MAY 2006 VOL 14 NO 5

NSC

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BCSA 1906 2006 CENTENARY
The British Constructional Steelwork Association Ltd

The Steel Construction Institute

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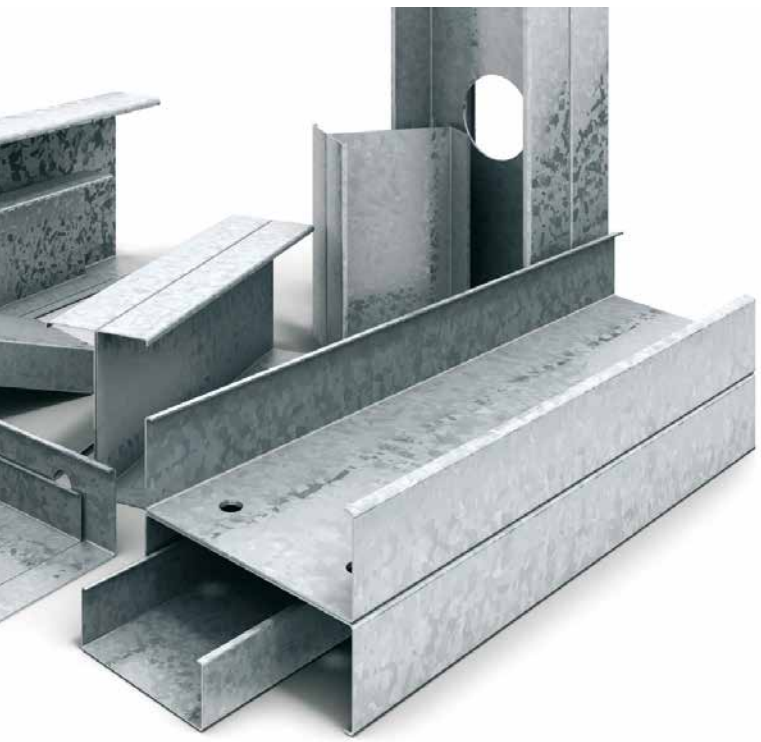

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Investment the key ingredient

Nick Barrett - Editor

Overseas constructional steelwork sectors frequently visit the UK to try and grasp what it is that gives our industry such a commanding share of the market. Some of the reasons why a particular project opts for steel in the UK may not apply in all of these markets of course; such as the near impossibility of using concrete in congested inner city sites where formwork and multiple trades would be, sometimes dangerously, working almost on top of one another. Wide open spaces in 'new world' countries can mean that these constraints often do not arise, but on many of these countries' own landmark projects steel is increasingly chosen for the familiar reasons like sustainability, cost and adaptability.

Increases in the productivity and technical excellence of the product of fabrication facilities is something overseas visitors like to keep abreast of, and a favourite stop on their tours are places where they can inspect new state of the art, fully integrated design and manufacture facilities such as you can read about in this issue of NSC.

There are varying sizes of facilities in operation in the UK market, some able to handle the very large volumes associated with large scale Terminal 5 type jobs, and others designed for more specialised or smaller scale projects. There is a key message for overseas visitors to take home – that UK steelwork contractors are prepared to invest in the latest machinery, which brings competitive advantage to themselves and delivers improved quality and service to customers.

Glossy brochures don't do it, neither do all singing and dancing presentations at seminars and exhibitions. What wins is an integrated focus across the steel sector on productivity gains that can be shared up the supply chain, along with investment in extensive research and development as well as provision of full technical support. That is the winning formula. Plus of course the willingness of steelwork contractors to stick their chins out and make the investments that clients will benefit from.

Harmonised standard makes marking possible

CE Marking of fabricated steelwork could be possible from late next year, assuming the standard – EN 1090-1 - is accepted at Formal Vote later this year (see News).

This is a potentially tricky area for steelwork contractors, but be assured that all the necessary steps are being taken to ensure that CE Marking can be introduced seamlessly. The CE Marking approach allows the legal requirements of the Construction Products Regulations (CPR) to be satisfied in a fairly straightforward way, while the alternative approach depends on Trading Standards Officers inspecting a heavy load of documentation relating to structures or products. This means, among other things, keeping even more detailed records for a long time.

BCSA has developed a two strand strategy to help members with the introduction of CE Marking and alternative means of satisfying the requirements of the CPR. A step by step procedure will be developed for those who want to CE Mark their products, while for those who decide to adopt the alternative approach BCSA will develop principles for meeting the minimum requirements given in the CPR.

The Steel Construction Certification Scheme (SCCS) is submitting an application to become a fully Notified Body for EN 1090-1 that will allow it to carry out the necessary third party certification of the manufacturers Factory Production Control systems for producing components to EN 1090-1.

SCCS will develop two approaches: a CE Marking system for steelwork contractors with ISO 9001 certification (by SCCS); and a stand alone CE Marking system based solely on the requirements of EN 1090-1.

Whichever route a steelwork supplier decides to take, clients could then be confident that the SCCS certified organisations would comply with the regulations.

CE Marking strategy being prepared

CE Marking of fabricated steelwork is anticipated to become a reality by late 2007 and the BCSA is developing guidance for companies wishing to mark their products and for those who do not.

Although the Construction Products Regulations (CPR) - and the concept of CE Marking - were initially introduced to the UK in 1991, they are not mandatory.

Steel sections are a construction product and the CE Marking of certain hot rolled structural steels was introduced last year.

However, putting products on the market which do not satisfy certain essential requirements is a criminal offence.

There are two ways that products can satisfy the requirements set out by the CPR: CE Marking and providing, when asked, Trading Standards Officers with sufficient information that proves a product meets the relevant harmonised standard.

The BCSA said, if carried out correctly, CE Marking satisfies the legal requirements given in the CPR. The second approach, however, leaves the manufacturer at risk of prosecution as all relevant documentation may not get examined and some information may even have been lost.

The BCSA also said steelwork companies not CE Marking their products must retain all documents for all structures/products produced and put on the market.

To navigate this legislation, the BCSA is putting together a two strand strategy and developing a step-by-step procedure for those wishing to CE Mark their products. Meanwhile, for those members wishing to adopt the alternative approach, the BCSA is compiling a set of principles for meeting the minimum requirements given in the CPR.

Conder is top of the class in Sheffield

Conder Structures is erecting steelwork for a major design and build contract for ten student accommodation blocks in Sheffield.

The project consists of 500 en-suite rooms, with each block incorporating a 'step-in' architect-designed bay to create an exterior that integrates with the next block at lower level. This is also said to offer students a high level of privacy.

Conder is supplying approximately 1,000t of beam and stick steelwork for main contractor Ocon Construction.

Occupying a city centre site, the ten blocks are set out in two sets of five, rising from four levels to a maximum of eight levels high.

Conder Managing Director, Gordon Riley said: "We formulated the design of our steelwork around the recessed bays in the floor plans, connecting each frame of the two separate sets of five buildings at floor level."

The nature of the confined city centre site dictated a careful sequencing and management process, according to Peter Moran, Ocon Construction Director.

All ten blocks were completed to full width at each level and then to full height, before work commenced on the next structure.

"With no road closures possible, the main access to the site was through a narrow 'central corridor', the only available siting for the mobile cranes, making on-site management extremely vital," Mr Ridley said.

The complex is scheduled to open in September.

Tall shed nears completion

A ridge height of almost 42.5m makes a new distribution centre in Northfleet, Kent, one of the tallest warehouse structures in the UK. The steelwork and top-out for the new 160,000 sq ft facility was completed in late summer last year and construction is now nearing completion.

Atlas Ward Structures has designed, fabricated and erected the 1,200t of structural steelwork on behalf of main contractor Bowmer & Kirkland.

Being constructed for client Kimberly Clark, the new warehouse will hold up to 30,000, 3m high, pallets in the high bay, with further low bay storage in a 12m high zone. Costing a total of £9.26M, the new distribution centre replaces a previous warehouse which was destroyed by fire.

New regs highlighted at Metals seminar

The recent Metals Forum health and safety seminar outlined a number of important industry topics including the new Control of Noise Regulations as well as the hierarchy to be followed under the Working at Height Regulations.

Chaired by Tony Woods, Director of Metals Packaging Manufacturers, the seminar was held at the National Metalforming Centre in West Bromwich on 6th April. More than 115 health and safety practitioners and production based personnel attended the meeting.

Presentations were made by the Health & Safety Executive (HSE) and industry specialists covering topics such as accident analysis in the metals industry.

Of the current HSE programmes, special attention was paid to the new Control of Noise Regulations, with practical demonstrations of how noise can effect workers hearing.

To support the noise regulations some techniques for managing and controlling noise in the workplace were presented by the Industrial Noise and Vibration Centre.

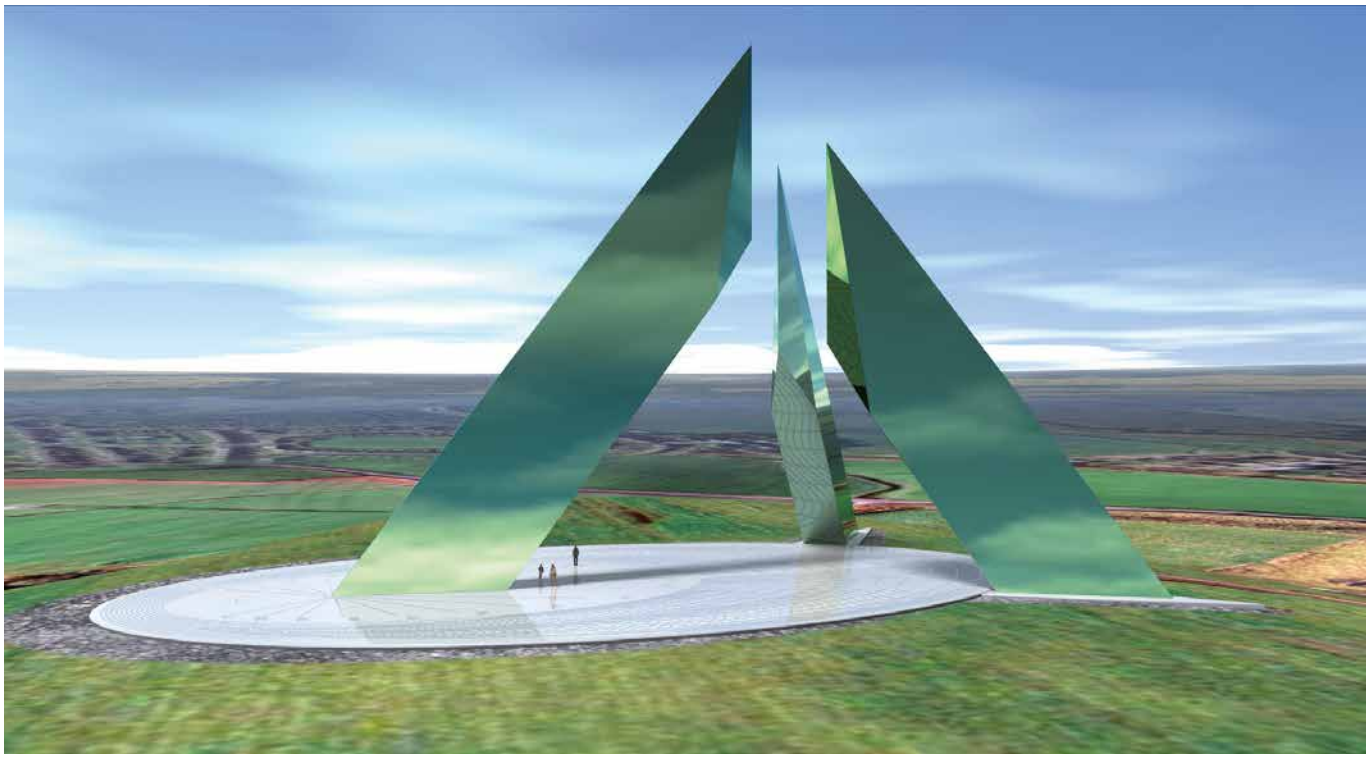
The BCSA also outlined the hierarchy to be followed under the new Working at Height Regulations.

A grand arcade for Wigan

More than 5,000t of steelwork will be supplied by Severfield Reeve Structures for the construction of Wigan's Grand Arcade shopping centre. Working on behalf of main contractor Shepherd Construction, Severfield began steel erection in October 2005 and over a period of 34 weeks the Arcade's superstructure will be constructed.

The project's client Modus Properties said the arcade will transform Wigan town centre. The £52M project is scheduled for completion in March 2007 and the massive 425,000 ft^2 scheme incorporates 35 retail units and the provision of a new multi-storey car park.

More than 75% of the development is already pre-let with tenants including Debenhams, Marks & Spencer, Next, HMV and Waterstones.



Time is right for giant steel pyramid

Foundation work has begun for the iconic Solar Pyramid project near Chesterfield in Derbyshire.

Once complete, the 58m tall steel structure will be the world's biggest timepiece and the UK's largest work of art.

Built on the site of a former colliery, the edifice will consist of three highly polished stainless steel leaning blade-like towers which will cast a shadow onto an elliptical sundial base telling the date and time.

Project creator Richard Lester Swain said approximately 50t of steel will be needed for the blades, which will be constructed with 4m x 4m x 10m triangular sections.

"Because the work is on the grounds of a former colliery, piles of more than 20m are required," Mr Swain said. "Once this part of project has been completed, the local authority will appoint contractors for the structure itself."

The giant timepiece is scheduled for completion in June 2007.

AROUND THE PRESS

Property Week
7 April 2006
Crisis at Castlepoint
Castlepoint retail park closed just before Christmas because of cracking concrete in the car park. Now, its future is uncertain.

"What I have said to retailers is that my understanding of the problem we are talking about involves a very significant repair. I am not ruling out even more extensive repairs, including partial or even total demolition of the car park." (David Paine, of retail park managers Castlepoint Partnership)

Contract Journal
12 April 2006
Offsite given shot in the arm by the army
The offsite industry won a vote of confidence from the government last week when it gained £132M worth of business for upgrades to army accommodation. Corus Living Solutions general manager Scott Carr told CJ one modular building will roll off its North Wales production line every 40 minutes for the project.

