FEBRUARY 2005 VOL13 NO2

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BARNSHAWS STEEL BENDING

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Cover Image
ADMIRAL'S QUAY, SOUTHAMPTON
Structural Engineer: Robert West Consulting
Steelwork Contractor: Robinson Construction

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Client focus reaps rewards

Nick Barrett - Editor

The 2004 market share statistics which have now been released in full by Corus paint an encouraging picture of the steel sector. Steel is still the construction framing material which most designers turn to; NSC's own reports frequently uncover examples of developments where other materials have been tried on early phases but shunned for later phases. Clients are often willing to look at design alternatives, and so they should be. But when the chips are down, money is at stake and windows of opportunity have to be taken advantage of, steel wins out for the reasons we know so well: cost-effectiveness, quality, flexibility, ease of installation, and off-site fabrication. There is also a sound sustainability case which we hope you will hear more of this year.

What offers most encouragement in the market share survey perhaps is the fact that steel is capturing a larger share of growing markets. For example, high-rise apartments have been a major success story for the steelwork sector, with apartments in unprecedented demand. Steel's share of this market has risen from 39.4% to 43.5% in one year. Clients in this market are mostly building speculatively and cannot afford construction delays which let market opportunities slip away. Steel is increasingly the client's choice, as well as the designer's.

This success is a clear sign of a constructional steelwork industry which is client-focused and able to market itself into new growth areas, as well as hold its ground in traditional markets. Whatever 2005 holds in store, an industry like this is in a good position to continue to profit.

Sustainable homes

There is good news on another marketing front, in the shape of the formation of a Steel Homes Group. We know that steel can make a significant contribution towards providing quality housing for sustainable communities, and this group aims to make sure the market knows about it.

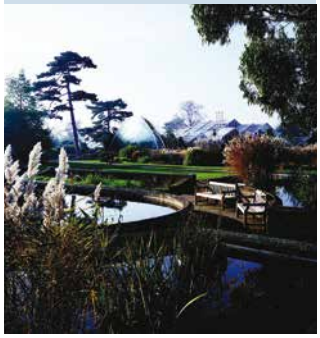
SCI has been spearheading efforts in this area for some years. There have been several successful technical development programmes and the uptake of steel framing in residential construction has showed signs of picking up in the last couple of years. There is a political wind behind the steel homes sector and the benefits of off-site production of quality units are increasingly realised.

Some 40,000 steel framed accommodation units were constructed last year, which gives manufacturing companies confidence to invest in the necessary plant; it is estimated that plant representing investment of about £50M will be operational by the end of 2005. The constructional steelwork industry has never been slow to invest and by this time next year steel homes may well deserve to be called the industry's 2005 success story.

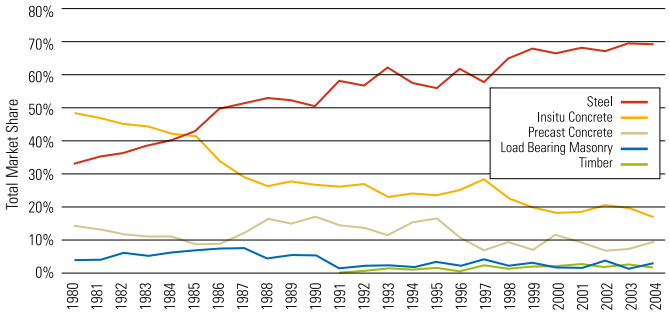
Kew's amazing armadillo takes shape

Steel erection for a new 'armadillo' shaped steel and glass Alpine House at the Royal Botanical Gardens at Kew has just got under way. The building is formed by two vertical steel arches and two horizontal steel arches fixed into the complex concrete base which contains a labrynth of tunnels to provide air cooling. The arches are connected by steel cables which will also support the laminated glass panels.

The new structure, designed by architect Wilkinson Eyre and structural engineer Dewhurst Macfarlane, will provide the optimum climate for Kew's alpine plant collection and is due to open in late summer. "The glasshouse is eye shaped in plan and is about 18m long, 9m wide and 9m high," says Dewhurst Macfarlane partner Scott Nelson. "Despite its small size, it is a highly engineered structure, which will be aesthetically pleasing when finished, but is calling for some precise construction to meet the structure's tight tolerances."



Flats rise high on steel



Corus has released further results of its 2004 Market Share Survey, which confirms that steel remains the construction framing material of choice in its key market sectors, while significant inroads have been made into developing markets.

One of the key features thrown up by the survey, carried out by independent market researchers Construction Markets, is a major change in the type of residential accommodation constructed over the past five years, with apartments now accounting for 40% of the total starts in 2004, compared to just 17% in 1999. Low rise apartments, up to four storeys, have risen to 29% of the total starts, while high rise apartments have jumped to 11% of the total from a negligible 1% five years ago.

Construction Markets' Dominic Collins said: 'The growth in apartments, particularly high rise, has been a striking feature of the survey. The survey shows that steel frames' share of the high rise apartments market has risen in the past year alone from 39.4% to 43.5%. With the market also growing in size, that means steel frames were used for over 10,000 high rise apartment units in 2004, compared with less than 5,000 units in 2003.'

The survey shows that in 2004, steel had a share of the market for all multi-storey non-residential buildings, of 69.2% against 16.8% for its nearest rival, insitu concrete. This is the lowest level for insitu concrete since the survey began in 1980.

Steel remains most dominant in multi-storey offices, with a share of 71.7%, defined by floor area. Insitu concrete saw its share of offices fall to 20.9%, from 23.3% in 2003.

In the 'other multi-storey buildings' category, which includes retail, leisure, education and health buildings, steel enjoyed a 68.2% market share with insitu concrete being used on just 15%, down from 17.5% in 2003. Load bearing masonry saw its share of these sectors rise to 11.2% from 8.4% in 2003.

