressed by design codes.

This article is written to assist in the design of bi-symmetric cruciform sections, as shown in Figure 1 and Figure 2. Such sections are prone to torsional buckling, but not to torsional-flexural buckling because the centroid of the section coincides with the shear centre.

1.2 Does it matter?

A good question is, "If I've never heard of these modes, can they be important?" The answer is that these buckling modes are not the critical modes in the most commonly used compression members with the most common restraint arrangements.

Structural hollow sections have such high torsional stiffness that torsional modes cannot be the critical modes in normal sections. Torsional modes will not be critical in bi-symmetric I-sections (eg UCs) with both flanges restrained at the same points along a member. However, where the flanges are not equally restrained, torsional modes may be the critical modes.

For all other sections, torsional modes are likely to be the critical modes. In the case of angles, channels and tees, this is effectively allowed for in BS 5950-1 by the slenderness calculations to 4.7.10 and Table 25. For other mono-symmetric or asymmetric sections, most codes give no assistance. With the evolution of steel structures towards more exotic structural forms, designers need to be aware of these other modes. It is especially worth noting that in an I-section with different flanges, torsional-flexural buckling is commonly the lowest mode.

1.3 What do these modes look like?

Torsional modes of buckling are commonly divided into two categories:

1. Torsional buckling
2. Torsional-flexural buckling

Cruciform sections and similar sections all have a torsional buckling mode, as shown in Figures 3 and 4.

Asymmetric sections are all prone to torsional-flexural buckling, as shown in Figure 5. Indeed, it is common for torsional-flexural buckling to be the critical mode of buckling, more onerous than pure minor axis buckling (Figure 5)

Sections in which the shear centre does NOT coincide with the centroid will be prone to torsional-flexural buckling and this should be expected to be

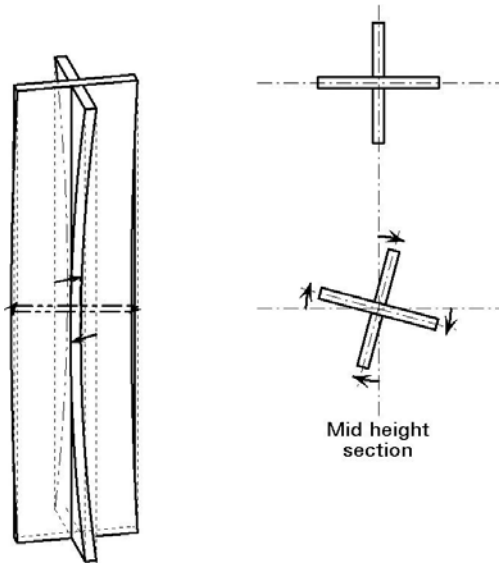


Fig 3. Plain Cruciform deforming in the torsional mode

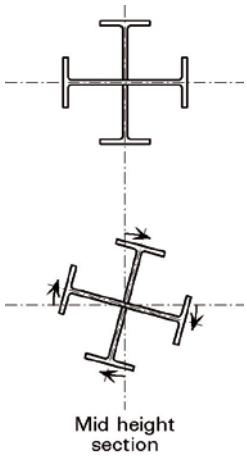


Fig 4. Asymmetric section

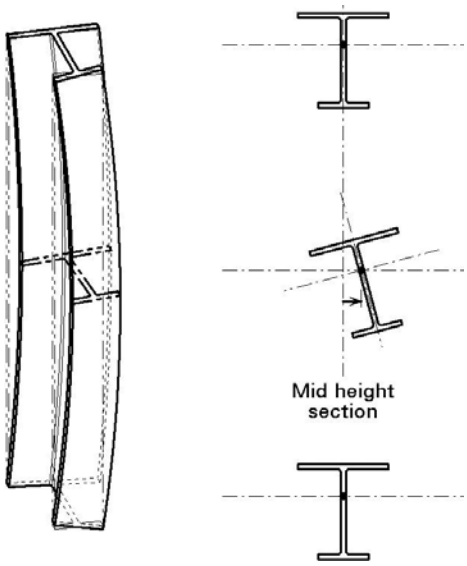


Fig 5. Plain cruciform

the critical mode of buckling for a given effective length. Sections in which the shear centre DOES coincide with the centroid will NOT be prone to torsional-flexural buckling.

This article is intended for the design of bi-symmetric cruciform sections. In these sections, the shear centre coincides with the centroid so they are NOT prone to torsional-flexural buckling.