New Civil Engineer
30 March 2006
Expert blasts government on fire testing
The government is "sticking its head in the sand" over the pressing need for more full scale fire testing, a leading structural researcher said this week. Professor Colin Bailey of Manchester University hit out at the "serious disadvantages and limitations" inherent in the prescriptive approach popular with governments.

Financial Times
11 April 2006
Severfield's order book hits £210m
Shares in Severfield-Rowen rose more than 10 per cent yesterday as the structural steel group involved in the construction of Arsenal's new stadium and Heathrow's Terminal 5 reported healthy profit growth and gave a bullish view of the year ahead.

The world's largest structural steel construction company said buoyant construction industry demand was driving enquiries, pushing its order book to £210m.

Countdown to London Olympics

In order to prevent damaging and time-wasting disputes on any of its construction sites, Olympic Delivery Authority (ODA) Chairman Jack Lemley is set to enlist the help of a team of high-level industry experts.

His plan is to recruit top architects, QSs, engineers, lawyers and contractors to form a dispute resolution board. They would have the power to mediate and make binding adjudication decisions.

Meanwhile, the ODA has also announced that it will be using the third edition of the New Engineering Contract on all projects.

This contract requires a partnering approach to both design and construction based on mutual trust and cooperation.

So far, five consortia are believed to have registered bids with the ODA for the role of delivery partner, which is expected to be awarded in August.

The five are: Mace and Laing O'Rourke; Parsons Brinckerhoff and Taylor Woodrow; Bovis Lend Lease, Capita Symonds and Kellogg Brown Root; a consortium led by Bechtel; and Amec and Balfour Beatty.

Although the role of the delivery partner may alter slightly, it has been claimed the main function will be to oversee all individual projects and make sure they are on time.

David Higgins, ODA Chief Executive said recently that the eventual winner may well be excluded from individual contracts.

He said that a number of bidders had approached the ODA about a potential conflict of interest, but delivery partner companies would not be automatically excluded from construction work.

On the design front, no architects have yet been appointed for any of the arenas, with the exception of the Aquatics Centre. This £70M project was awarded to Hadid Design, but its original design was deemed too expensive and a redesign is currently underway.

Before many of the projects can get underway an estimated £200M clean-up must be undertaken at the Olympic Park site.

At present six firms have pitched for the work: Birse; Kier; May Gurney; Morrison, Mowlem and Nuttall.

In another development London Mayor Ken Livingstone has announced the formation of an organisation that will pool the resources of all design bodies at the Greater London Authority involved in the Olympics.

An artist's impression of the land bridge at the Olympic Park © London 2012

Steel scores at new Twickenham stand

Steelwork erection for Twickenham's new £90M South Stand is well underway and is scheduled for completion by December.

The official home of English Rugby Union, will have increased its capacity from 75,000 to 82,000 once main contractor Mowlem (now part of Carillion) has finished the redevelopment.

Steelwork contractor Cleveland Bridge is supplying and erecting steel for two separate on site packages; 3,000t for the commercial and hotel complex, and a further 1,500t for the grandstand.

The new South Stand consists of three levels, a lower concrete tier which is new complete, and a mid and upper tier which are steel framed. Housed within the stand is a commercial complex with a sports and leisure centre, and a 4-star hotel

According to Cleveland Bridge Project Manager, Andy Hall, the upper tiers will be ready for this year's Autumn internationals.

"The plan is to initially use the stand without a roof, and then erect the steel roof during December," Hall said.

For the stand Cleveland is supplying rakers and trusses of various sizes, while the commercial and hotel complex requires steel columns and beams.

Kelvin bridged by longest span girder

Main contractor Farrans opted for the most environmentally friendly and cost effective way of constructing a new bridge across Glasgow's Kelvin River, a 61.5m single span steel girder believed to be the longest ever in the UK.

Grant Scholes, Project Manager for bridge designers Atkins said a construction method was required that would cause minimal disruption to the river while allowing workers to remain on either bank.

"A composite steel girder solution gave us the facility to crane in braced pairs of single span beams eliminating the need for work in the river channel," Mr Scholes said.

Other important factors for choosing a single span steel girder, Scholes said, was the light nature of steel which allowed relatively easy craneage, while minimising loads to the piled foundation.

The single span bridge has an overall length of 62.5m and is 16.3m wide.

Steelwork contractor Fairfield-Mabey delivered the structure to site in 18 pieces which were then assembled into three 62.5m 128t braced pairs.

In total, Fairfield-Mabey supplied 384t of steelwork which also included six main girders measuring 2.4m deep and 1150mm wide.

After four weeks of pre assembly on site, the three pairs of braced girders were lifted into position during one weekend possession. The procedure took only one day and was completed by two mobile cranes, one an 800t unit and the other 1000t machine. The cranes were positioned on the west and east abutments and lifted the braced pairs in tandem lifts.

The bridge is scheduled to open to traffic in June.

Essential steel industry information

The 2006 Directory for Specifiers and Buyers in the steel construction industry is out now.

This essential directory lists details of every BCSA member for 2006; from British steelwork contractors to their suppliers.

RQSC (Registered Qualified Steelwork Contractors) listings are also included as are Quality Assurance Certification details.

The directory, which is illustrated throughout with a number of images of members' work, also contains details about steel as a material and its benefits from fire protection to design possibilities.

To receive your free copy email: Gillian.mitchell@steelconstruction.org

Environmentally friendly shed is taking shape

Described as one of the greenest buildings in the country, brewer Adnams' new warehouse and distribution centre is currently under construction. The environmentally friendly building, being constructed by main contractor Haymills, is expected to be completed and operational by September.

Using a combination of steel and timber frame, the building will be clad with hemp, lime and chalk blocks and have a roof formed of Sedum – a living carpet of fleshy plants and grass.

AC Bacon Engineering supplied the 220t of structural steelwork. Director of AC Bacon Engineering Neville Howling said: "This building shows the flexibility of steel by being able to combine it with timber."

The structural steelwork had to be connected to the two Glulam roof beams, each 41.6m long – these are said to be the longest Glulam beams to be used on a project in the UK. "Special care was taken in detailing, fabrication and erection of the steelwork, especially with the connections to the timber Glulam roof beams," Mr Howling said.

"The steelwork connections had to marry up with pre-drilled holes and slots that were already in the prefabricated roof beams."

The structure in Southwold, Suffolk, will have many 'green' features including including solar panels in the roof which will provide 80 per cent of the facility's hot water. Rain water, which will be harvested from the roof, will be used for the facility's washing equipment. In addition, the building will have its own waste water system which cleans the water and returns it to a nearby pond.

NEWS IN BRIEF

The new **Stainless Steel Specialist Course** brochure from the British Stainless Steel Association (BSSA) is now available. The course consists of 16 self-study modules with two levels of certification - intermediate and full certificate. For more information contact: alison.murphy@bssa.org.uk

CSC has launched its new **Connection Design Suite** which is fully integrated with Fastrak Building Designer. The new Suite is said to be able to check whole floors' or even whole buildings' connections giving designers a quick assessment of where standard connections will not be satisfactory.

Cleveland Bridge is in the running to supply a large proportion of the 60,000t of steel required by the Rosyth shipyard for two new aircraft carriers. The company is also in talks about a £35M contract to build a steel cover over the former **Chernobyl** nuclear power station in Ukraine.

ICSCS'07 which will be held in Manchester next year is seeking papers on topics such as buildings, bridges, beams and columns, fabrication and erection, and case studies. Prospective authors are invited to submit abstracts of 200 to 300 words by 30 September 2006 to: mcc.reg@manchester.ac.uk

Fabsec has launched **FBEAM 2006** a new design software programme said to offer designers and developers of steel-framed buildings major cost savings. The programme also gives structural engineers the capability to manage multiple optimised beams.

REIDsteel wins second Queen's Award

One of the Queen's Award for Enterprise has been given for the second time to structural steel firm John Reid & Sons. The company won the award previously in 1985 and now 21 years later, on the Queen's 80th birthday, has been given it for a second time.

A total of 145 awards were given to businesses to mark their success. The award gives businesses such as John Reid & Sons, a good opportunity to prove to customers how successful the business is. It can also open doors to new customers and can raise a company's profile. Managing Director Michael Reid Said: "Since 1919 we have exported to 140 countries and hope to add more to the tally in years to come."

John Reid & Sons, known as REIDsteel, design and make a wide variety of steel structures, including wide span aircraft hangers, grandstands, industrial buildings and road bridges.

As well as designing and fabricating the steelwork, REIDsteel gets involved with details such as cladding and insulation as well as making accessories such as doors and windows for its buildings and anti-skid steel floors.

The Doug Ellis Stand, Aston Villa FC, one of REIDsteel's projects

An award presentation will be held with a representative of The Queen in attendance. As part of the award, the company will use The Queen's Award Emblem for five years as a symbol of its commercial success.

Fisher completes truss movement

Many of Belfast's city centre streets were recently closed over two weekend nights as seven large steel trusses were transported from the Harland & Wolff shipyard to the Victoria Square development.

The steel trusses vary in size and weight, from the largest which is 28m-long and weighs 100t, to the smallest which is 16m-long and 35t.

Brian Keys, Project Manager for steelwork contractor Fisher Engineering said: "The trusses are so big they had to be fabricated offsite. Space is also at a premium at Victoria Square, so we delivered the elements to the shipyard and welded them together there."

Fisher Engineering secured a rolling road closure for a Friday and Saturday night. The trusses were individually transported by lowloader over the first night and stacked beside the project.

The following night, one street beside the development was shut as the seven trusses were lifted into position by a 1,000 capacity crane.

The trusses support four levels of apartments over a retail service yard. "To allow for an unobstructed area without supporting columns, we had to have extremely large trusses," Mr Keys explained.

The £300M Victoria Square project includes 75,000m² of retail space and 90 residential apartments. It is scheduled for completion by early 2008.

New labour saving system

FICEP has launched a new Scribing System which is said to automatically make lines and weld symbols as well measurements on beams, thereby reducing the normal labour intensive marking out process.

The new feature is now available on FICEP's 1002 DZB, a drilling and sawing line with a twin rotating head that can high speed drill beams on all sides.

The machine has two, six position linear tool changers as standard and accepts any kind of drilling, countersinking, milling or tapping tool.

Another FICEP unit which is equipped with the new Scribing System is the TIPO B161. This machine is an automatic line for punching, high speed drilling and milling of large and high thickness plates.

The TIPO is said to perform a wide range of functions including milling and scribing, using both oxy-cutting and plasma cutting systems.

Diary

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

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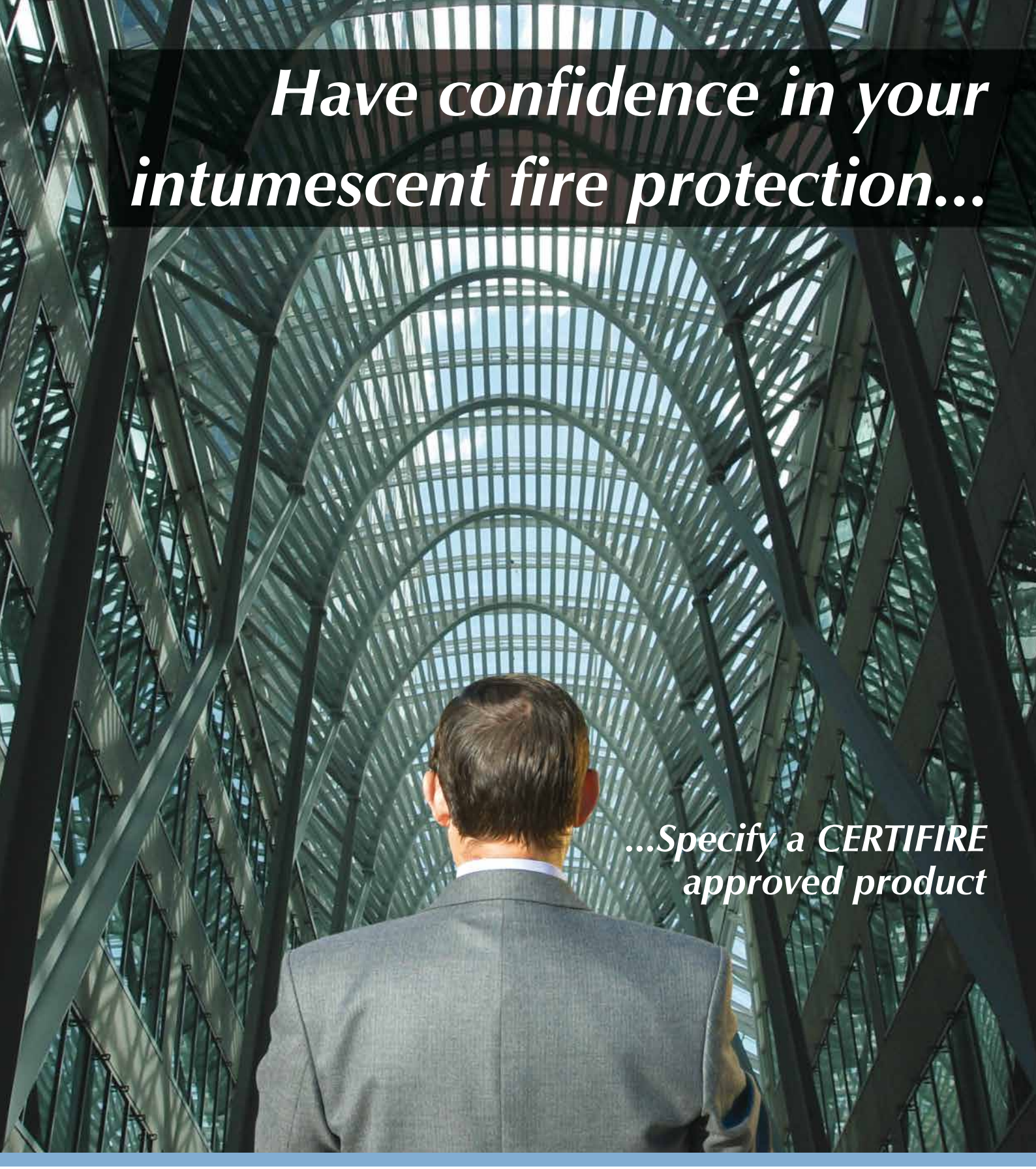

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Showcase for fully integrated design and fabrication

Barrett Steel Buildings has created a state of the art facility that fully integrates design and fabrication. Nick Barrett reports on what a modern fabrication operation can now achieve.