Paddington bridge on a roll

Paddington Basin's unique rolling bridge is "a work of art that happens to be a bridge", according to the project's structural engineer.

The 12.9m pedestrian bridge, conceived by designer Thomas Heatherwick, which spans an 8.5m canal inlet and is made up of eight segments which lift and roll back under hydraulic power to form a circle, as shown in this composite photo.

Alan Jones, Project Director for structural engineer SKM Anthony Hunts, said the structural design presented unusual challenges because of the constantly changing geometry.

The structural frame is fabricated in grade S355 rectangular hollow section, to fine tolerances more usually associated with mechanical engineering than construction.

The bridge is stable in the open and fully closed positions without the aid of hydraulics. In its unrolled position it behaves as a truss with the handrails acting as the top boom.

As the lift begins the structure changes from a simply supported to a cantilevered truss, with the consequent load reversal. Several segments undergo a second load reversal as they roll over the centre of the circle. It is opened every Friday at 12 noon.

Design awards shortlist

The range and versatility of steel is demonstrated in the shortlist for the Structural Steel Design Awards, announced in January.

Chairman of the judging panel David Lazenby CBE said: "There is a good spread of entries ranging from domestic houses to town centre developments, and bridges from moveable pedestrian structures to main line railway crossings. The standard was remakably high."

Mr Lazenby, who takes over as chairman from Professor Patrick Dowling, and RIBA representative Robin Booth are joined this year by four new panel members. They are Gerry Hayter of the Highways Agency; Joe Locke, recently retired from William Hare; Martin Manning, a director of Arup; and Christopher Nash, Managing Director of Nicholas Grimshaw.

The winners will be announced at the awards presentation lunch at London's Savoy Hotel on 23 June.

• Joe Locke profile: Page 12.

The shortlist

Buildings of one or two storeys

Tower Environs Building, Tower of London
Tanaka Business School, South Kensington
Centre of Engineering and Manufacturing Excellence, Dagenham
Kingstown St. House, Regents Park, London
Milestones of Flight, RAF Museum, Hendon

Buildings over 2 Storeys

Plantation Place South, London
Broadwick House, London
Faculty of Law, Manchester Metropolitan University
Wales Millennium Centre, Cardiff
The Wellcome Trust Gibbs Building, London
Carlton House Studios, Southampton

Bridgework

Midland Main Line Rail Bridge, Kings Cross / St Pancras, London
Rolling Bridge, Paddington, London
Cheadle Royal Bridge, Manchester
Usk Crossing, Newport Southern Distributor Road

Other Structures

Car Park Access Ramps, Croydon Centrale
Extension to the Concast Facility, Port Talbot Steel Works

Flight of the Swan

Stainless steel and brick have come together in the Swan Legacy, a new landmark sculpture in Bedford's Marston Vale area. The sculpture, which shows two swans soaring 15m above the vale's chimneys and trees, is the work of local artist Susannah Oliver. Barnshaws Steel Bending was responsible for curving the stainless steel tubing used to support the flying swans.

The sculpture marks the regeneration of the area, and recalls the chimneys of the brick works that used to dominate the area. Former clay pits are now lakes for wildlife and form part of 40ha of woodland and open space for the local community.

Swan Legacy is situated adjacent to Marsh Leys Distribution Park on the A421, and cost in the region of £230,000. The Office of the Deputy Prime Minister's Green Space fund contributed to the cost.

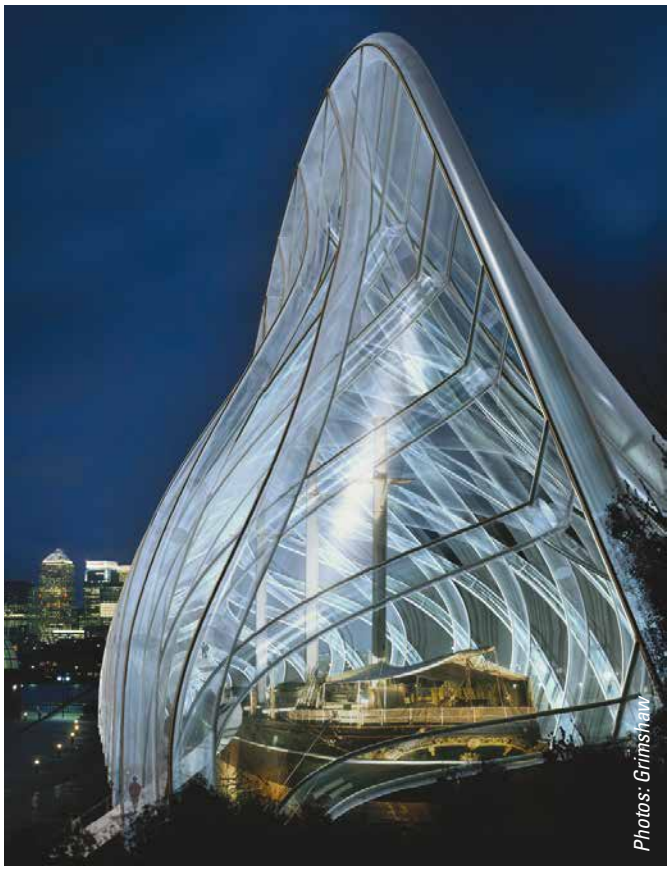
Steel supports restoration of the Cutty Sark

The Cutty Sark in Greenwich is to be restored in an ambitious £25M project to preserve the world's only remaining tea clipper for future generations. Steel compression rods and cables will form part of a huge temporary enclosure of fabric tubes and transparent ETFE membranes. The enclosure will protect the vessel from the elements during the three year project.