1.4 What should a designer do?

Designers would be wise to avoid the problem wherever possible by using appropriate sections and restraint arrangements. It is simplest to resist compression either by UCs with both flanges equally restrained or by hollow sections.

If you cannot avoid the problem, calculate the compressive strengths for the torsional modes and compare these with the compressive strength for flexural buckling. Then calculate the compression resistance of the member using the lowest compressive strength and continue with the normal codified design procedures.

2. COMPRESSIVE STRENGTH

2.1 Use of the elastic critical buckling strength

The "elastic critical buckling stress" is the stress at which the member would buckle if it had an infinitely high yield stress and no imperfections. Engineers learn about Euler buckling during their studies and learn that the Euler buckling load of a strut is

$$P_E = \frac{\pi^2 EI}{L^2}$$

The Euler buckling stress is the elastic critical buckling stress of the strut for flexural buckling. In the case of Euler buckling, this can be written using BS 5950 1 symbols as

$$p_E = \frac{P_E}{A} = \frac{\left(\frac{\pi^2 EI}{L^2}\right)}{A} = \frac{\pi^2 E\left(\frac{I}{A}\right)}{L^2} = \frac{\pi^2 E\left(r^2\right)}{L^2} = \frac{\pi^2 E}{\left(L/r\right)^2}$$

Codes use the elastic critical buckling stress to find the compressive strength of a member. In BS 5950-1:2000, this can be seen in Annex C, section C.1. The procedure in Annex C can be adapted to check other modes of buckling by using the elastic critical stress of the mode of buckling considered in place of the elastic critical stress from the usual flexural mode.

To avoid having to use Annex C to calculate p_c from p_E, it is more convenient to calculate the equivalent slenderness, λ, from the equation in Annex C and then find p_c directly from tables in the Standard.

Annex C gives $p_E = \pi^2 E/\lambda^2$. Therefore, λ can be found from $\lambda = \sqrt{\frac{\pi^2 E}{p_E}}$.

This allows the designer to use Table 24 of BS 5950-1:2000 to find p_c easily.

2.2 Torsional buckling

The elastic critical load for torsional buckling can be found in classic references such as Timoshenko, Strength of Materials, Part 2 or Timoshenko and Gere, Theory of Elastic Stability. The elastic critical buckling stress is simply [elastic critical load]/area. Using symbols in BS 5950-1,

$$p_E = \frac{1}{I_0}\left(GJ + \frac{n^2\pi^2}{L^2}EH\right)$$

where

I_0 is the polar moment of area with respect to the shear centre of the section. For bi-symmetric cruciform sections, $I_0 = I_x + I_y$.

G is the torsional modulus

$$= \frac{E}{2(1+\nu)} = \frac{E}{2(1+0.3)} = \frac{E}{2.6}$$

J is the torsional constant. $J = \sum \frac{bt^3}{3}$.

For flanged cruciforms comprising two rolled sections, J is the sum of the J values of the component rolled sections.

n is the number of half-sine waves along the outstands of the member. For members restrained at both ends, this should be taken as 1.0 unless you are sure you can prove it is

greater. For cantilever columns this should not be taken as greater than 0.5.
L is the length of the member
E is Young's modulus
and
H is the warping constant. For bi-symmetric cruciform sections such as in Figures 1 and 2, this is the sum of the warping constants, H, for the two component sections. H for a plain cruciform is very small, so it is recommended that H is taken as zero.

The formula for members with no warping stiffness (such as a plain cruciform) reduces to:

$$p_E = \frac{1}{l_0} GJ$$

2.3 Selection of the buckling curve

Where there is a torsional component to the buckling, the buckling involves flexure of the flanges similar to minor axis buckling of the component parts of the member. Therefore the buckling curve should be selected from Table 23 of BS 5950-1:2000 for the components as shown in Figure 6.
For example, a flanged cruciform made from UB sections designed to BS 5950-1:2000 would use curves (b) or (c) depending on the thickness of the flange being less than or greater than 40mm. A plain cruciform section would also use curves (b) or (c) depending on the thickness of the flange being less than or greater than 40mm.