The dramatic success of steel in the construction market over the past twenty years has been in large part due to the remarkable productivity improvements made by steelwork contractors. The ever improving ability to respond to customer's demands for quality, short lead times with just in time delivery and work carried out off site to the most exacting tolerances – matched by an equally high performance on site – looks like being a feature of the success story for the next twenty years as well.

Barrett Steel Buildings aims to be at the forefront of productivity and quality improvements to come, with a new state of the art production facility being opened this month in Bradford. The new workshop extension might not be the largest in the industry, but Barrett plans that a unique, bespoke layout and use of the latest steel processing machines will place them at the leading edge of productivity and quality advances.

Barrett plans that a unique bespoke layout and use of the latest steel processing machines will place them at the leading edge of productivity and quality advances.

The workshop, adjacent to a new purpose built company headquarters, positions Barrett strongly to continue with ambitious growth plans which have seen turnover grow from £13.5M in 2003 to £26.4M in 2005. The target of £30M for 2006 should be easily reached. The development represents a £4M investment, including over £1.3M on new machines alone.

"We spent six months studying the market to determine exactly what the implications of the various machinery available were," explains Managing Director Richard Barrett. "It was a complicated, iterative process. We visited the United States and suppliers in Europe to see machines in operation.

"Once we decided what the ideal configuration would be we designed and built the extension around the machines…"

"We wanted a supplier who would be our partner for the next ten years or so. All options were considered before we settled on machines from FICEP. Once we decided what the ideal configuration would be we designed and built the extension around the machines, rather than try to fit

Continues on p14

The new Barrett Steel Buildings headquarters

Above: The Orient 11 with the Schlick RB 1500 in the background

State of the art

Four new machines have been supplied to Barrett by FICEP, two Orient 11 – 1101DZB CNC Drilling & Sawing Lines, an Orient 11 – 1102 DZTT CNC Plasma Coping machine combine with Drilling System and a Schlick RB 1500 Automatic Roller Conveyor Shot Blast System.

"This is state of the art machinery which represents significant advances on what was available previously," says Ficep Managing Director Mark Jones. "Barrett Steel Buildings has made a significant investment in this new facility and have agreed that we can use it as a showcase for what is now possible."

The Orient 11 is described as an advanced, high performance monospindle drilling machine, equipped with a CNC controlled rotating head that can drill beams and profiles on three sides (flanges and web). The Orient 11 is said to be as productive as a more expensive three-headed machine on certain applications, but is much more efficient when frequent changes of profile are called for. The presence of only one spindle does not affect line productivity but dramatically reduces auxiliary and set-up times, especially when processing beams of different sizes in sequence. In this case no complex set-up operation is required, the operator simply enters the new dimensions on the user-friendly "ARIANNA" CNC console.

The rotating head is mounted on the vertical slide and can be orientated in three working positions (vertical and horizontal on the left and right) and rotates at 2,500rpm. It is equipped as standard with a six position linear tool changer designed to accept any kind of drilling, milling or tapping tool with ISO 45 connections, and capable of drilling holes up to 40mm diameter. A coolant system is incorporated whereby the choice of lubricant occurs automatically depending on the tooling used.

The workpiece is clamped by a series of CNC controlled rollers designed to allow efficient controlled movement of the beam through both the horizontal and vertical jaws. At first a stronger force is applied initially for the Y axis, but instead of having to open the jaws to adjust and position the X axis, the pressure is simply reduced slightly by the CNC, allowing the bar to move to the new position where a stronger clamping action is applied, permitting drilling to commence. This offers a significant increase in production output.

Thanks to Field Bus operating protocols, all the electronics and CNC controls are built into the Orient 11, dispensing with the need for separate large control cabinets and external electronic connections. "This increases reliability and reduces the overall footprint of the machine," says Mr Jones. The CNC controls operate from a single motherboard that reduces costs and allows only that that part of the software that needs to be activated, increasing the machine's performance and user friendliness.

"The flexibility of the Orient 11 makes it the most versatile in our range of drilling lines," adds Mr Jones. It is the first machine in the range to offer a complete marking system that scribes assembly information or characters onto the beam using the effective spindle and patented technology to mark all facets of the profile. With the option of a second smaller spindle the beam can be marked underneath. The restrictions of marking on only one side of a beam are eliminated.

The scribing information can make lines, weld symbols, logo's and measurements removing time consuming and laborious marking out phases from the fabrication process in the workshop. Having no need to produce drawings for fabricators, this process allows faster productivity and less need for reliance on skilled personnel to do the setting out.

A Schlick Roto-Jet, a 1,500 mm wide shot blast line, complements the three FICEP machines. Mr Jones says: "FICEP are exclusive agents for Schlick machines, and this model was chosen by Barrett as it offers outstanding performance with the new 'ETA' turbine wheels which offers increased blasting speed to efficiently clean the material before processing through the new purpose built production facility, while at the same time reducing overall costs of maintenance."

SCHLICK roto-jet® roller conveyor shot blast machines are easy to use and provided the results required by Barrett. Plates, sheets, beams, sections, pipes, and tubes can all be descaled and cleaned simply by loading the pieces, pressing the start button, and unloading the finished product after a short cycle time.

The Orient 11 1101DZB with the Orient 11 1102 DZTT in the background

the machines into a pre existing shed."

The new machines are described by Barrett and FICEP as state of the art. Mr Barrett said:' The machines will allow us to reduce overall production costs and increase output, but most importantly we will be able to offer customers a better service."

"This equipment is completely integrated to our IT."

The machines being replaced were from the 1980's and 1990's. The new machines will have a drill speed eight times faster than the old ones, and the overall operation will be four times faster than before.

Mr Barrett is particularly impressed by the new coping machine which has a plasma cutting head with a robot arm. "It is the most intricate machine here and there are only one or two more in the country like it," he says.

Close up view of the Orient 11, 1101 DZB

The big differentiator between the competing systems in the marketplace, Mr Barrett says, is their IT sophistication. "This equipment is completely integrated with our IT. We use a Tekla CAD package linked to Fabtrol production control software that means we can route any job to the optimal machine.

"We have bought new software from Tekla and Fabtrol as well as FICEP. FICEP appreciated that we are IT competent so we developed the software with them. We have modified Tekla software to download design information from our own design office. There will be less human error in the marking process as the machine will do it all now."

"There will be less human error in the marking process as the machine will do it all now."

The new line will have three men for the main preparation bay to carry out blasting, sawing, drilling and coping operations, releasing operatives to work in the assembly area. "There will be a 24% efficiency increase,' says Mr Barrett.

Operatives are being trained by FICEP in Italy, and FICEP also provides a two-year service package with the purchase. "FICEP view the set up here as a showcase for their machines so we will be allowing people to come and have a look for themselves."

Productivity and quality are not the only drivers. There has been a lot of safety related input to the design as well: the new warehouse is racked to the most modern standards; light beams can shut machines down if interrupted in improper ways; bridges have been supplied over conveyors to allow safe passage from one side of the process line to another.

The new headquarters building houses multi disciplinary teams on two floors, with the single storey design team on the ground appropriately enough, and the multi storey team upstairs. "We have a high level of design competence which means we can offer a design and build service for sheds and medium rise multi storey buildings," says Mr Barrett. "We can switch production between 100% sheds and 100% multi storey, and everything in between, so whatever the market wants we will be able to supply. Our 100% commitment to design and build and emphasis on design for manufacture, will enable us to maximise the benefits of our new investment".

"…whatever the market wants we will be able to supply."

Growth areas include residential: "We did seven residential buildings in Birmingham alone last year. Other recent projects have included a ten-storey building. Healthcare and schools are also providing steady demand.

Other planned investments for 2006 include speedlines for the production area and further improvements in painting and dispatch.

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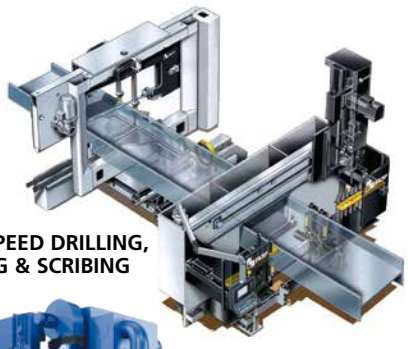

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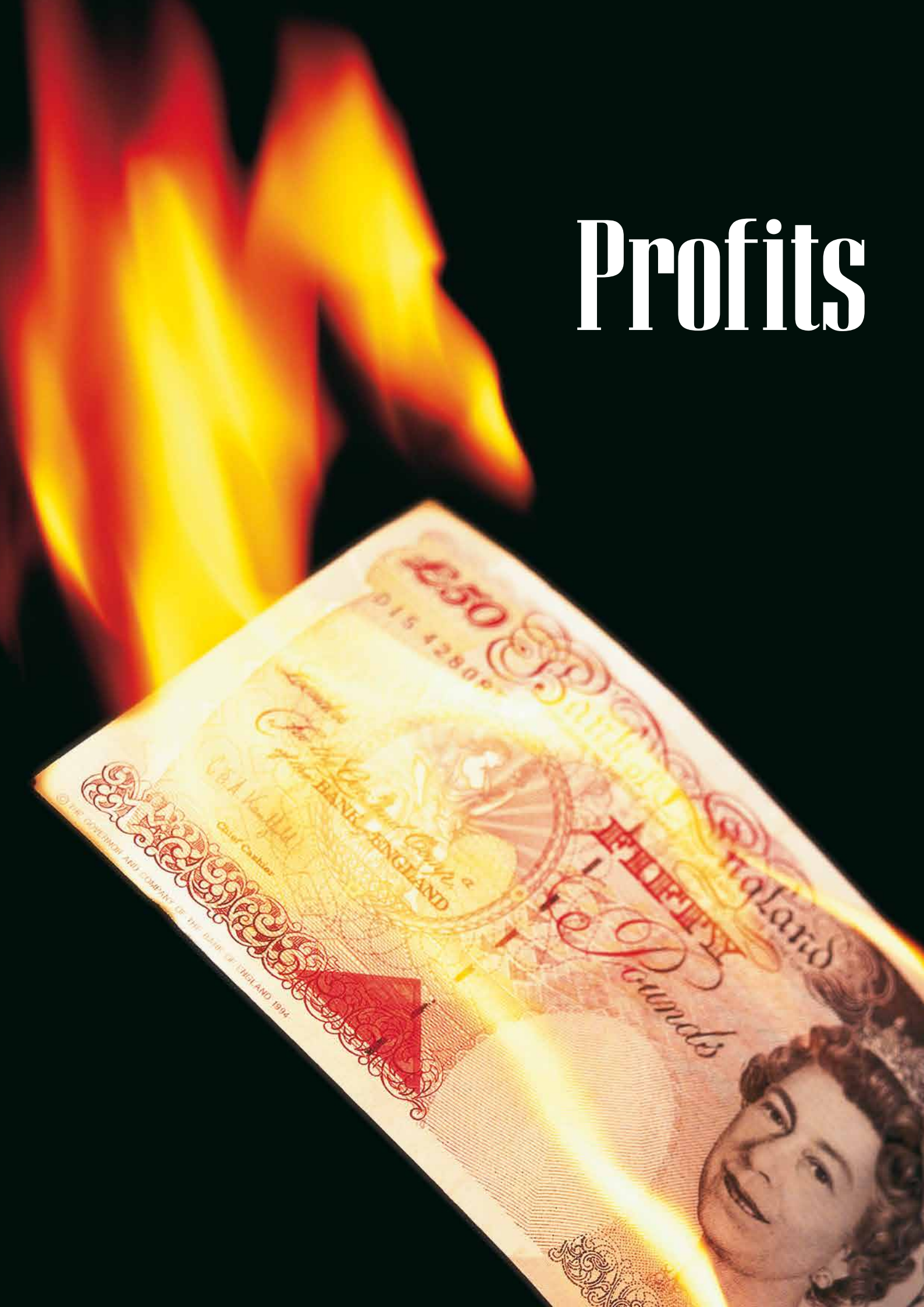
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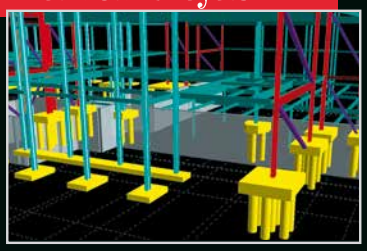

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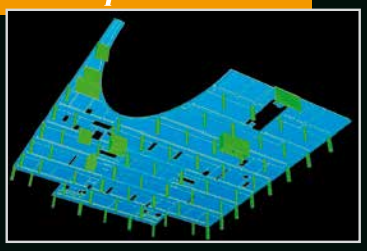

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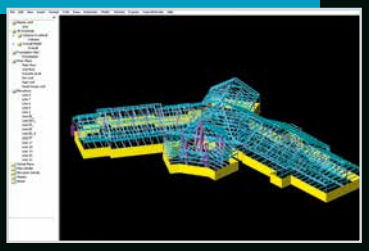

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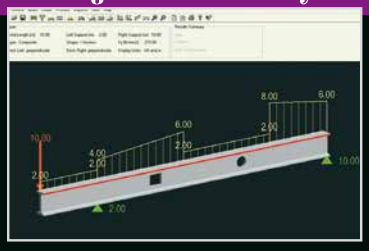

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Fast steel cores

Work is underway on the tallest building in the UK to make use of Corefast – a new and faster method of constructing cores with steel. Victoria Gough reports.