Major works will include the raising of The Cutty Sark from its dry berth by 1.5m. This will free the vessel from props and shores that have begun to distort the shape of its hull, and enable visitors to walk beneath the ship. Steel cantilever arms anchored into the dry dock will secure a Kevlar web that will support the vessel in its new elevated position.

Restoration of the ship is badly needed. Its iron framework has suffered corrosion, wooden planks have decayed and many bolts holding planks to iron frames have failed. Works will include replacing the main deck and keel.

A glass structure to be built beside the vessel is designed to give the impression that the Cutty Sark is sailing through waves. Works will begin in September 2006, depending on the approval of an £11M grant from the Heritage Lottery Fund, news of which was due as we went to press. Architect is Nicholas Grimshaw and structural engineer is Adams Kara Taylor.



AROUND THE PRESS

New Civil Engineer
20 January 2005
Multi-national cement producer Lafarge faces massive compensation claims after admitting this week that 'rogue staff' at one of its cement works faked results on more than 1Mt of cement.

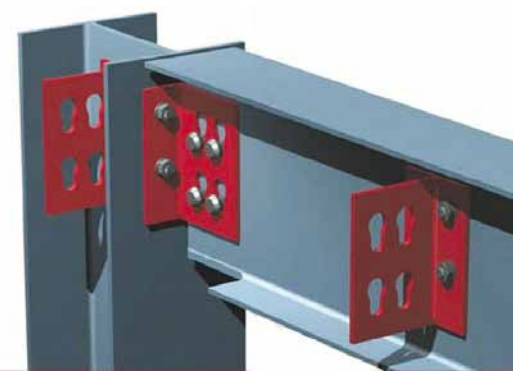
New Civil Engineer
16/30 December 2004
"We suggested both concrete and steel options," says Alistair Lenczer, project architect for Millau. A civil engineer by training, he plays an important role in speaking engineer's language within the Foster parnership. "The steel allowed for a slimmer cross section deck. It also reduced the number of cables needed in each fan by two."

Construction News
16 December 2004
The reinforced concrete sector must have been rubbing its hands with glee, envisaging market share flooding back. But… [despite rising prices] concrete could not dent the might of steel and the sector has had one of its busiest ever years. More than 1.3 million tonnes of the stuff was fabricated by steelwork contractors over the course of the year.

Construction News
7 January 2005
"I would hope that 2005 will be as good for steel contractors as 2004 was in terms of volume of output and market share. In London the commercial property market is set to rebound. Our greatest concern is for the underlying economy. Inflation and interest rises could damage investment in commercial property, which could stifle the market" — Derek Tordoff, director general, British Constructional Steelwork Association

The Times
12 January 2005
Thomas Heatherwick seems to have one of those one-in-a billion minds that is capable not only of imagining the impossible — shapes that seem to defy the laws of physics and all conventional engineering wisdom — but of making the impossible happen.
• Rolling bridge, p 7

Quicon wins contract at IKEA



Quicon connectors have been adopted in a project to extend retail space in an Ikea store, where speed of construction is critical. The second project to use the innovative connection system, developed by the Steel Construction Institute (SCI), started on site in mid-January.

The project will provide an additional 5,700m^2 of retail space in Ikea's Croydon store by installing mezzanine floors. Bourne Steel has won the contract to supply and erect 240 tonnes of steelwork and a composite metal deck floor.

SCI says the system is the first radical change in erection technology in 50 years, offering substantially quicker construction. It uses T-shaped brackets, of which the top bar of the 'T' bolts to a column in the normal way. On the leg of the 'T' the holes are elongated so that studs attached to the end of a beam can pass though. The shanks of the studs then move down into the narrower part of the slot.

SCI has patented the principle for use in structural steelwork.

SCI Deputy Director Bassam Burgan said that Quicon had been chosen for the Ikea project "because "speed is key." He added: "On the first job Quicon demonstrated quite substantial time savings." The first project was also a mezzanine, involving the installation of 100t of steelwork at Land Securities' Edison's Park in Dartford.

Bourne Steel Technical Director Alan Pillinger said: "It looks like a product with a lot of potential but you don't know until you've been through the process.

"The Ikea project is a reasonable size, a relatively simple structure, and it's design and build so we have control over the process. Because we're working close to the public any reduction in on-site time is a real bonus. So we're using the project as a trial run to see if there's merit for use in the future."

Both the connecting pieces and special bolts are available ex-stock. A single stud size has been adopted as standard, and connection plates are available to suit universal beam sections from the 300 series to the 600 series, covering the most common applications. Vertical shear capacity is slightly less than a fin plate of similar size because more material is removed from the plate to form the slots.

Design approaches to BS5950 and Eurocode 3 have been developed and connection design checks have been incorporated into RAM software suites. A design guide is available from the SCI (see page 38).

Fast finish for Polestar

Final fit out of a new £110M printing facility in Sheffield for Polestar is now under way following fast-track erection of the 2250t steel framed True North building. Steelwork contractor Atlas Ward Structures completed site work on the structure in just seven weeks thanks to some careful planning and close liaison with the rest of the project team.

"Understanding the printing process was key to successfully delivering this scheme in such a short time," said Atlas engineering manager Jim Martindale. "Most of the services will be carried in the roof — the largest is being carried through a duct measuring 3.5m in diameter — and needed secondary steel fixing points to be attached to the steel frame. Ensuring all the fixing points were in exactly the right position meant that close co-ordination with the main contractor and fit-out contractors was vital. But this high level of planning meant that everything on site ran like clockwork allowing us to complete the work more quickly than would normally be possible."

Polestar's new facility, set to open in spring, will house three new gravure presses. UK GSE was main contractor and Gazeley was the developer.