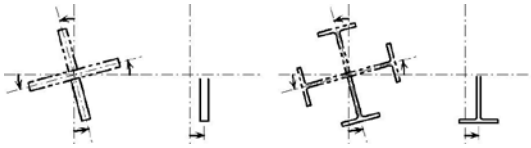


Fig 6. Similarity between torsional buckling and flexural buckling about the minor axis of the component parts

3. BENDING STRENGTH OF CRUCIFORM SECTIONS

When checking the interaction of axial load and bending moment, both axial and bending resistance are required. The axial resistance should be checked as above. The bending resistance can be calculated using the advice in the following sections. Note that the following advice is limited to bi-symmetric sections (torsional-flexural buckling is not critical). A subsequent article will show how torsional flexural buckling can be calculated for other sections

3.1 Flanged cruciform sections

The bending strength of flanged cruciform sections is most conveniently found by calculating the slenderness, λ_{LT}, using the method in BS 5950-1:2000. It is recommended that when using Annex B, section B.2.3, the value of gamma, γ, is taken as 1.0 because the value given in Annex B was derived for single I-sections. It is also recommended that values of "*u*" and "*x*" are calculated using the formula given for channels with equal flanges to avoid assumptions made for single I-sections. Tables 16 or 17 can then be used as for lateral torsional buckling of single I-sections.

3.2 Plain cruciform sections

It is recommended that the derivation of the slenderness for plain cruciform sections, as shown in Figure 1, is calculated assuming that the section is Class 3 and that designers proceed as follows:

1. Calculate the elastic critical stress for lateral torsional buckling for members with no warping stiffness (such as a plain cruciform), which is:

$$p_E = \frac{M_{cr}}{Z_x} = \frac{\left(\frac{\pi}{L}\sqrt{EI_yGJ}\right)}{Z_x}$$

2. Calculate the slenderness, λ_{LT}, from the equation in Annex B relating p_E to slenderness, λ_{LT}, which can be re-arranged as

$$\lambda_{LT} = \sqrt{\frac{\pi^2 E}{p_E}}.$$

3. Use Table 17 of BS 5950-1:2000 to find p_b.

4. DETAILING CRUCIFORM SECTIONS

Where the failure mode is by flexural buckling about one of the rectangular axes of the cruciform, the I-section that is on the axis of flexure relies on the other I-section for stability. If the web of the I-section that is on the axis of flexure is neither stiff enough nor strong enough to make the flanges on the axis of flexure deflect in the same shape as expected for the whole, then these flanges will deflect more and will unload, reducing the resistance of the cruciform.

The simple way to avoid this problem is to add gussets between the webs and flanges (so that all the elements are connected) at centres such that the slenderness about the minor axis of the I-sections (taking an effective length factor of 1.0) is not greater than the slenderness of the full length cruciform. A possible arrangement is shown in Figures 7 and 8.

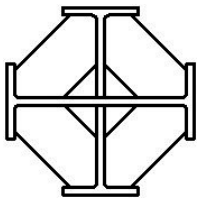


Fig 7.

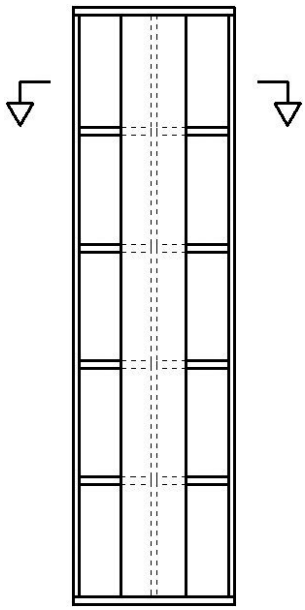


Fig 8.

New and Revised Codes and Standards

(from BSI Updates February 2006)

BS EN PUBLICATIONS

The following are British Standard implementations of the English language versions of European Standards (ENs). BSI has an obligation to publish all ENs and to withdraw any conflicting British Standards or parts of British Standard. This has led to a series of standards, BS ENs using the EN number.
Note: The date referenced in the identifier is the date of the European standard.

BS EN 1991:-
Eurocode 1. Actions on structures
BS EN 1991-1:-
General actions
NA to BS EN 1991-1-3:2003
UK National Annex to Eurocode 1. Snow loads
No current standard is superseded
BS EN 1991-1-6:2005
Actions during execution
Supersedes DD ENV 1991-2-6:2000

BS EN 1994:-
Eurocode 4. Design of composite steel and concrete structures
BS EN 1994-1-2:2005
General rules. Structural fire design
No current standard is superseded
BS EN 1994-2:2005
General rules and rules for bridges
Supersedes DD ENV 1994-2:2001

BS EN 1998:-
Eurocode 8. Design of structures for earthquake resistance
BS EN 1998-2:2005
Bridges
Supersedes DD ENV 1998-2:1996