FACT FILE
Birmingham 1
Main client:
Opal Property Group Ltd
Architect:
LOC Associates
Structural engineer:
Tier Consult Ltd
Main contractor:
Ocon Construction Ltd
Steelwork contractor:
Henry Smith (Constructional Engineers) Ltd
Steel tonnage: *1,320t*

Above: The last piece of the second layer of Corefast modules is put into place.

Above right: Birmingham 1 – fronted by an 18 storey glass and zinc clad tower.

Developed by Corus, Corefast combines Bi-Steel panels to form lightweight modules which are assembled on site and when erected form a building's core up to six times faster than concrete.

This new and revolutionary method of core construction is currently being utilised on the Birmingham 1 project, the tallest building, so far, to make use of Corefast in the UK.

The new development is being constructed by Ocon Construction and the focal point is an 18 storey glass and zinc clad tower. The entire project consists of four blocks, including the tower and 1,320t of steel will be used. It is the core of the main tower which is being constructed with Corefast.

Located on a busy intersection of the A38 Bristol Road – the main route into Birmingham – the development will provide halls of residence for 604 students, as well as a luxury leisure suite and an internet cafe.

Construction began on site in January and is scheduled for completion in August 2007, just in time for the new university term. Using Corefast to create the central core of the tower was recommended by Henry Smith, the steelwork contractor, as the steel system uses Corus' Bi-Steel panels and allows for very rapid core construction. Ocon Construction estimates that using this system will save approximately five weeks on an 86 week construction programme. Construction Director for Ocon Construction's Midlands Division Steve Dando says: "Although we are a fairly new company, we were not afraid to take on this innovative way of constructing building cores."

Bi-steel was originally designed for the defence industry, due to being 'blast-proof'

Each Bi-Steel panel is made up of two steel plates spaced 200mm apart, these are connected by a series of welded steel bars spaced at 300mm centres. Interestingly, Bi-Steel was originally designed and used for industries such as defence, due to being 'blast proof'.

Corefast was developed using these panels to provide an extremely strong and durable structural core that is quick to erect and allows buildings to be constructed as complete steel structures. In addition, the walls of the core can be reduced in thickness to approximately 60 per cent of a concrete core of equivalent strength. Each module is entirely pre-fabricated before being transported to site, →

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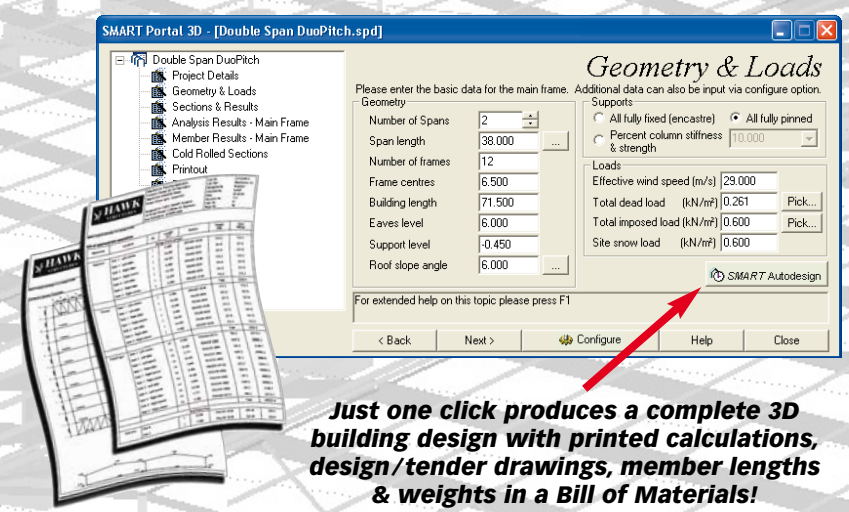

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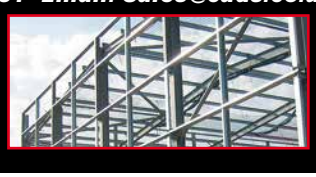


Strip above: The first Corefast modules are lowered onto the foundation.

Below: The prefabricated panels are simply bolted together on site

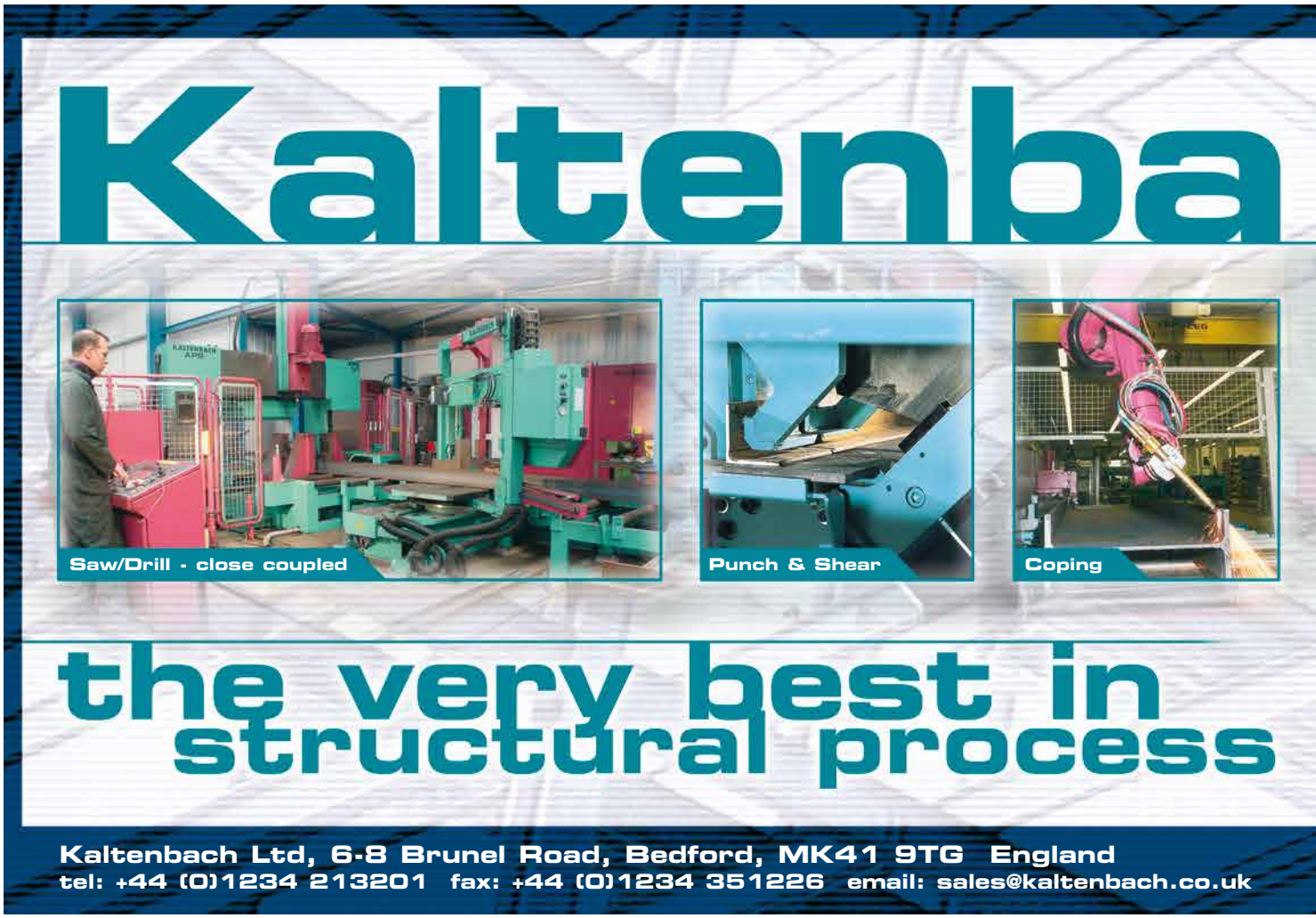
including pre-drilled and with nuts already in place to ensure quick and efficient assembly.

The first phase of constructing the core on site involved the erection of ten, 15m high, modules that created the first four floors. Each piece, weighing approximately 8t, was delivered to site and then up-ended, lifted into position and lowered onto starter bars from the foundation. As each module is put into place, it is bolted onto the previous module and ready for the next. Pre-fabricated stairs are lifted into the core along with other appropriate internal work being carried out during the erection process. Construction of the core for the first four storeys of the tower was completed in just five days.

Business Development Manager for Constructional and Industrial at Corus Bi-Steel Robert Fisher comments: "Erecting the Corefast modules is just like putting together pieces of Meccano. It is a simple flat pack that is delivered to site and then pieced together."

Once the lower floors of the core were in place, the surrounding steelwork began, simply bolted onto the panels of the core. Before being lifted into place, all of the handrails and safety barriers are attached on the ground to ensure health and safety risks are kept to a minimum. The modules of the core also provided an "in built" edge protection and safety barrier.

Having completed the initial core erection, the Bi-Steel panels are filled with concrete to allow the core to reach its full strength. After completion of the lower floors the next ten Corefast modules, each weighing 4-5t, are lifted into place and bolted to the



previous modules below, extending the building two storeys at a time. The steel core is being erected in conjunction with the main frame steelwork which is progressing at a rate of approximately one floor per week.

A total of 1,706m² of Bi-Steel panels will be used for Birmingham 1, to complete the core, which had to be carefully designed to splay at the correct angles to accommodate the architectural curve of the tower.

Gerard Kitching, Managing Director of Henry Smith says: "Using Corefast maximises off site manufacture. It cuts down on site construction time and more importantly it reduces health and safety risks involved with this sort of project, such as working at height."

"It is a simple flatpack that is delivered to site and then pieced together."

Using Corefast allows the structure to be constructed as a complete steel frame.

More for More London

Two steel framed structures are the latest buildings to be added to the burgeoning More London development. Martin Cooper reports.

Standing on Tower Bridge and looking upstream at London's South Bank you can't fail to notice the vast More London development. Incorporating the Greater London Authority's eye-catching City Hall, the entire 13-acre site is now widely regarded as one of the capital's best business locations.

Masterplanned by Foster and Partners, More London has planning consent for more than 280,000m² of business space which will include up to 186,000m² of Grade A offices accommodating nearly 20,000 workers.

As well as the Mayor of London, a number of high-profile firms have also moved their headquarters to the site, with more to follow as two new office blocks are nearing completion.

For example, international law firms Norton Rose and Lawrence Graham have committed to 3 and 4 More London Riverside respectively, as the locations for their new international headquarters. These two buildings - with a combined floor space of more than 50,000m² - will along with a couple of other structures, including a new Hilton Hotel, complete the entire development.

Initially known as Plots 3 and 4, both buildings are 10-storey steel framed structures from the lower ground level up, with 3 the largest with a footprint of 90m x 50m, while 4 is a slender office block measuring 81m-long x 18m wide.

Andrew Barrow, Mace's Project Manager for the two plots explains the site is quite confined, as it is bordered by the River Thames to the north, Tooley street to the south, and existing buildings to the east and west.

"Piling and foundation work got underway in early

The larger Plot 3 will incorporate a glass covered atrium.

All photos © KS Photography

2005. Prior to steel construction we had to construct a haul road around Plot 4, to gain access to the larger Plot 3."

Six concrete cores, three for each building, were formed by Laing O'Rourke, before any steelwork commenced. However, when steelwork did begin, Plot 3 was first off the mark. Both plots were completed by Christmas 2005, as the smaller Plot 4 had caught up by this time.

"Fabsec beams offer a more efficient system for floor build up as they have ducts to carry services."

"It was important to get the steel structures done before the Christmas holidays," Mr Barrow explains. "That gave the concrete roof time to cure before roof fit-out began in January."

Steelwork contractor Severfield-Reeve erected both building's frames in a two-floor sequence. Erecting columns to give a clear two-floor gap (8m) ahead of decking contractor Richard Lees, which followed behind.

Dave Lee, Severfield-Reeve Project Manager says the majority of steel supplied to the project consisted of Fabsec beams, primarily 650mm deep x 140mm wide.

"We delivered all steel to project in 20t loads," Mr Lee says. "And bolted everything together on site." Mike King, Project Manager for structural engineers Arup says the experience of using Fabsec beams on other related More London plots meant it was an easy decision to use them on Plots 3 & 4. "The decision was made very early in the design stage," he says.

"Fabsec beams offer a more efficient system for floor build-up as they have ducts to carry services," Mr King adds. "Otherwise the build-up would be greater as the services would have to run beneath the beams."

"Fabsec beams also have optimal fire protection properties," Mr King sums up.

"One less trade on site is very important, especially on a worksite with limited space."

Mr Barrow backs this up and adds that another important factor in favour of the Fabsec beams is that they were coated with intumescent paint prior to being delivered to site and this meant less work to do on the project.