BRE wins software contract

The Office of the Deputy Prime Minister (ODPM) has awarded the long-delayed contract to develop software for calculating the thermal performance of buildings, after coming under sustained pressure from industry. But concern remains over whether it will be ready in time for a January 2006 deadline.

Members of the ODPM Industry Advisory Group, on which the Steel Construction Institute (SCI) is represented, used a December meeting to make the growing urgency of the situation clear to ministers. BRE now has the task of producing a beta version for testing by March.

The new software is needed to comply with the European Performance in Buildings Directive, which comes into force next January. The directive requires calculations on heating and insulation for non-domestic buildings to be carried out using a 'whole building' approach. Previously the U-value of each element was considered separately.

Construction Products Association Industry Affairs Director John Tebbit, who is also represented on the advisory group, said: "There was concern from us and others that ODPM didn't recognise the urgency of getting the National Calculation Tool for the non-domestic side developed. We needed to get our hands on the software earlier than they realised."

The question is now whether the timetable is realistic.

Mr Tebbit said: "I'm not an IT expert but based on experience of government IT projects the omens are not good.". But he added: "Some work from previous projects covers a chunk of it so they're not starting from scratch. "

Following release of the beta version it will be distributed to industry practitioners for six months of testing in real-world conditions.

If the testing does not raise major problems, the ODPM hopes to be able to make an announcement in the autumn on the final form of the software, while BRE would have three months to iron out bugs.

Steel – the safe solution

Steel is inherently safer than other structural framing solutions, argues a new brochure aimed at steelwork designers.

'Steel – the safe solution' is targeted at steelwork designers to familiarise them with the essentials of how steel erection interacts with design.

It cites nine reasons why steel construction is safer than alternatives:

1 Steelwork is pre-engineered in a way that makes planning of operations easier and more certain

2 A 3D virtual reality computer model of the steel frame can be built to aid planning of the erection process

3 Prefabrication off-site makes steelwork accurate and less prone to errors that would lead to site hazards

4 Steelwork is standardised, leading to repetition of site tasks and hence a greater certainty of safe practice

5 A steel frame is stable and the full strength of the material is available immediately

6 As the structure is erected it provides safe access to working positions for erecting subsequent parts

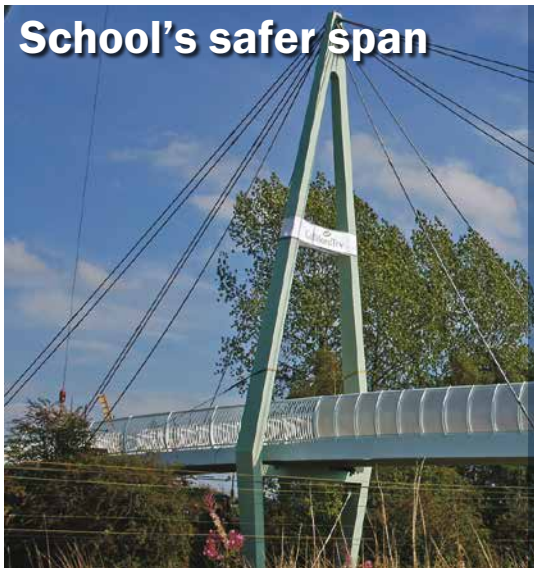
7 Where necessary, a trial erection can be carried out to establish the safest method to use on site

8 Steelwork is easily modified, if necessary, during maintenance or refurbishment

9 Steel is readily demountable if demolition becomes necessary.

The guide outlines easily understood 'default solutions' or basic concepts underlying safe erection, and how to develop a method statement. It refutes the misconception that steelwork is risky and explains how information provided by the Register of Qualified Steel Contractors can help to select a steelwork contractor capable of dealing with a contract of any given size or type.

School's safer span



The first cable-stayed bridge over an electrified rail line is providing residents of Nuneaton with a safer pedestrian and cycle route across the West Coast Main Line.

The 70m bridge, which provides a route for schoolchildren living in Maple Park to primary schools in Whitestone, as well as a link to playing fields, has just had its official opening. It provides an alternative to an existing road bridge which has a narrow footway on only one side of the road.

The 105t bridge, including cable stays and 25m high pylon, was fabricated by Rowecord in Newport, working with Galliford Try. It was erected during a three-day closure of the West Coast Main Line.

Part of the funding for the £0.65m project was provided by sustainable transport charity Sustrans, as the bridge also forms a link in Nuneaton's Green Track system and links to the National Cycle Network.

NEWS IN BRIEF

A stainless steel surface finishes pack, targeted for use by architects, has been published by the British Stainless Steel Association (BSSA). It contains samples of a range of finishes and highlights do's and don'ts in speccifying surface finishes, with information on maintenance and cleaning. Extensive case studies and contact details of suppliers are also included in the pack, whcih costs £40 + VAT and postage. Contact daniel.challender@bssa.org.uk

FICEP UK, which specialises in CNC machine tools for processing of steel sections and plate, has formed a partnership with leading wheel blast equipment specialist, Schlick. Mike Speak, sales director of Schlick's parent Wheelabrator, said that dealing with a single source would help structural steel manufacturers integrate new equipment into their production systems more easily, and help them to increase efficiency.

Kingspan Metl-con's Multichannel system played a key role in a £21M project to create a new ground level entrance to the National Gallery from Trafalgar Square. Investigations showed that a new atrium forming part of the entrance, created by glazing an open courtyard, could move 5mm up or down relative to the existing building because of ground instability. Kingspan engineers created a solution in which the entire atrium is linked back to the existing building with sliding joints.

Metsec supplied nearly 14 tonnes of galvanised purlins to provide additional support for the roof of a Grade 2 listed warehouse in a Swansea waterfront regeneration development. Strengthening the roof was complicated by heritage requirements to leave the existing slate roof, timber purlins and original metal trusses in place. Keeping the roof in place also made using cranes impossible.