BS EN ISO 2560:2005
Welding consumables. Covered electrodes for manual metal arc welding of non-alloy and fine grain steels. Classification
Supersedes BS EN 499:1995

BS EN 10080:2005
Steel for the reinforcement of concrete. Weldable reinforcing steel. General
No current standard is superseded

AMENDMENTS TO BRITISH STANDARDS

BS 499:-
Welding terms and symbols

BS 499-2C:1999
European arc welding symbols in chart form

BRITISH STANDARDS WITHDRAWN

DD ENV 1991:-
Basis of design and actions on structures
DD ENV 1991-2-6:2000
Actions on structures. Actions during execution
Superseded by BS EN 1991-1-6:2005

NEW WORK STARTED

BS EN 1991:-
Eurocode 1. Actions on structures
BS EN 1991-1-4:2005/ Corrigendum 1
General actions. Wind actions

BS EN 1993:-
Eurocode 3. Design of steel structures
BS EN 1993-1-2:2005/ Corrigendum 1
General rules. Structural fire design
BS EN 1993-1-8:2005/ Corrigendum 1
Design of joints
BS EN 1993-1-9:2005/ Corrigendum 1
Fatigue
BS EN 1993-1-10:2005/ Corrigendum 1
Material toughness and through-thickness properties

BS ISO 4995
Hot-rolled steel sheet of structural quality

BS ISO 5951
Hot-rolled steel sheet of higher yield strength with improved formability

CEN EUROPEAN STANDARDS

EN 1990:-
Eurocode. Basis of structural design
AMENDMENT 1: December 2005 to EN 1990:2002

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Vibrations	16 May 06	London
Curved steel - Angle Ring	18 May 06	Birmingham
Vibrations	19 May 06	Leeds
Fire In Boundary conditions	6 June 06	Nottingham
Preparation for Eurocodes	8 June 06	Dublin
Multi-storey Steel Framed Structures	15 June 06	Birmingham
Disproportionate Collapse & The Revised Building Regs	20 June-06	Leeds
Composite Design	22 June 06	Cardiff
Frame Stability	27 June 06	Manchester
Connection Design workshop	4 July 06	Milton Keynes
Portal Frame Solutions	11 July 06	Cardiff

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Steel: The Show 2006	05 May 06	Hilton Hotel,East Midlands Airport, Derby
Design of Steel Bridges	10-11 May 06	Redworth Hall Hotel, Co. Durham
Sustainability	6 June 06	Thorpe Park Hotel, Leeds
Sustainability	28 June 06	Cavendish Conference Centre, London
Steel: The Show 2006	26 July 06	St Davids Park Hotel, Chester
Steel: The Show 2006	06 September 06	Holland House Hotel, Cardiff
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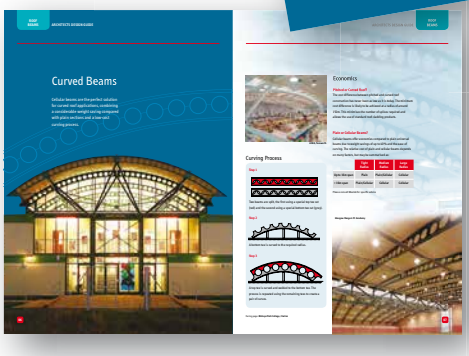

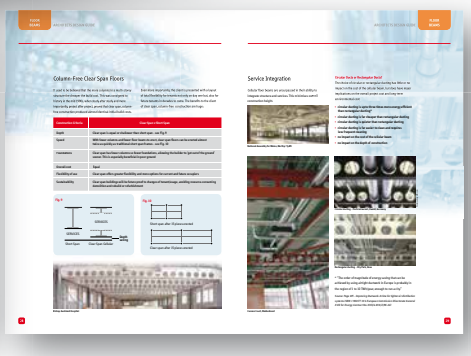

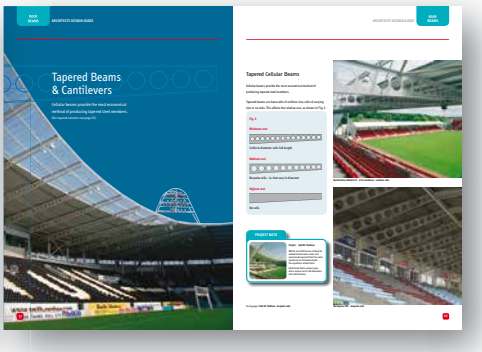

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BUILDINGWITHSTEEL

A restaurant in Hyde Park

A new modern restaurant has been built in Hyde Park on the banks of the Serpentine. It opened in July last year (1965) in The Dell, one of the prettiest parts of the park.