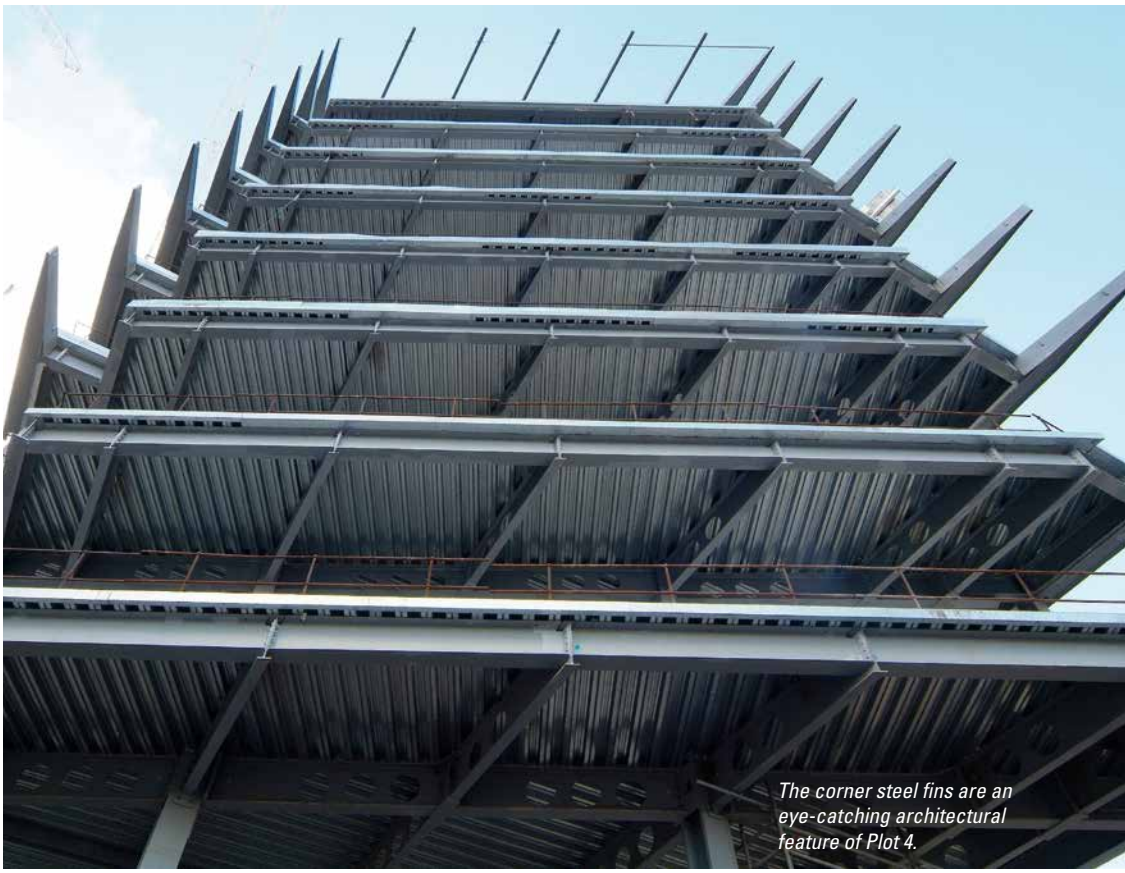
"One less trade on site is very important, especially on a worksite with limited space," Mr Barrow explains.

In total the project required Severfield to supply 2,850t of steel for Plot 3, of which 1,775t was made up of Fabsec beams, and a further 1,540t for Plot 4 (936t Fabsec).

Plot 3 is basically a U-shaped structure, with the open end facing the river front and containing a glass covered atrium. Severfield installed an array of steel columns and beams, but an interesting feature of this building is the glass roof covering the atrium.

Severfield installed two large cantilever box girders, each weighing 15t, to support this glass canopy. A further four 20m-long beams support the canopy over a ninth floor balcony. Cladding contractor for Plot 3, Permasteelalissa, supplied and →

FACT FILE
3 & 4 More London Riverside, Southwark
Main client: *More London Developments*
Architect: *Foster & Partners*
Structural engineer: *Arup*
Construction manager: *Mace*
Steelwork contractor: *Severfield-Reeve Structures Ltd*
Project Value: *£95m*
Steel tonnage: *4,400t*



The corner steel fins are an eye-catching architectural feature of Plot 4.

Below: Protruding fins on Plot 4.
Right: Fabsec beams were used throughout.

Three steel bridges traverse Plot 3's atrium.

erected the architectural steelwork for the balcony itself.

Meanwhile, traversing the atrium are three bridges situated on the third, fifth and seventh floors. Each of these steel bridges were initially constructed by installing two 18m-long beams, situated 2.5m apart and then bolting in the intermediate cross beams.

Plot 4 is a narrow structure compared to its neighbour, but did present the contractors with an interesting architectural design feature. This building has a floor grid plan of 9m x 6m and was constructed with Fabsec beams and 356mm x 406mm columns.

On each of the four corners of every floor there is a protruding steel fin. This architectural feature is made with a 1.5t 8m-long cantilever steel plate box girder member jutting out from the structure's main perimeter beam. A further 12 of these fins have been installed on the roof to support a canopy.

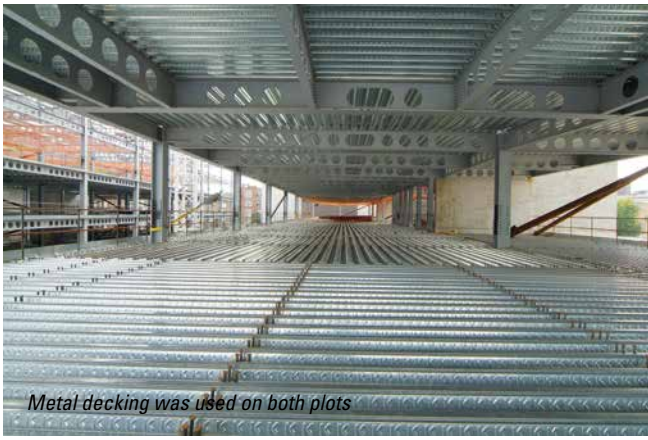
As Mr Barrow says, the feature fins will give Plot 4 a distinctive look, but getting the cladding to fit was a little problematical. Cladding contractor on this part of the project is Schmidlin, and they've supplied glass units that when bolted into position, will completely surround the fins.

Mr Barrow explains that steelwork around the central core was started first as there's a lot surrounding the risers and lifts. "This progressed in a similar sequence to Plot 3, but with the core always ahead of the rest of the steelwork, and this in turn always two floors ahead of the decking installation.

Steel erection on both building's frames went to plan, Mr Barrow says. But one aspect which did speed up the construction process was the use of steel staircases throughout the project. Supplied by Marshalls and installed by Severfield, Mr Barrow says prefabricated steel staircases are erected quickly and used immediately.

Shell and core completion will occur this Summer, with occupation scheduled for Spring 2007 following the tenants fit out of the building. Once construction work has finished the haul road will be dug up and landscaped to form a centre piece garden.

Interestingly, this will contribute to More London's variety of public spaces, which have opened up a previously derelict area of the South Bank.



Metal decking was used on both plots

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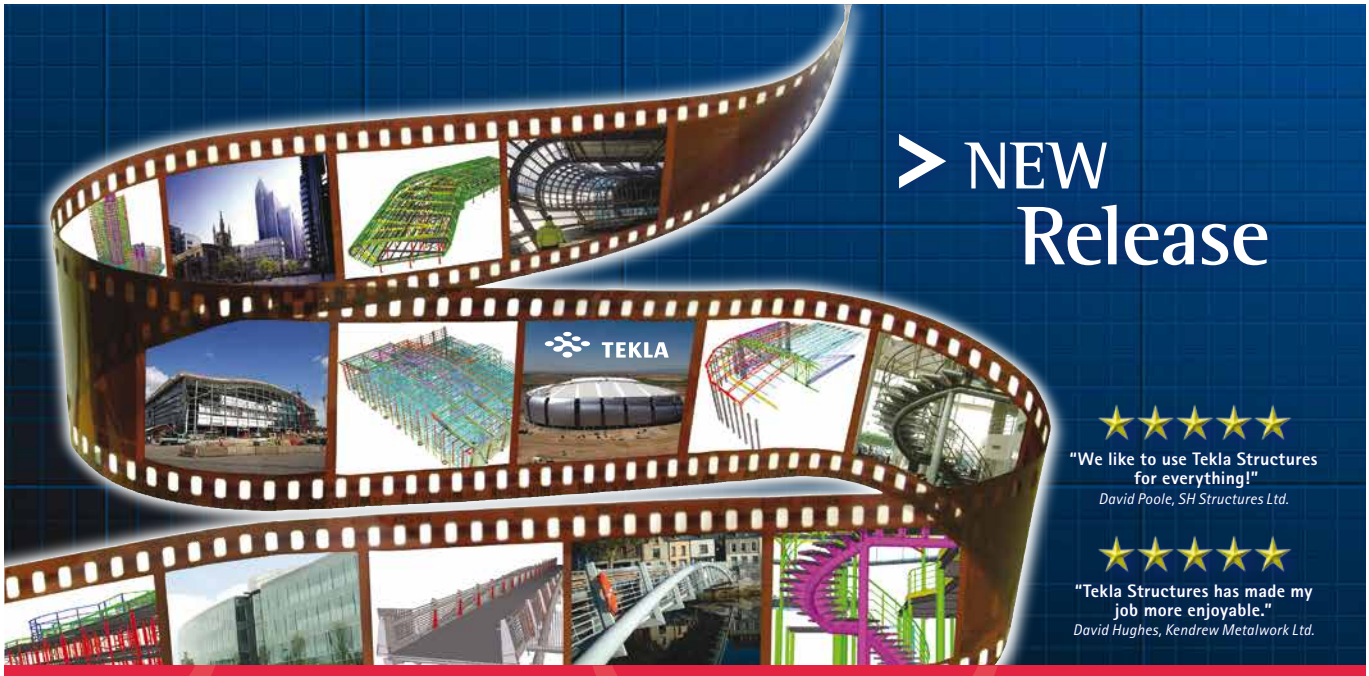

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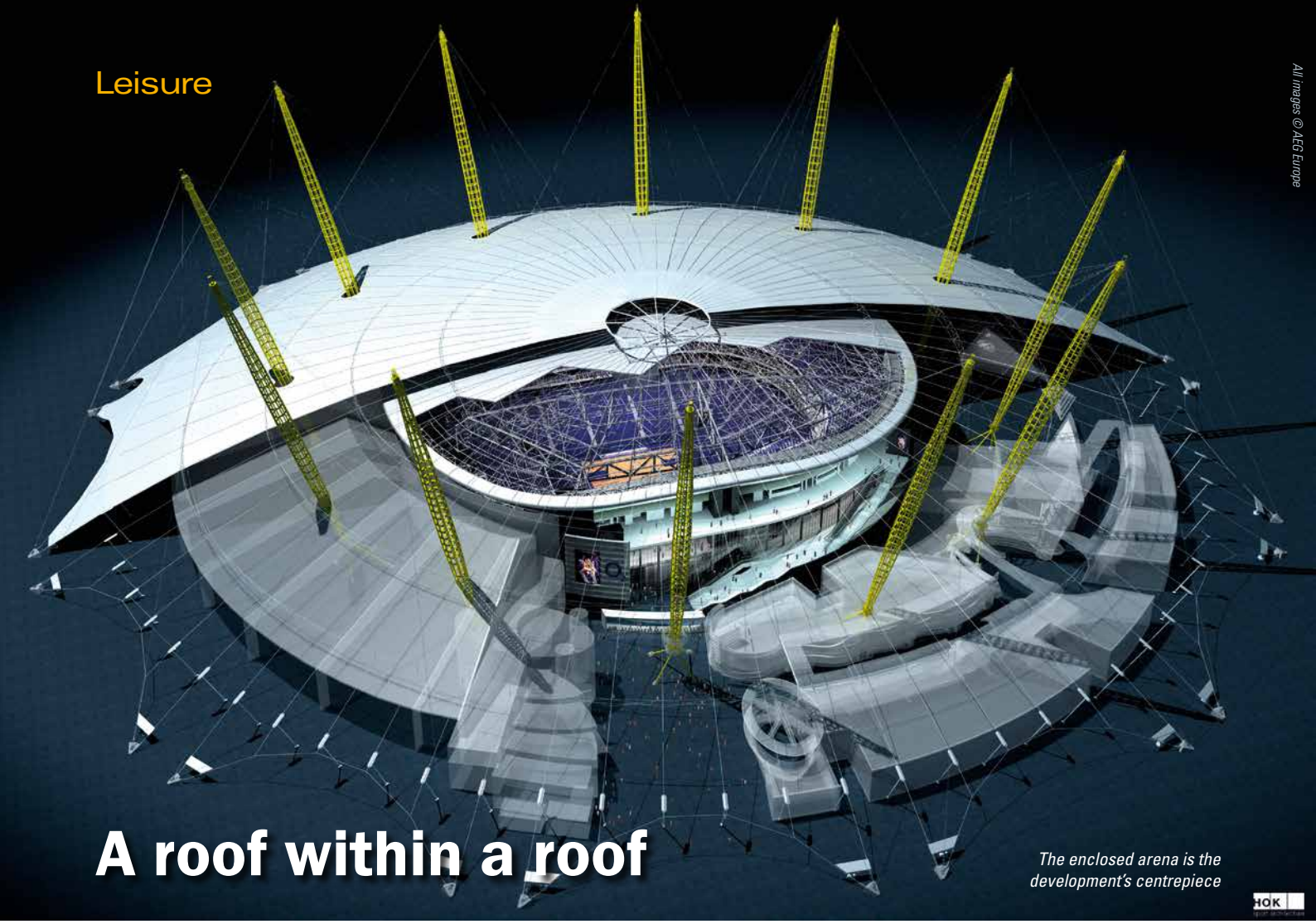

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A roof within a roof

The enclosed arena is the development's centrepiece

Formerly known as the Millennium Dome, London's giant big top is set to be reborn as a US-style entertainment centre with a 23,000 seat arena, bars, restaurants and exhibition and theatre spaces. Martin Cooper reports.

The structure previously known as the Millennium Dome is finding a new lease of life as The O_2 , a major entertainment and leisure complex taking shape at Greenwich, London.

This will be a new American-style entertainment complex, born from a collaboration between US based developer Anschutz Entertainment Group (AEG) and corporate sponsors O_2. The Dome as we knew it will be no more, and the entire site has now officially been dubbed The O_2.

Central to the whole redevelopment of the dome is the 23,000 seat enclosed arena which is being created inside the original dome structure, set to open in early 2007 to host both sporting and music events.

Constructing an arena inside an existing structure is certainly unusual and the design threw up a number of unique challenges. Not least being the 2,500t steel roof (which weighs 4,000t when fully clad) for the arena, which has only 4m clearance below the dome's fabric roof.

The 2,500t steel roof has only 4m clearance below the dome's fabric roof

Using tower cranes within the dome to erect the roof was out of the question, says Ken Jones, Associate Director at structural engineers Buro Happold. "There just isn't the room."

So the roof was initially assembled on trestles on the dome's floor and then jacked into position. Putting a roof on the arena also means it is 'future proofed' and could stand-alone if the enclosing dome structure was ever dismantled.

Mr Jones says the design and construction of the arena's roof has driven the early stages of the project.

Watson Steel fabricated the roof's steelwork at its Bolton facility and transported sections to the site in pieces no larger than 3.5m wide or 22m long.