The ninth annual Metals Industry Apprentice of the Year competition has been launched by Metals Industry Skills & Performance (MetSkill). The competition is open to all apprentices in UK metals companies who can demonstrate exceptional progress during their apprenticeship. The winner receives a £1,000 laptop computer. Application packs from Donna Nicholson, d.nicholson@metskill.co.uk

Letters

NSC welcomes letters from readers on steel construction related issues. Please keep your letters brief — the editor reserves the right to condense. Address your letters to: The Editor, NSC, BBA Linden House, Linden Close, Tunbridge Wells, Kent TN4 8HH. Fax: 01892 524456. e: info@new-steel-construction.com

Unprotected beams

I attended the Corus Framed in Steel Seminar on Plantation Place South mentioned in your article on page 12 of the January NSC. Both the seminar and your article tended to concentrate to a large extent on the fire design work carried out by the design team. Whilst this was interesting there were other notable features about the project which supported the choice of a steel frame. In addition to the pure structural justification there was a strong case made for time, cost, ground conditions, site restraints and ease of service integration.

Furthermore I was impressed with the professionalism shown by Arup Fire in their work and the diligence shown by themselves and the Corporation of London in ensuring that a full process of checking and validation was carried out before the proposed solution was accepted. I was left with one question however: the design solution adopted leaves up to 50% of the steel beams unprotected, which may be damaged in the event of a severe fire. Can you comment on the insurance implications?

Leon Kalkwarf
Studio K Architects, London

The Editor replies: Yes, the case for steel framing of Plantation Place South was very compelling, as it is for virtually all commercial buildings. The brochure which accompanied the Framed in Steel seminar is available from the Corus literature line on 01724 404400.

The insurers of Plantation Place South were fully consultated before the fire engineering study was carried out and raised no objections to the use of bare steel. Arup Fire did carry out a study to determine the level of displacement which would occur in the building using the fully protected and partially protected options. The latter included some additional compensatory features as outlined at the seminar. In both cases the level of displacement in the fire situation was quite similar, indicating that there would be few if any additional costs for the insurance company in the event of a severe fire.

It is worth remembering that the structure in a modern multi-storey building represents a relatively small part of the total value, typically 10-15%; the majority of the cost is in the cladding and services. Nevertheless, before undertaking a study of the kind carried out at Plantation Place South, it is advised that the insurer is always consulted.

If you would like to know more, then please speak to Dr. Barbara Lane at Arup Fire who presented at the seminar.

Alternative fibres

I read with interest the article on fibre reinforced composite floors in the NSC January issue. This development seems to offer significant advantages over traditional reinforcement not least of which are health and safety, speed and crack control (T20's at 100 c/c). The article discusses "synthetic" fibres and a specific deck profile, I would be interested to know if other deck profiles and fibres can be used to similar effect.

Ray Postolowsky
Clugston Construction Limited

The Editor replies: This exciting development in composite construction is not limited to Richard Lees Steel Decking and Grace Construction Products. For example, Bekaert produce a steel fibre system which has been used successfully in ground floor applications for over ten years. This product now has firecertification for suspended floors when used in conjunction with Kingspan Multideck 60 floor deck. More information can be obtained from Bekaert Building Products Ltd on 0114 224 4487 and Kingspan Metl-Con Ltd on 01944 712000.

Eurocode changeover

The STEEL initiative (p25 NSC Jan 2005) sounds as though it may be useful in terms of educating engineers, and it is reassuring that the SCI are up to speed with the technical detail (p26 NSC Jan 2005). However, neither article on the subject of Eurocodes were specific on when we will have to use the new codes and what the cost will be for implementing them. This is fundamental to a smooth transition, as design office software will have to be updated, staff will have to be trained, and the initial effect on productivity will have to be assessed when bidding for work. All of this needs careful planning.

Can the steel industry shed any more light on when the Eurocodes will be available for use, when we will have to use them, and what guidance will be available to help us through these challenging times?

Ian Oliver
Atlas Ward Structures Limited

The Editor replies: The timetable for Eurocode adoption will be covered in the magazine in the near future, but the simple answer to the question is that all the Eurocodes and National Application Documents will be ready by March 2007, with some packages ready earlier. British Standards will be withdrawn in March 2010. This means, for a "typical" designer, March 2007 is the date when they can be used and March 2010 is the date from which they must be used. Clients, especially in the public sector, may decide to make use mandatory earlier in the three year window.

There is indeed much work to be done before that time, but rest assured the steel construction industry is already working productively behind the scenes to facilitate a smooth transition. The cost of implemenetation will be significant, but will be eased slightly by the free provision of technical documentation from the steel construction industry which is already being prepared in readiness.

There will also be the web-based STEEL project to further support the construction practitioners during this period of change.

Diary

8 March **BCSA National Dinner**
Savoy Hotel, London. Contact: Gillian.Mitchell@steelconstruction.org

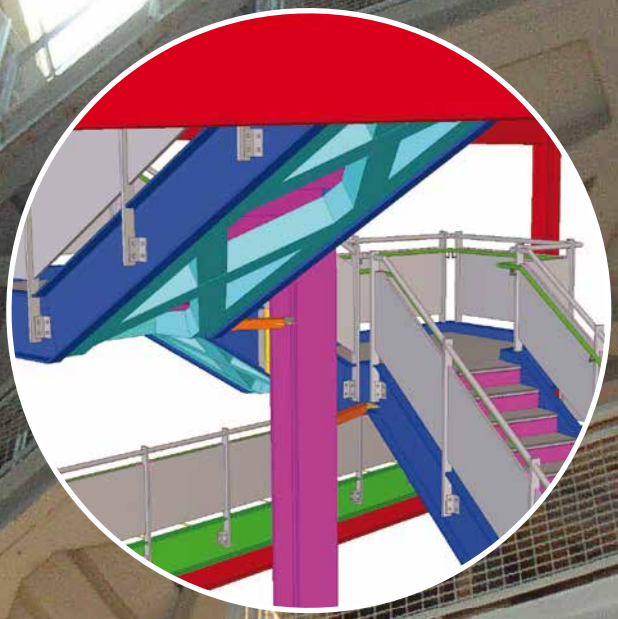
15–16 March **Construction - beyond the horizon**
The 8th National Conference of the Welding & Joining Society
Covering developments in materials, design, welding and related technology with presentations on a number of high profile UK construction projects. Contact Rachel Wall, meetings@twi.co.uk