Built at a cost of £120,000, it is both striking and original in design. It is octagonal, a shape employed to avoid the need for curved surfaces, and the use of a regular segmental layout has produced a continuous window line. The result is a building with the advantages of a circular form, but achieved with the use of straight lines; it is 100 ft. across.

The structural design comprises two main elements, (1) an octagonal core supported on piles and (2) an umbrella of steel beams cantilevering from this core to the edge of the roof and carried at the window line by extremely slender tubular steel columns. Roof finish, insulation and the ceiling are carried on or suspended from the steelwork and the glass of the window fills the whole space between the columns. The inverse-arch form of each segment has made possible the use of a light structure: the curved shape is nearly that of the natural 'sag' of a roof slung between the main beam lines.

At the centre, the walls are taken up to carry and enclose an upper floor providing tank space and an office and terminating in a dome constructed of light timber trusses covered with copper roofing.

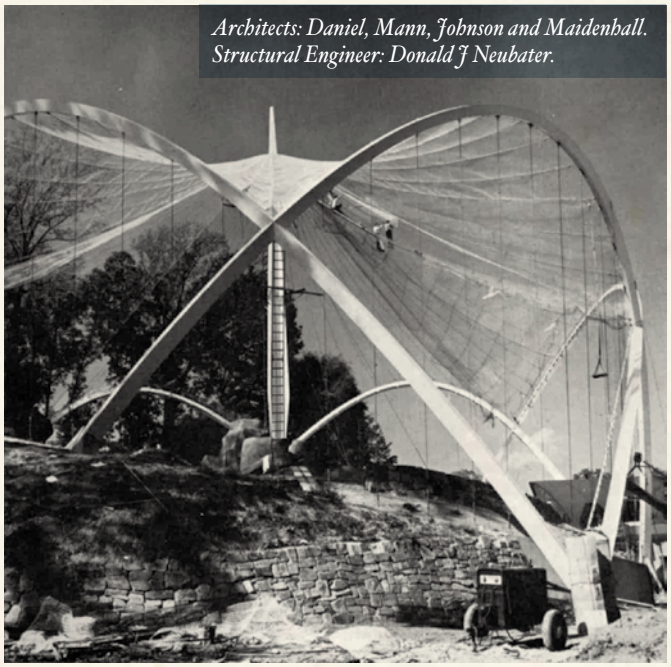
Both the enclosed and the outdoor terrace areas are covered by the large umbrella-like roof, the under-surface of which consists of shaped fibrous plaster panels separated from each other by a gap which creates a bold ceiling panel and provides a slot through which the curved window head glass is taken out of sight. This glass stretches from column to column on a staggered plan around the entire building.

The restaurant includes a cafeteria, an automat and a licensed buffet; it will seat 114 people inside and a further 136 outside on the terrace.

The architect was Patrick Gwynne and the Consulting Engineers were Jenkins and Potter.

From BUILDING WITH STEEL, Vol 4 No. 1, Winter 1966

Strictly for the birds



Architects: Daniel, Mann, Johnson and Maidenhall. Structural Engineer: Donald J Neubater.

An aviary in the United States has been created using structural steel members.

The Great Flight Cage at the National Zoo, Washington D.C. is 130 ft. diameter and 90 ft. high and dominated by six parabolic arches tilting outwards at 30°. It is built on the side of a hill and the need to keep the top of the arches on a level plane posed something of a problem for the designers. The arches are welded box sections tapering from 12 in. by 24 in. at the bottom to 12 in. by 16½ in. at top.

The central mast is a tapering Y-section fabrication tapering from its heaviest point about 18 ft. above ground. From a conical steel anchor ring near the top of the mast 72 half inch diameter wire rope cables radiate to the rims of the arches from where cables of similar dimensions extend downwards to anchorages around the periphery of the cage. In all, two miles of rope are used. Draped over the structure and clipped to the cables is a vinyl-coated steel mesh.

Although of such slender proportions the structure is extremely strong and stable, and capable of withstanding the worst weather conditions, particularly heavy wind loadings and ice build-up. The mesh, or instance, has been tested to a wind loading of 100 mph. The strength of the structure is due largely to the employment of 50,000 psi minimum yield corrosion resistant steel for the mast and arches, coupled with the design of the sections.

Corrosion has been eliminated by the corrosion resistant properties of the steel used in the main members, and the plastic coating on the steel mesh.