Paul Hulme, Watson's Project Manager, says approximately 600t of steelwork that has been used for the arena roof was made up of two primary trusses, each of tubular construction and 130m long, which were brought to site in sections and welded together on the ground.

Spanning the void between the primary trusses are 16 central trusses with spans ranging from 30m to 60m. Each of these members has a depth of more than 5m. Radiating from the primary trusses are four secondary trusses which are 5m deep and nearly 40m long.

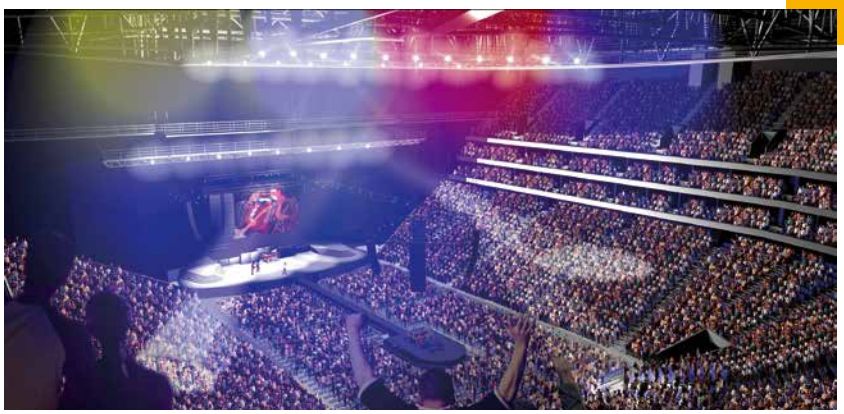
And finally, stretching around the entire roof there is a perimeter truss, again made up of tubular sections.

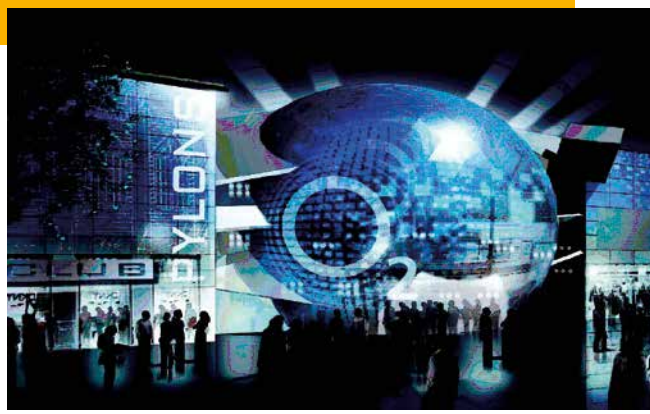
As Mr Jones explains, this is no ordinary roof, as the spherically-shaped structure is 11m deep at its apex and very deep trusses were required because of its 150m maximum span.

This roof space is needed for a vast array of

What's in O_2

The 23,000 seat arena (below left) is the overall centrepiece of the redevelopment. However, there is vast space to fill inside the dome and other developments include a large casino, depending on Government legislation. Main contractor, Sir Robert McAlpine also has a contract to build a 32,500m^2 entertainment zone, known as the waterfront development. This will include a 2,200 capacity music club, 6,000 seat exhibition centre housed in a glass-framed bubble (below) and an 11-screen cinema. The area will have an array of restaurants, bars and other leisure facilities (left).





FACT FILE
The O_2, London (formerly the Millennium Dome)
Main client: *AEG Europe*
Architect: *HOK Sport*
Structural engineer: *Buro Happold*
Main contractor: *Sir Robert McAlpine*
Steelwork contractor: *Watson Steel Structures*

The waterfront takes shape

Once the arena's roof was jacked up work began on the stadium's seating

equipment. Up to 50t of equipment can be hung from the roof such as lighting and sound equipment and a huge scoreboard - dubbed the Gondola - that will be lowered for sporting events. There are also large ducts for the environmental control of the arena and acoustic cladding.

Up to 50t of equipment can be hung from the roof such as lighting and sound equipment and a huge scoreboard, dubbed the Gondola, that will be lowered for sporting events.

Eight concrete bearing cores, housing everything from stairs, lifts, air ventilation shafts and risers, were, however, the first part of the arena to be constructed. The steel roof was then constructed around these cores at ground level.

The two primary trusses were then laid out and all other trusses were bolted around these, including the secondary and perimeter trusses.

Four opposite cores were designed and constructed with inlaid grooves to accept the primary trusses. These grooves, as Mr Jones explains, were then used to facilitate the final jacking process.

"We also designed four quadrapods to sit on each of these cores. These supported the main trusses during the jacking process and were then twisted and lowered down once the trusses were resting on the cores."

During the early part of March, the entire roof was jacked into an intermediate position approximately 11m above its previously supporting trestles.

Then, at the end of March, the final process of raising the arena's roof took place over two night shifts. Computer controlled strand jacks installed in the roof inched the structure up cables, attached to the tops of the eight cores.

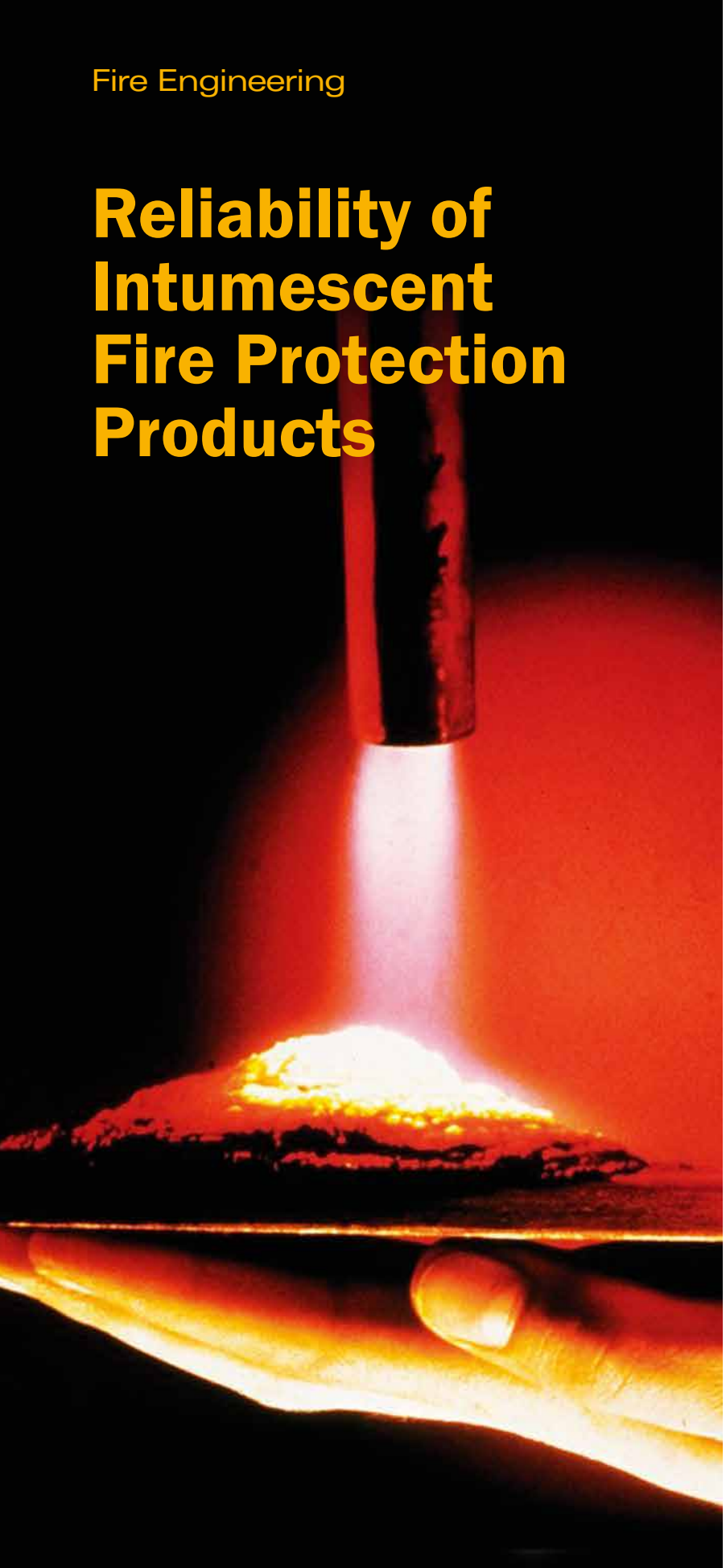
"Once the roof was in position we then in-filled the missing elements of cladding over the tops of the cores," Mr Jones explains. "And once the roof was raised, a clear space was opened up and work could then begin on the rest of the arena."

Steel construction will also play a pivotal role in the erection of other elements within the complex. The majority of the arena's frame will be steel, while the mezzanine floor has also been designed as a steel framed structure. Watson Steel is supplying approximately 1,200t of steel for this part of the project, including cigar-shaped rakers with a tapered depth of 550mm to 900mm and back to 550mm. These will support the upper tier seating, while a variety of UBs will be used on the lower tier.

Another large steel framed structure, situated adjacent to arena, sits on top of a large and already complete service yard and will require Watson Steel to supply 2,200t of steelwork. This building will be constructed with 14 x 3m deep primary trusses formed into an arched configuration.

"Once the frame of the casino has been built the 50m span steel roof will be bolted together while resting on the frame. It will then be lifted into position by two cranes and bolted to another section of roof attached to the arena building," Mr Jones says.

Reliability of Intumescent Fire Protection Products



In this demonstration, the intumescent material foams under a blowtorch, but the substrate underneath the coating remains cool enough to be held.

Debbie Smith of BRE Fire and Security and Geoff Deakin of warringtonfire

report on tests on 15 water based intumescent fire protection products available on the UK market.

Intumescent fire protection technology continues to develop at a pace where new products offering greater performance with lower thicknesses emerge into the market with frequent regularity. This continuing trend of 'using less to do more' often raises questions amongst designers and specifiers as well as regulators and enforcers about the reliability of the products and their performance. These products, which must be described as 'high technology' by comparison with most other forms of fire protection, tend to be value engineered for performance which places additional demands upon those who are responsible for their evaluation and their application.

Against this background, and other challenges faced by the industry, not least the implications of new requirements from Europe, the various manufacturers and suppliers of thin film intumescent coatings have been meeting regularly with the support of warringtonfire and BRE Fire and Security, to address the challenges. Meetings have been taking place over a period of two years involving the most senior executives of the various companies and as a consequence of the regular venue (Stratford upon Avon) the activity was initially christened 'The Stratford Initiative'. Recently, 'The Stratford Initiative' has been adopted jointly by the Association of Specialist Fire Protection (ASFP) and the British Coatings Federation (BCF) and has been given the title of The Intumescent Coatings Forum, the membership of which is given in Table 1.

Within the next two to three years, intumescent fire protection together with all other forms of structural fire protection will have to be CE marked under the Construction Products Directive if they are to be placed upon the European market. While CE marking is not mandatory within the UK, many manufacturers of intumescent fire protection work at a European, if not worldwide level. CE marking as proof of conformity, involving third party certification of the product, is viewed by the industry as the most effective way to demonstrate performance and reliability. This does bring with it, however, the need for product performance evaluation utilising new harmonised European test standards that are more

Within the next two to three years, all forms of structural fire protection will have to be CE marked

Left: two examples of the aesthetic qualities of intumescent coated steelwork.

Below: Table 1 – Participants in the ASFP/BCF Intumescent Coatings Forum

severe than those currently used in the UK. In line with other sections of the UK fire protection industry, the intumescent manufacturers/suppliers have conceded to ODPM that they accept that there should be no compensatory reduction in performance levels given in the regulatory guidance in Approved Document B (to the Building Regulations – England and Wales) to maintain the status quo. They accept that, in the future, to align with Europe, they will need to enhance product performance or increase the required product thicknesses, to satisfy similar fire resistance requirements.

Another matter of importance to the manufacturers/suppliers is the potential for undermining their product's performance by application by contractors who do not have an understanding of the special requirements of the product and do not possess the skills to ensure that it is applied in the correct manner. As a consequence, the product may have inadequate adhesion (due to poor application or incompatibility of the primer or existing paint protection) or may not be applied to the correct thickness, within tolerances and with adequate controls over accuracy. To circumvent this danger, the industry has therefore agreed to collectively address this issue and has committed itself to ensure high standards of reliability for the installed product.

The industry has committed itself to ensure high standards of reliability for the installed product.

As a consequence of the Stratford discussions, the Intumescent Coatings Forum has set itself a vision for the future as follows:

VISION FOR THE INDUSTRY
ASFP/BCF Intumescent Coatings Forum

To ensure that by 2010 all intumescent coatings for fire protection of steelwork are

- √ Tested and assessed products conforming to European standards and certified by an independent third party
- √ Installed by certified third party applicators
- √ Are subject to independent inspection of completed works, as appropriate

To advance this, the Forum has taken a number of specific actions to ensure that standards of quality and reliability of intumescent products are maintained at the highest level. These include the following:

i) A position paper has been agreed relating to the fire testing and assessment of intumescent steel protection. Currently, there is no British Standard test and assessment method for this purpose and the 'standard' for the industry has been set by the 'Yellow Book', the ASFP publication "Fire protection for structural steel in buildings" *(http://asfp.associationhouse.org.uk/default.php?cmd=210&doc_category=27).* However, the process described in the Yellow Book has been conservative in terms of the evaluation of performance of intumescent steel protection and relates to a time when there were fewer products in the market at more significant thicknesses and when the testing and assessment process was basically carried out only by the two laboratories working together to ensure consistency of practices. The situation today is very different with many more products, tested in different ways and assessed by others than the test laboratories. The predictive capability has improved through more refined but competitive and different mathematical or physical models. To standardise the situation, the industry has developed and agreed to voluntarily adopt a new protocol as a basis for formulating claims in the market. By agreement to this protocol, the manufacturers/suppliers are setting the requirements that will impose new rigors and procedures on the laboratories and others involved in the process.