6 April **Open day** at Fairfield Mabey's factory in Chepstow, and a visit to the nearby Costain project at Sirhowy. This includes Arup's 227m Pont Dewi Sant cable stayed bridge. Contact: tracy.booth@fairfieldmabey.com

23 June **Structural Steel Design Awards Luncheon**
Savoy Hotel, London
Winners of the 2005 awards, sponsored by Corus, the BCSA and the SCI, will be announced. Contact: Gillian.Mitchell@steelconstruction.org

TEKLA Structures

"No one in the 2D world details as fast as I do with Tekla Structures... When it comes to drawing production, I never had so much freedom and control. Steel detailing is fun again." David Ball - Detailing Group



"In the past, we would decline work because we couldn't handle the intricacy of certain projects. Tekla Structures is the key software for us, especially when it comes down to architectural metal work. There is no way we would be able take on such complex projects using any other software." Vic O'Mara - Marton Engineering Services

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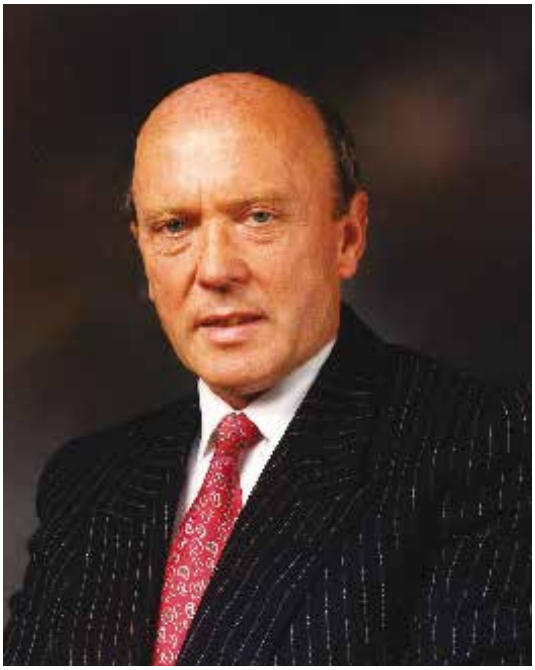
Man of mettle



Metals run through the blood of Joe Locke who 'retired' from the steelwork industry last December. Ty Byrd reports.

Joe Locke, who retired at the end of 2004, had retired once before, from the position of Chief Executive Officer of Watson Steel. That was in 1998 when, in accordance with company policy, he cleared his desk aged 60. The man moved straight to William Hare to be responsible for the engineering aspects of that company's activities plus executive director of subsidiary Westbury Tubular Structures.

What was a seamless transition reflected Joe Locke's status as an elder statesman of the industry, a constructional steelwork engineer of outstanding ability. At Hare he maintained his reputation for exciting structures and adventurous projects. But after six years — having reached 66 and received more than enough accolades from his peers — he decided to retire for real this time. Or did he?

"Well, I've had enough of five and six days a week working and am keen to shed the rigours of 9 to 5," he says. "That said, I am not yet ready to dig the garden full time either." So, a spot of consultancy perhaps? It is on the cards, he says, "although there are no firm plans as yet". What is certain is that the industry will not wish to lose his knowledge and experience.

Take a look at some of the aforementioned accolades. In 1990 he was awarded an MBE for his contributions to the structural steelwork industry. He was elected to the Royal Academy of Engineering six years later. In 2003 he was presented with the European Medal of the European Convention for Constructional Steel (ECCS) for services to European steelwork.

He has been President of the British Constructional Steelwork Association (between 1988 and 1990, when – among other things – he was prime mover behind the association's astute purchase of its own offices) and of the ECCS (in 1998–99). Five years ago he was appointed Visiting Professor at UMIST, the University of Manchester Institute of Science & Technology. It all amounts to a great deal of respect for his work with steel. Tap Joe Locke's veins and metals flow.

He was born in Bolton, described by him as the ultimate structural steelwork town in its day, the first place in England to have a Bessemer converter. His grandfather had been a blast furnace man, his father an iron moulder. Becoming an indentured apprentice with Watson at 17 was a natural move for him with five good years of theoretical and practical training to follow, in the workshops, template board, drawing office and on site. The apprenticeship was good. "It prepared you to become a chartered engineer but also provided the people skills that employers

Locke projects include the TGV station at Charles de Gaulle Airport (1), Hong Kong's Chek Lop Kok Airport (2 & 3) and Kansai Airport, Japan. (4, 5 & 6)


1


2


3

Above: On site in the Philippines

wanted," he says now.

He sat his associate membership of the Institution of Structural Engineers at 23, not only passing two years before the minimum age for being chartered, but receiving the institution's Wallace Premium for the highest marks in the Theory of Structures paper.

Joe was subsequently moved by Watson to its Bristol factory where he became chief designer. "The role did not sit comfortably – I was young, the job was demanding and I always felt I had things to prove. I worked too hard at this time." He turned to academia for several years, firstly to the Bolton Institute of Higher Education as a lecturer in the theory and design of structures, later joining UMIST as a research assistant.