The size of the cage provides plenty of space for the birds to stretch their wings and the internal landscape has been planned to simulate natural conditions. The reduce the discomforts of wet and cold weather there are shelters and electrically heated perches are provided. Visitors can walk through and see the birds at close quarters.

AD 299

The Use of Intumescent Coatings for the Fire Protection of Beams with Circular Web Openings.

In December 2003, SCI issued a report, RT983, *Interim guidance on the use of intumescent coatings for the fire protection of beams with web openings* and an Advisory Desk Note, AD269. The report described an approach for determining the thickness of intumescent coating required for composite beams with web openings. AD269 contained a simplified form of the RT983 guidance. Following work by an industry group consisting of SCI, ASFP, warringtonfire and BRE, a new protocol for testing and assessing the fire protection requirements of cellular beams has been developed. The protocol comprises a detailed test program, a thermal assessment and a structural assessment.

During the development of the new protocol, which is based on a detailed analysis of test results, it has become apparent that a more complex relationship exists between bottom flange temperature and coating thickness than that used in AD269 and RT983. Therefore, SCI have recently issued RT1085, *Guidance on the use of intumescent coatings for the fire protection of beams with web openings*[1]. This is a modified version of RT983 and contains a more realistic relationship between bottom flange temperature and coating thickness. It has therefore been decided to withdraw the quantified guidance contained in AD269 and, instead, point designers to RT1085. Like RT983, RT1085 contains generic guidance applicable to any intumescent product. The guidance in RT1085 applies to both composite and non-composite beams.

A small number of intumescent coating manufacturers have already carried out tests in accordance with the new protocol, and their results will allow a reduced thickness of these specific products to be used on most cellular beams, and is likely to encourage other manufacturers to test their products.

During 2006, SCI will be issuing reports on product specific assessments, similar to the generic RT1085, to manufacturers who have completed the new assessment procedure on their products. This product-specific guidance will be less conservative than that contained in generic RT1085 and should be used where possible.

RT1085 may be withdrawn towards the end of 2007 by which time most manufacturers will have completed the new assessment procedure and the generic guidance will not be required.

(1) RT1085 is available on SteelBiz at www.steelbiz.org. Paper copies may be purchased for £30 through the SCI Publications Department.

The following guidance is based on the guidance given in AD269

For optimum economy, liaison is required between the structural engineer responsible for the design and the fire protection supplier. This is particularly important when an intumescent coating is to be applied to beams with large web openings. It can be economically very important to take account of the level of loading on different parts of the beam. Cellular beams in which the utilisation factors for normal design are significantly below unity require less protection than more highly stressed beams.

The SCI recommends one of the following options for design of beams with circular web openings, protected using an intumescent coating. The option selected will depend on the amount of design information available and whether evidence of performance in fire tests is available.

Option 1
The simple use of the tabular information contained in AD269 has been withdrawn and SCI now recommend that the revised information contained in RT1085 is followed.

Readers should be aware that product-specific versions of the design information contained in RT1085 will start to become available as manufacturers start to use the new testing and assessment protocol.

Option 2
Design software that explicitly calculates the load carrying capacity for beams with web openings at the fire and ultimate limit states may be used. The development of such software should be based on the observed temperature distribution throughout the beam for different coating thicknesses and the observed performance of the beam in loaded fire resistance tests.

Option 3
The thickness may be assessed using a structural model based on the principles given in EC4-1-2. The model should take account of the increased temperatures of the web posts relative to the flanges. Information on temperatures may be obtained from fire tests.

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Steel Construction Yearbook 2006

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ISBN 1 85942 170 9,
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A4 paperback (full colour),
March 2006
Cat Ref: P345

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The British Constructional Steelwork Association Ltd

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

BCSA is the national organisation for the steel construction industry; its member companies undertake the design, fabrication and erection for all forms of construction in building and civil engineering. Associate Members are those principal companies involved in the purchase, design or supply of components, materials, services etc, related to the industry. Corporate Members are clients, professional offices, educational establishments etc, which support the development of national specifications, health and safety, quality, fabrication and erection techniques, overall industry efficiency and good practice. The principal objectives of the association are to promote the use of structural steelwork; to assist specifiers and clients; to ensure that the capabilities and activities of the industry are widely understood; and to provide members with professional services in technical, commercial and quality assurance matters.