The industry protocol will be the basis of future recommendations in the Yellow Book since ASFP has agreed to amend it to follow the →

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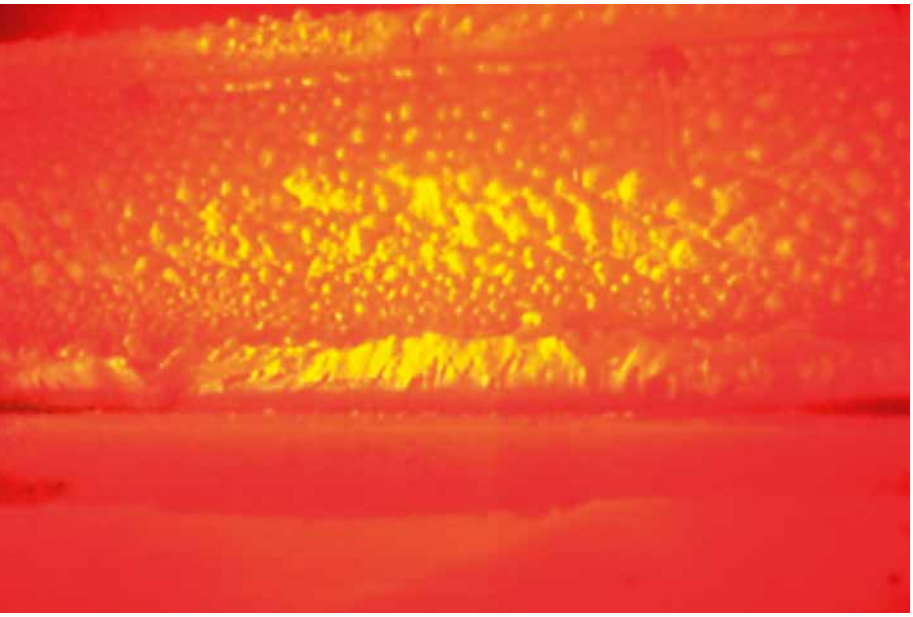
protocol. It will also reflect the new European requirements for European Technical Approvals and CE marking of products. The industry agreed Code of Practice is to be published jointly by ASFP and the BCF.

ii) The industry has agreed the methodology to be used for determining and presenting volume solids data. This will be a routine measurement made by the fire test laboratories at the time of test and will be presented in the test report. Volume solids will be presented in data sheets by manufacturers in a consistent manner. This eliminates any potential variations or confusion associated with the translation of the dry film thicknesses required for a given contract, to quantities of paint in liquid form.

Intumescent swelling during a test



iii) The most significant initiative ex Stratford, however, has been an agreement with warringtonfire and BRE Fire and Security to undertake independent market sampled product testing of water-based intumescent products.

warringtonfire sampled a total of 15 different water-based intumescent products, available on the UK market, directly from the market. These were each applied to a common dimensioned short beam at a thickness specified by the manufacturer to be appropriate for providing the beam with 60 minutes fire protection. This was given as the time for the beam to reach the specified temperature used as the basis for the assessment of the product (typically 620°C). The manufacturers were able to make or witness the application process to ensure that it was to their satisfaction but the whole process was under the control of the laboratories. The results of this testing provided a 'snapshot' of the state of the industry. The achieved level of performance was compared with the manufacturer's claim in relation to both the assessment and data sheets that are

The most significant initiative has been an agreement to undertake independent market sampled product testing of water-based intumescent products.

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supplied to the market place. It needs to be appreciated that such a single test result does not provide a reliable indicator of a products overall performance across its range of thicknesses and steel section factors. Biases are possible from one end of the range to the other. Therefore, where the result from the single beam suggested a deficiency in providing less than 90% of the claimed performance (this value was agreed to allow for variability associated with testing), a more detailed test evaluation was completed involving reviewing the product performance across the range of steel section factors.

The ASFP/BCF Intumescent Coatings Forum continues to make steps towards its vision for the industry in 2010.

After completion of the agreed test programme and some further supplementary testing only one product at one level of Section Factor (HpA) gave results less than 90% of the claimed performance, but still gave a mean performance in excess of 100%. A modification of the assessment table has been agreed with the manufacturer of this product.

iv) The results of the exercise in iii) above has led to another initiative by the industry. All manufacturers/suppliers have voluntarily agreed that all the assessments used in support of their water-based and solvent-based products should be reviewed by warringtonfire and BRE Fire and Security against an agreed set of 'acceptability criteria'. This will ensure that all current product assessments provide the same level of confidence in the product performance based upon the available test data.

'The ASFP/BCF Intumescent Coatings Forum' continues to make steps towards its vision for the industry in 2010. New initiatives to address better support for the installers of products and to validate applied thicknesses are planned. The first significant milestone, however, is the commitment to embrace the European requirements and work only with product performance claims to the new European standards by mid-2008.

Intumescent coating after expansion

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Cold-rolled portal frames

David Brown, Deputy Director of the Steel Construction Institute, provides timely advice on what engineers should watch for when working with any of the portal frame structures being introduced to the UK market from Australia.

Over recent months structural engineers may have noticed advertisements for modest span portal frame structures, typically in local press and on the internet. Sold as a complete building and formed from cold-formed lightweight members, the style of structure is often a single span portal frame, or a so-called 'American Barn' having two monopitch side spans meeting the columns of a central portal span (Figure 1).

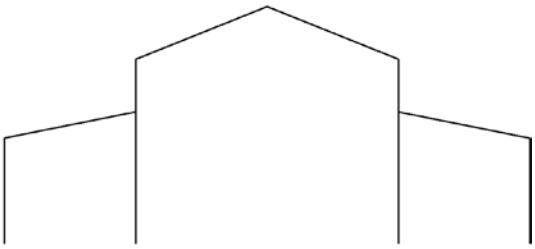

Figure 1. 'American Barn' structure

This form of structure constructed of cold-rolled members is very common in Australia, where such structures are often sold in this way, directly to the end client. This article sets out some of the technical issues that must be considered when transferring the technology to the UK. The comparison is with Australian practice, as this appears as the source of many of the companies now active in the UK.

UK Regulations

Although Building Regulations in the UK simply demand a safe structure (and thus permit design to any design Standard), common practice is to determine loading and structural resistance by reference to the appropriate British Standards. Thus it is important that any design needs to be proven by reference to the British Standards – which may be difficult if member sizes and details are simply imported into the UK without further consideration. Common practice is to demonstrate adequacy by calculation rather than by test, which means that buildings that actually have the same structural resistance may well have different calculated resistances according to different codes. Unless physical tests are undertaken, demonstrating adequacy by calculation is the only option.

Common practice is to determine loading and structural resistance by reference to the appropriate British Standards

	Dead	Imposed	Wind
	1.4	1.6	
	1.2	1.2	1.2
	1.0		1.4
	1.25	1.5	
	1.25		1.0
	0.8		1.0

Table 1 Comparison of UK and Australian combination load factors

Loads and Load combinations

We Brits are familiar with imposed roof loads as a minimum or 0.6kN/m². It appears that Australian imposed loads may be as low as 0.25kN/m² which is a hugely significant reduction. We are also familiar with the load combinations shown in Table 1, and contrasted with those found in Australian designs.

Assuming a dead load of 0.2kN/m² typical ULS gravity loads are as follows:

UK: $1.4 \times 0.2 + 1.6 \times 0.6 = 1.24\text{kN/m}^2$

Australia: $1.25 \times 0.2 + 1.5 \times 0.25 = 0.63\text{kN/m}^2$

This is obviously a very significant difference, especially as in the UK it is common that the gravity loadcase is critical for strength.

Designers should also carefully consider service loading, and allow for this if necessary. A typical service load would increase the ULS gravity loads by 17%.

No extensive comparison of the wind loading in UK and Australia has been undertaken. However, UK designers will be familiar with the often onerous effect of positive (downward) coefficients on rafters as described in BS 6399-2. These positive coefficients appear absent in the Australian Standard, which is a further significant difference.

Material strength

Designers and checkers should be careful about the yield strength of the cold formed members assumed in design. Yield strengths of 450 N/mm² are common in Australia; in the UK, 350 N/mm² is typical, which represents a 22% reduction in strength.

Connections and Restraints

At eaves and apex connections, joints are often made using bolts and flat plate as shown in Figure 2, or plate with pressed indentations for increased strength and stiffness. There has been much research and testing of such connections and these may obviously be used

Designers and checkers should be reassured that the details are appropriate

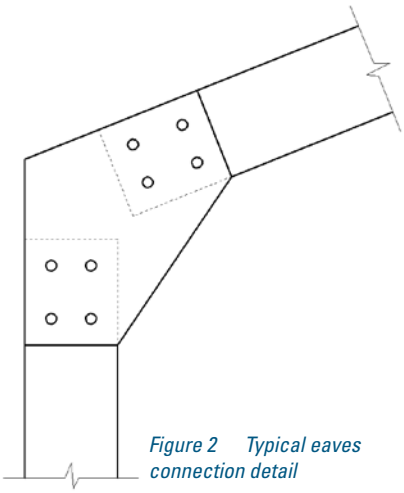

Figure 2 Typical eaves connection detail

with confidence in the appropriate circumstances. Clearly, designers and checkers should be reassured that the details are appropriate, and have not simply been detailed to look similar. Connections formed from bolts and thin plate are likely to be semi-rigid, and in the absence of other information, this flexibility should normally be accounted for in design. It may be that tests have demonstrated that particular approaches to design, combined with particular details, produce entirely satisfactory structures. If this evidence is not available, caution is advised.

Australian practice for connection plate strength is also significantly different from common UK design. Typically, connection plates in Australian designs may be 480 N/mm², considerably higher than common UK practice.

Pay particular attention to the inside of the haunch connection

Detailing is always critical – to realise the assumptions made in design. Designers and checkers should pay particular attention to the inside of the haunch connection, as shown in Figure 2, which will have an enthusiasm to buckle out of plane. If there is no restraint, and no test data to demonstrate adequate performance, how is buckling prevented?

Bracing, side rails and purlins

Bracing is commonly narrow, thin gauge material that is commonly delivered in a roll and is often fixed between the side rails and the cladding. To UK design Standards, such bracing may be difficult to prove as adequate. In reality, the cladding and roof sheeting is probably providing the resistance to shear and longitudinal forces. If no test evidence is available, it may be possible to demonstrate adequate resistance by utilising stressed skin action, and designing in accordance with BS 5950-9.

In Australian practice, purlins and side rails are often so-called 'Top Hat' sections.

In Australian practice, purlins and side rails are often so-called 'top-hat' sections, as shown in Figure 3. These profiles are not common in the UK; Designers should reassure themselves that the resistances to load, including the effects of pressure and suction, are adequate.

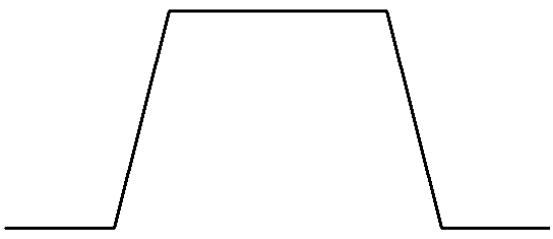

Figure 3 Typical 'Top Hat' section

In-plane stability

There is no excuse for ignoring in-plane stability just because the members are cold formed. The rafters will still have axial load in them, and the frames subject to second-order effects. The Australian design Standard has code provisions that will be familiar to UK portal designers, proposing either a second-order analysis, or a first-order analysis and amplification to allow for second-order effects.

The 'Australian' amplifier is the factor $\frac{1}{1-\left(\frac{1}{\lambda_{cr}}\right)}$

which UK designers will recognise as $\frac{\lambda_{cr}}{\lambda_{cr}-1}$

Analysis and Design

Issues to consider during analysis include the connection flexibility and base fixity. Most common base details appear to involve a pair of cleats bolted through the web of the column member. This appears to be relatively flexible compared to orthodox hot-rolled base details, so it is recommended that a pin be assumed in design.

Some iteration is likely in analysis and design, as the members are relatively small, and sensitive to modest changes in member loads. The amplifier to allow for second-order effects may vary quite significantly if members vary. A crucial influence on the amplification factor will be the relationship between the actual compression in the rafters and their elastic critical buckling load; the latter may change dramatically as the members change size.

It is not uncommon to find that adequate resistance can only be provided by utilising back-to-back members – this will change the analysis results significantly, and may well force further changes to other members.

Design in the UK will be to BS 5950-5. Though this may initially appear complex to designers used only to the design of hot-rolled members, the calculations of strength are straightforward. Shear resistance, and the resistance to shear and bending combined will more often be critical checks than is the case in hot-rolled design.

Conclusions

There are obvious risks in 'importing' any technology directly to the UK without proper consideration of any important differences in practice. Designers (and particularly those checking calculations) need to ensure that design assumptions are made in accordance with the UK Standards and are realised in the structural details, or that test results are available that demonstrate satisfactory performance.

Designers need to ensure that design assumptions are made in accordance with the UK standards

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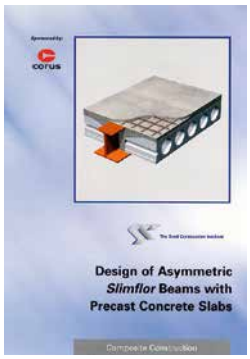

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This publication provides guidance on the design of Asymmetric *Slimflor*® Beams (ASBs) with precast concrete hollow core units. This form of construction is not fully covered by Codes of Practice, but this publication provides the design guidance and practical detailing necessary for its safe use. The design methodology is based on BS 5950 1:2000 and existing SCI publications.

Two types of construction are defined: Type 1 ASB sections and PC Units without a concrete topping; and Type 2 – ASB sections and PC Units with a concrete topping. Construction details for each of these are provided, including the transverse tying reinforcement, which is essential for robustness requirements. Practical guidance is given on tolerances that affect the bearing of the PC Units, together with information on the end preparation of units to provide clearance for concrete encasement of the ASB section.