"This was a fantastic period of my life. I particularly appreciated the UMIST attitude where, however massive the problem encountered, someone would say 'Well, that's easy, isn't it?' This way of thinking eventually became natural," he says. He got his Masters at UMIST, with a thesis entitled 'The flexural torsional buckling of I-section columns with a restrained access of rotation'. "Catchy, isn't it?" At UMIST he was very happy but poor as well. "Also I wanted to get back to doing real work."

Real work meant a return to Watson and putting to use the programming skills he had developed on UMIST's ATLAS autocode computer, writing large suites of software for the design and optimisation of steel structures. This was the early 1970s, real trail blazing days in computation. "I learned my computing from first principles, unlike many designers today," he says. (If Joe Locke has a real beef about current design practice, it is the blind reliance on design software and the lack of knowledge about its limitations.)

Later came the Middle East boom and years spend visiting Bahrain, Dubai, Saudi Arabia and the rest, marketing steelwork, helping put it up correctly and firefighting when things went wrong. Later still, back home in Britain, Leonard Fairclough's (and ultimately Amec's) acquisition of Watson opened doors previously closed to him, culminating in his appointment as managing director.

"At this time, mainstream structural steelwork was a highly competitive market, so I drove the business into areas out of the mainstream. We looked hard for heavy engineering works, complex structures of high added value, and where there was no market price. The policy brought us some amazing and profitable contracts."

These included a 360º rotating telescope housing with an opening roof, built on a volcanic peak 5000m above sea level in Hawaii; Sellafield nuclear power station's massive thermal oxide reprocessing plant (THORP); Kansai airport's terminal building in Japan, built 5km offshore; Charles de Gaulle airport's TGV station near Paris; and the cable net structure of London's Millennium Dome.

"All through I remained hands on, maintaining my affinity for engineering and design. I walked the shops, the drawing offices, every day. I visited the sites. I've had a tremendously interesting working life and seen the industry change incredibly, principally because of CNC, computer numerical control, making possible increasingly complex shapes."

He sees design becoming more complex in the years ahead, driven by European standards, possibly not for the best of reasons. "My call has always been 'simple codes sell steel'," he says. The Europeans notwithstanding, the UK industry is in good shape. "It has been a privilege to serve it and maybe I'll maintain an interest..."

4

5

6

Lighthouse shows the way

Steel has replaced concrete for the main frame of a prestige residential block on Cardiff's waterfront, cutting construction time and cost. David Fowler reports.

Above: Hollow section bracing members will be concealed within wall thickness. (pic: Bison Structures)

Conventional wisdom has it that the market for high-rise buildings falls neatly into two categories: for commercial buildings steel is by far the preferred material, but high-rise residential blocks are seen as the domain of reinforced concrete. Not any longer.

The conventional view is fast being overturned, as steel makes growing inroads into the multi-storey residential market. Independent market statistics now suggest that steel frames have overtaken concrete as the preferred solution for residential buildings of five storeys and over.

A graphic practical demonstration of the new trend is currently to be found in a prime residential development overlooking Cardiff Bay. The Lighthouse, which forms part of Bellway Homes' Prospect Place development, was originally conceived as a reinforced concrete structure and had gained planning approval, but is being built as a steel frame.

The preference for concrete in the residential sector stems from perceptions of shortcomings in steel's performance in sound and vibration transmission and the need for additional fire protection. But engineers and architects are satisfied that these issues have now been resolved.

Moreover, steel can match the structural depth of a reinforced concrete flat slab floor, important because this affects overall height and therefore has implications for planning approval and on the cost of the external envelope.

A recent cost study on behalf of the Steel Construction Institute by Davis Langdon showed there was no financial penalty associated with steel when compared to concrete alternatives. Davis Langdon calculated the cost of a notional multi-storey block in reinforced concrete and in

steel with three different floor systems. It found that the difference between the highest and lowest was only £10/m², or about 1%, even after recent price rises. "The structural frame only accounts for 14% of the total project cost," says Davis Langdon cost research associate Peter Fordham. "Quality of specification, especially of the facade, ceiling height, and bathroom provision all have a greater effect on cost than the structural system."

The Prospect Place building, known on site as Block L, has a main block of 12 storeys and a six-storey wing. It will comprise 20 studios, 24 one-bedroom and 58 two-bedroom apartments and four penthouses. And buyers in the market for urban waterfront apartments are unlikely to be tolerant of any deficiencies in sound insulation.

Bellway wanted to change to steel due to cost and to take advantage of a wider South Wales contractor base in steel. There were also problems sourcing the necessary skilled labour for concrete. Bellway project manager Paul Minnis says: "There wasn't much of a market in concrete, with one contractor always the cheapest. For steel there was a bigger contractor base, better competition on price and more choice."

Changing materials posed no particular problems from the structural point of view. Project engineer Marcus Tulloch of structural engineer Bingham Hall O'Hanlon says: "For planning approval the height had been specified on the basis of a 475mm floor depth, so we had to meet the same criterion using steel."

Using the Slimdek system, in which a troughed steel former supported on the extended lower flange of a 280mm deep asymmetric steel beam acts compositely with an in-situ concrete floor, a depth of 325mm excluding the suspended ceiling was achieved.

The steel beams span 7.5m. Only one row of internal columns, which could be accommodated within the internal walls, was needed. Balconies are supported by a separate tubular steel structure but were installed as part of the main steelwork contract.

Minnis admits to early reservations about the change, but is happy these were overcome. "I was worried about sound transmission in steel being potentially a big disadvantage. But our technical division felt the sound transference could be managed out."