Details of BCSA Membership and services are available from: Gillian Mitchell MBE, Deputy Director General, British Constructural Steelwork Association Ltd, 4 Whitehall Court, Westminster, London SW1A 2ES. **Tel** 020 7839 8566 **Fax** 020 7976 1634

KEY

Categories

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

Quality Assurance Certification

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

Classification Contract Value

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

Notes

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

* For details of bridgework sub-categories contact Gillian Mitchell at the BCSA.

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Tel 01684 856600 **Fax** 01684 856601

FLI PRODUCTS
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Gloucester GL2 2AA
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Tel 01944 712000 **Fax** 01944 710555

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Tel 01335 300999 **Fax** 01335 300888

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Tel 0115 946 2316 **Fax** 0115 946 2278

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Tel 0121 601 6000 **Fax** 0121 601 6181

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STRUCTURAL SECTIONS LTD (Q1)
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CORUS CONSTRUCTION & INDUSTRIAL
Frodingham House, PO Box 1,
Brigg Road, Scunthorpe DN16 1BP
Tel 01724 404040 **Fax** 01724 404229

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

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FICEP (UK) LTD
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Leeds LS14 2LB
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PEDDINGHAUS CORPORATION UK LTD
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Prescot, Merseyside L34 9GT
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Notts NG20 8SS
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Gateshead NE10 0JY
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Tel 0131 459 3200 **Fax** 0131 459 3266

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Bodmin, Cornwall PL31 2PZ
Tel 01208 77066 **Fax** 01208 77416

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

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

ASD METAL SERVICES – HULL
Gibson Lane, Melton, North Ferriby,
East Riding of Yorkshire HU14 3HX
Tel 01482 633360 **Fax** 01482 633370

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

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

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Tel 01327 876021 **Fax** 01327 87612

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Warrington, Cheshire WA2 8TX
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GRIFFITHS & ARMOUR
Tel 0151 236 5656

HIGHWAYS AGENCY
Tel 08457 504030

ROGER POPE ASSOCIATES
Tel 01752 263636

The Register of Qualified Steelwork Contractors

BUILDINGS SCHEME

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

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

Company Name	Telephone	A	C	D	E	F	H	J	K	L	M	N	S	QA	Contract Value (1)
ACL Structures Ltd	01258 456051				●	●	●				●				Up to £2,000,000
Atlas Ward Structures Ltd	01944 710421	●	●	●	●	●	●	●	●	●	●			●	Up to £6,000,000*
B D Structures Ltd	01942 817770			●	●	●	●								Up to £1,400,000*
B & K Steelwork Fabrications Ltd	01773 853400		●		●	●	●	●	●		●			●	Up to £4,000,000*
A C Bacon Engineering Ltd	01953 850611				●	●	●								Up to £800,000
Ballykine Structural Engineers Ltd	028 9756 2560				●	●	●	●				●		●	Up to £2,000,000
Barrett Steel Buildings Ltd	01274 266800				●	●	●							●	Up to £6,000,000
Billington Structures Ltd	01226 340666	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Bison Structures Ltd	01666 502792			●	●	●	●							●	Up to £2,000,000
Border Steelwork Structures Ltd	01228 548744		●		●	●	●					●			Up to £1,400,000
Bourne Steel Ltd	01202 746666	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901		●			●	●	●	●	●	●			●	Up to £800,000
Brooksby Engineering	01707 872655					●		●	●	●	●				Up to £200,000
CTS Ltd	01484 606416						●	●							Up to £800,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Compass Engineering Ltd	01226 298388		●		●	●	●		●						Up to £2,000,000
Leonard Cooper Ltd	0113 270 5441		●			●	●		●		●			●	Up to £800,000
Costruzioni Cimolai Armando SpA	01223 350876	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Curtis Engineering Ltd	01373 462126					●									Up to £800,000
Frank H Dale Ltd	01568 612212			●	●	●								●	Up to £4,000,000
Dew Construction Ltd (Fabrication Division)	0161 624 5631				●	●	●		●		●			●	Up to £800,000
EAGLE Structural Ltd	01507 450081				●	●	●	●	●	●					Up to £400,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●		●			●		●	Up to £4,000,000
Emmett Fabrications Ltd	01274 597484				●	●	●								Up to £800,000
EvadX Ltd	01745 336413				●	●	●	●		●	●	●		●	Up to £1,400,000
Fairfield-Mabey Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Fisher Engineering Ltd	028 6638 8521	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Glentworth Fabrications Ltd	0118 977 2088					●	●	●	●	●	●	●		●	Up to £2,000,000
Graham Wood Structural Ltd	01903 755991	●	●	●	●	●	●	●	●	●	●	●			Up to £2,000,000
D A Green & Sons Ltd	01406 370585				●	●	●	●				●		●	Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456		●		●	●	●	●	●	●	●			●	Up to £6,000,000
James Bros (Hamworthy) Ltd	01202 673815				●	●	●	●				●		●	Up to £2,000,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●			Up to £6,000,000*
Meldan Fabrications Ltd	01652 632075		●		●	●	●	●	●		●			●	Up to £4,000,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●				Up to £2,000,000
Harold Newsome Ltd	0113 257 0156				●	●	●								Up to £1,400,000
Normanby Wefco Ltd	01427 611000		●				●	●	●		●			●	Up to £800,000
Oswestry Industrial Buildings Ltd	01691 661596				●	●	●		●		●				Up to £400,000
RSL (South West) Ltd	01460 67373				●	●	●				●				Up to £800,000
John Reid & Sons (Strucsteel) Ltd	01202 483333	●	●	●	●	●	●	●	●	●	●	●			Up to £6,000,000
J Robertson & Co Ltd	01255 672855									●	●		●		Up to £100,000
Robinson Construction	01332 574711		●	●	●	●	●							●	Up to £6,000,000
Roll Formed Fabrications Ltd	028 7963 1631				●	●	●	●		●	●	●		●	Up to £800,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Rowen Structures Ltd	01623 558558	●	●	●	●	●	●	●	●	●	●	●			Up to £6,000,000
SIAC Butlers Steel Ltd	00 353 502 23305		●	●	●	●	●	●				●		●	Up to £6,000,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Henry Smith (Constructional Engineers) Ltd	01606 592121		●	●	●	●	●	●							Up to £2,000,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●	●		●	Up to £1,400,000
Warley Construction Company Ltd	01268 726020				●					●					Up to £400,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Webcox Engineering Ltd	01249 813225				●	●	●				●				Up to £400,000
H Young Structures Ltd	01953 601881		●		●	●	●	●				●			Up to £800,000