A step by step procedure is set out for all the different loading cases which must be considered at the construction and normal stages, including the principal design checks at the ultimate and serviceability limit stages. Particular issues affecting the design of this form of construction are covered, including: stability of the compression flange; local transverse bending of the bottom flange; and combined bending and torsion. Information is given on the connection design of ASB sections to columns and the design of the precast floor slab, including robustness and diaphragm action. Guidance on detailing and design for the fire limit state is also provided.

The guidance is supplemented by two worked examples, for Type 1 and Type 2 construction respectively.

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Disproportionate Collapse & The Revised Building Regs	**5-Sep-06**	**London**
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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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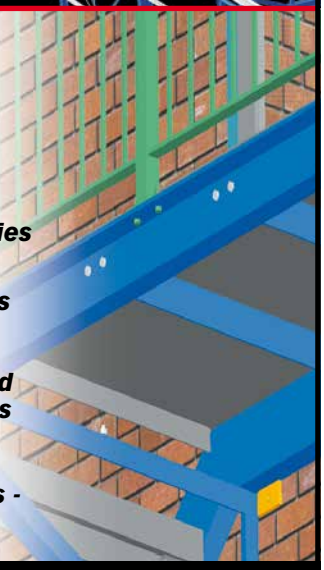

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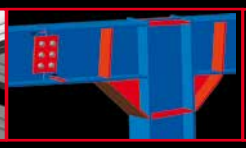

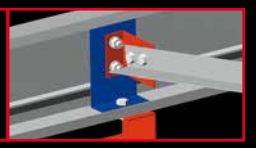

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Steelwork on the Motorways

The Pennine Tower Restaurant, Forton – M6

The main area of the new Forton Service Area on the M6 consists of a two storey building housing a cafeteria, transport cafe, toilets, rest rooms, showers etc. This is connected to a 92 ft. high tower containing – 62 ft. above ground level – The Pennine Tower Restaurant capable of seating 150 people, and above this is a sun lounge. On the opposite side of the motorway is another transport cafe, a smaller cafeteria and other facilities, linked to the main area by a footbridge over the M6.

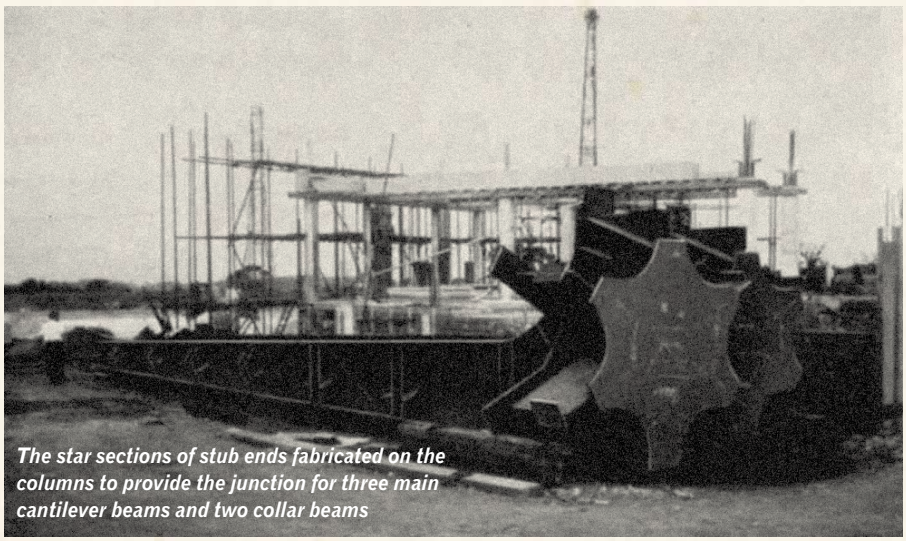
The main area, situated on the SW side of the motorway, is unusual and striking. Both buildings are glass walled and hexagonal in shape, and the tower is a landmark visible for considerable distances in all directions. From the sun lounge Morecambe Bay can be seen to the west, and the Trough of Bowland to the east.

The chief feature of the area is the tower carrying the restaurant and the sun lounge, which measure approximately 74 ft. across the flats. The floors cantilever outwards from six columns forming the central hexagonal core, which is about 20 ft. across the flats.

A reinforced concrete frame with a concrete plate floor was originally investigated but, in order to meet the architectural requirements, an all-welded mild steel frame was chosen, with the beams at both levels arranged on a diagonal grid. To ease welding problems and to reduce the deflections of the long cantilevers mild steel was used in preference to a high tensile steel.

The flanges of the main restaurant floor cantilever beams and of the stanchions are $1^{3}/_{4}$ in. thick. The grid design of the floor involved a junction of three main cantilevers and two collar beams at the stanchions at each of the two floor levels. A star section of stub ends was fabricated with the column, leaving straightforward butt joints in each member to be welded on site.

Because of the high moments and shear stresses involved at the cantilever knee the design of the main intersection of these beams on the columns was complex and it was appreciated that the combination of heavy sections and 'multi-dimensional' shape would lead to welding problems due to inherent restraint. For this reason notch ductile plates were used at critical points carrying tensile stresses in the final



The star sections of stub ends fabricated on the columns to provide the junction for three main cantilever beams and two collar beams

Service Area at Leicester Forest East – M1

The concept of the 18-acre service area recently constructed for the Ross Group on the outskirts of Leicester is entirely different from that of Forton. It is essentially a 60 ft wide bridge straddling the M1. The main restaurant building – housing kitchens, two restaurants a food bar and two cafeterias – is a steel framed structure 300 ft long by 60 ft wide built on a 126 ft span bridge with extensions at each end. Structural steelwork was the most economical means of providing long spans with light roof loading. The trusses are at 10 ft centres and span 52 ft on to 6 in by 4 in rectangular hollow sections as stanchions overhanging 4 ft at each end. They are 2 ft 4½ in deep at the centre and 2 ft deep at the ends: the top member – a 7 in by 3½ in channel with flanges downward – is cambered to give the required roof falls. The bottom member is a solid 2 in square bar: 1⅛ in square bar is used for the diagonals. As the trusses are visible in parts of the building this arrangement gives a neat looking truss and makes maximum space available for the installation of the ventilation trunking. The metal deck roof is fixed directly to the top member.

loading and a detailed welding procedure was prepared incorporating pre-heating of the thicker plates and the use of low-hydrogen electrodes.

Site weding of the butt joints in the cantilevers was done without difficulty with the floor steelwork assembled and lightly service bolted in order to provide location without undue restraint. Intersections in main members of the floor grid remote from the columns were joined with high strength friction-grip bolts.

During erection the main restaurant beams were supported on trestles and adjustments for welding 'draw' and the eventual deflection were made on removal of the trestles. On completion the edge mullions between the restaurant and sun lounge floors were post tensioned to ensure that both floors worked together under varying degrees of superload. This also reduced the support moment at the root of the sun lounge beams and thus reduced the depth of those beams within the restaurant. The stanchions were designed with fixed bases and to prevent uplift the ends were built 12 ft. deep in a massive foundation block.

A propriety decking and shear studs were used in conjunction with the concrete floor slabs to distribute loads on the 'saucer', to keep internal deflections to a minimum, to add inertia to the beams to reduce deflection, and also to act as shuttering.

From 'Building with Steel' Vol 4 No 2, 1966.

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RICHARD LEES STEEL DECKING

AD 300
Paint on the Outer Face of Cover Plates and Preloaded Bolts.

The advisory desk has recently been asked about the effect of paint on the outer faces of cover plates on the specified minimum preload of preloaded bolts. The question has arisen because of the increasing use of offsite applied fire protection and multi-coat paint systems. Figure 1 shows bad practice with a paint layer under both the head and washer. There is a concern that thick coatings will slowly 'creep' due to the preload on the bolt and that the preload is reduced below the specified minimum value. Therefore, the connection design assumption regarding slip may be rendered invalid. The same issue would arise if the paint were applied on site before the bolts were preloaded.

Advice:
The SCI's advice is that where possible no paint or sealer should be permitted on the outer face of cover plates in the vicinity of the preloaded bolts prior to preloading. The outer faces of the cover plates should be masked off prior to painting and protected during transport and erection of the steelwork. When the connection has been assembled and the bolts preloaded the paint system for the steelwork must be made good around the connection.

Occasionally it is necessary to use a site holding primer on the outer face of the cover plate but the total dry film thickness of the coating should not exceed 20 microns. The figure of 20 microns is taken from clause NG 1906-8, Notes for Guidance on the Specification for Highways works – Protection of Steelwork against Corrosion.

Contact: Thomas Cosgrove
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Tel: 01344 623345

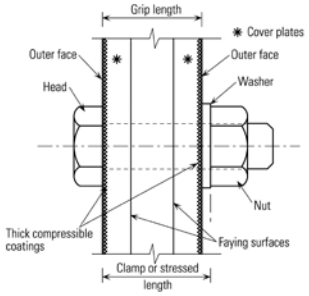

Figure 1 Bad practice - Preloaded Bolt with thick compressible coating in the clamp length

Codes & Standards

New and Revised Codes and Standards

(from BSI Updates March 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
NA to BS EN 1991-1-1:2002
General actions. Densities, self-weight, imposed loads for buildings (national annex)
No current standard is superseded

BS EN 1998:-
Eurocode 8. Design of structures for earthquake resistance.
BS EN 1998-3:2005
Assessment and retrofitting of buildings
Supersedes DD ENV 1998-1-4:1996
BS EN 1998-6:2005
Towers, masts and chimneys
Supersedes DD ENV 1998-3:1997

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT

06/30130880 DC
EN ISO 13918 – Steel, concrete and composite bridges. Part 3. Code of practice for design of steel bridges

CEN EUROPEAN STANDARDS

EN 1993:-
Eurocode 3: Design of steel structures
EN 1993-1-2:-
General rules. Structural fire design
CORRIGENDUM 1: December 2005 to EN 1993-1-2:2005

EN 1993-1-8:-
Design of joints
CORRIGENDUM 1: December 2005 to EN 1993-1-8:2005
EN 1993-1-9:-
Fatigue
CORRIGENDUM 1: December 2005 to EN 1993-1-9:2005
EN 1993-1-10:-
Material toughness and through-thickness properties
CORRIGENDUM 1: December 2005 to EN 1993-1-10:2005

EN 14399:-
High-strength structural bolting assemblies for preloading
EN 14399-5:-
Plain washers
CORRIGENDUM 1: January 2006 to EN 14399-5:2005
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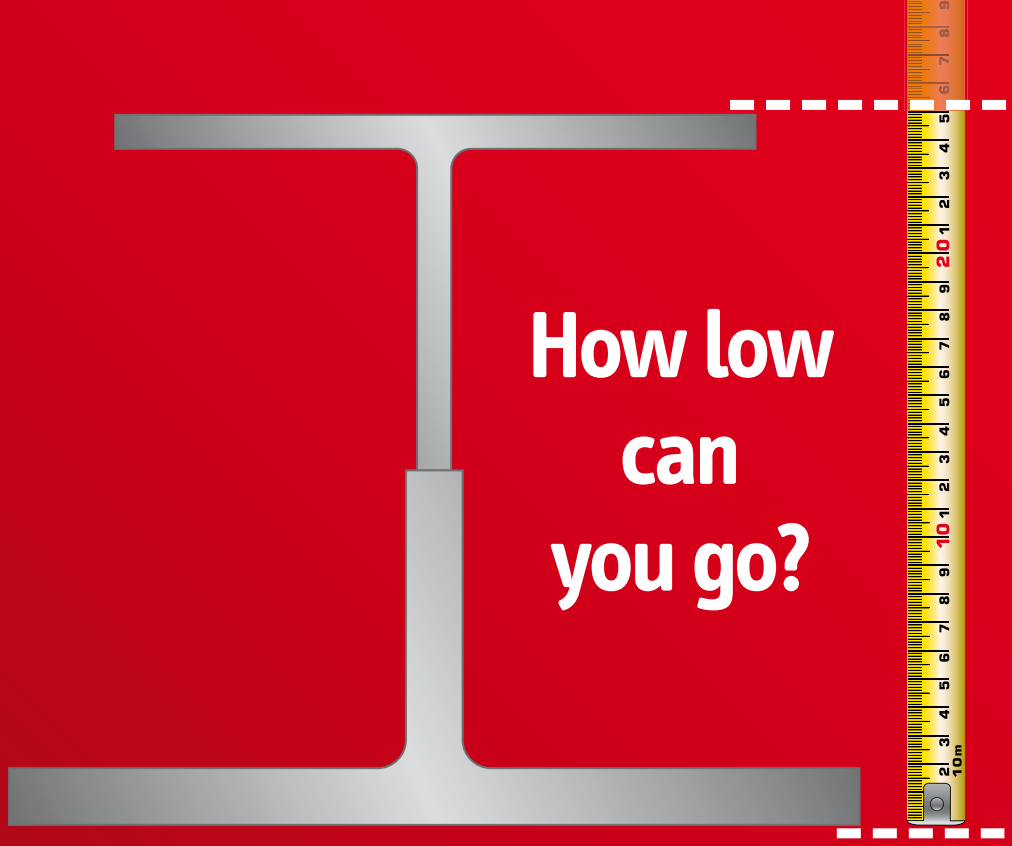

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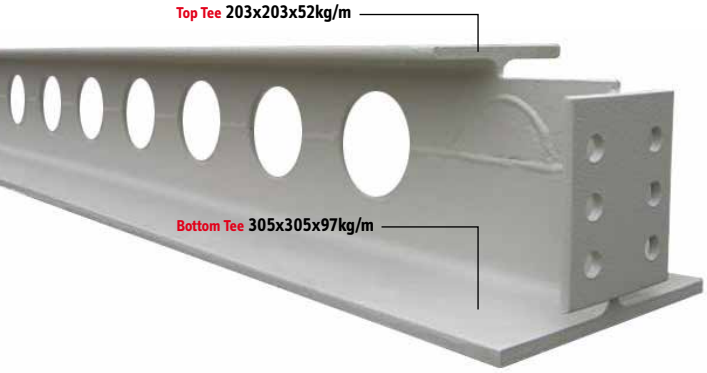

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The British Constructional Steelwork Association Ltd

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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