Notes (') Contracts which are primarily steel but which may include associated works. The steelwork contract for which a company is pre-qualified for the Scheme is intended to give guidance on the size of steelwork contract that can be undertaken; where a project lasts longer than a year, the value is the proportion of the steelwork contract to be undertaken within a 12 month period.
(*) Where an asterisk appears against any company's classification number, this indicates that the assets required for this classification level are those of the parent company.

RQSC
The Register of Qualified Steelwork Contractors Scheme

BRIDGEWORKS SCHEME

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

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

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

Company Name	Telephone	FG	PT	BA	CM	MB	RF	X	Contract Value (1)
Allerton Engineering Ltd	01609 774471	●	●	●	●	●	●		Up to £1,400,000*
Briton Fabricators Ltd	0115 963 2901	●	●	●			●		Up to £800,000
Butterley Ltd	01773 573573	●	●	●	●	●	●		Up to £3,000,000*
CTS Ltd	01484 606416	●	●		●	●			Up to £800,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●		Above £6,000,000*
Costruzioni Cimolai Armando SpA	01223 350876	●	●	●	●	●			Up to £6,000,000
Dew Construction (Fabrication Division)	0161 624 5631	●	●	●			●		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*
Mandall Engineering Ltd	0114 243 0001	●	●	●	●	●	●		Up to £800,000*
Meldan Fabrications Ltd	01652 632075	●	●	●	●	●	●		Up to £4,000,000
'N' Class Fabrication Ltd	01733 558989	●	●	●		●	●		Up to £1,400,000
Normanby Wefco Ltd	01427 611000	●	●	●			●		Up to £800,000
Nusteel Structures Ltd	01303 268112	●	●	●	●				Up to £2,000,000*
P C Richardson & Co (Middlesbrough) Ltd	01946 727119	●					●		Up to £6,000,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●		Above £6,000,000
Taylor & Sons Ltd	029 2034 4556	●	●	●	●	●	●		Up to £800,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●		Above £6,000,000*

Notes (') Contracts which are primarily steel but which may include associated works. The steelwork contract for which a company is pre-qualified for the Scheme is intended to give guidance on the size of steelwork contract that can be undertaken; where a project lasts longer than a year, the value is the proportion of the steelwork contract to be undertaken within a 12 month period.
(*) Where an asterisk appears against any company's classification number, this indicates that the assets required for this classification level are those of the parent company.

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- Stainless Steel
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