Senior architectural technician Nick Jackson of BMG Architects says: "We tend to use reinforced concrete in residential buildings, but we had done a multi-storey residential block in steel, Sophia Mansions at Penarth Marina, before. So we were quite comfortable with moving to a steel frame and we were familiar with Slimdek."

He adds: "Detailing in steel requires a lot more care about the transmission of sound and you need to be very vigilant on site. But mainly it's a discipline for us upfront to make sure details are in place."

The principles, he says, are using resilient joints, filling voids, and isolating the room surfaces from the steel frame.

Above: Design changed from reinforced concrete to steel for speed, cost and because of more competitive market in steel.

Above right: Insulating render or brickwork used for external cladding with dry, lightweight system internally.

For example, expanded foam is inserted between columns and internal walls. Brickwork ties for the external cladding are shot-fired to the column flange with a neoprene washer between the two to prevent sound transmission. Mastic is used between the steel frames and the lightweight metal sections used to support the internal cladding, to prevent metal-to-metal contact. Insulation quilt is placed within the webs of the columns before they are enclosed by plasterboard. The suspended ceiling hangers are supported from plywood boards, rather than directly from the steel frame, to attenuate sound, and an insulation quilt within the ceiling void prevents boom.

Mr Jackson admits: "You do need control on site to make sure all the sealing is done. Site supervision wasn't our responsibility, but we kept reinforcing the point when we visited site and we have confidence in the site team."

That this confidence was well-founded was demonstrated when the building comfortably passed acoustic tests to demonstrate Building Regulations compliance towards the end of last year.

Bellway project manager Steve Northam praises the efficiency of steelwork subcontractor Bison Structures. "We worked with Bison and found we could control delivery to site so that we knew exactly the day and time of delivery. Steel arrived virtually on a just-in-time basis and

FACT FILE
Client:
Bellway Homes
Contractor:
Bellway Homes
Architect:
BMG Architects
Structural Engineer:
Bingham Hall O'Hanlon
Steelwork Contractor:
Bison Structures
Decking:
Studwelders

Above: Steel frame erection completed a week ahead of schedule

Left: Hollow section bracing members as seen from inside before wall construction

erection was very clean and efficient. They finished ahead of programme."

The Slimdek floors required no formwork and had no lead-in time. The concrete for each floor was generally placed in a single day. In fact the only problem, Northam says, was that the frame went up so quickly that follow-on work was not up to speed and orders had to be implemented rapidly to keep up.

Bison Structures project manager Mark Fox says: "The contract period was 16 weeks. We completed the frame three weeks early and the decking a week early.

"We used the unusual approach of building the floors as we went up rather than later, which was definitely the quickest solution. The only practical problem was getting access. Our cherry pickers had to be set outside the decking erectors', so for the upper floors we needed 40m cherry pickers, the biggest in the country, which we had to book three months in advance."

Construction was further speeded up by using a lightweight, dry system for internal and external walls, with 150mm Metsec channels supporting internal plasterboard. External cladding is either brickwork supported by stainless steel angles on the edge beams or insulating render attached to the lightweight walling. This meant lower loads compared with building blockwork walls and eliminated wet trades. Structural hollow section bracing 150mm square is fitted within the wall thickness.

"It screwed together very quickly and effectively," says BMG's Nick Jackson. "I can see us doing it again."

The steel structure's lower weight compared with reinforced concrete also meant reduced foundation costs, which consisted of friction piles bored into the alluvial clay.

Having pulled out the stops to complete the lift-shaft, Bellway has now handed over the six-storey block to the NHBC. The first occupants will be moving in shortly.

"The building is being occupied early," says Mr Jackson. "They wouldn't have been able to do anything like that if they'd had to cast the whole thing."

Meanwhile, Bison is about to start work on a 158-unit residential scheme for Bellway at the SA1 development in Swansea Docks. Bison's Mark Fox says: "It's a growing trend, Over 50% of my work in the last year has been residential and many of our other project managers are doing residential developments non-stop."

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Impressive cinematic debut

A new system for speeding the often critical process of constructing stair and lift cores won wide acclaim on its first outing, in a multiplex cinema in Ireland, reports David Fowler

Speeding up the process of building the stair and lift cores of multi-storey buildings could bring about significant savings on the overall programme. The first application of a system designed to do just that has succeeded dramatically on the 275,000m² Dundrum retail, office and residential development on the outskirts of Dublin. A stream of other projects is expected to follow.

The new product, Corefast, is a development of Corus's established Bi-Steel system, in which two steel panels linked by friction-welded rods to form a 'sandwich' is filled with concrete after construction. Bi-Steel was originally developed for applications in industry. Research and development to make connections between modules easier and quicker to undertake on site has made the system cost-effective for civil and structural applications.

The €400M Dundrum Town Centre development is a prestigious new retail and leisure complex. It is arranged as a number of separate but linked buildings; Corefast was used on one of the satellite structures, the six-storey Cinema building. As well as a 12-screen multiplex cinema at the basement and first levels this also accommodates a pub, a restaurant, and retail space for a House of Fraser store on the top floor.

The building is steel-framed with composite floors. Pat Duffy, Project Engineer for structural engineer TJ O'Connor & Associates, says: "It's a very unusual building, with irregular floor plans, a rotunda on one side, beams meeting at different angles and little repetition."

Some of the beams span up to 18m, and because the bigger auditoriums are on the lower levels a number of complex lattice-girder transfer structures are needed, with spans of up to 20m.

The acoustic separation between the cinemas and the surrounding shopping and restaurant

Bi-Steel

Bi-Steel was originally developed some 10 years ago for high load applications in industries such as petrochemicals and defence. It consists of two steel panels connected by an array of friction welded steel rods. The space between is filled with concrete to form an extremely strong composite structure.

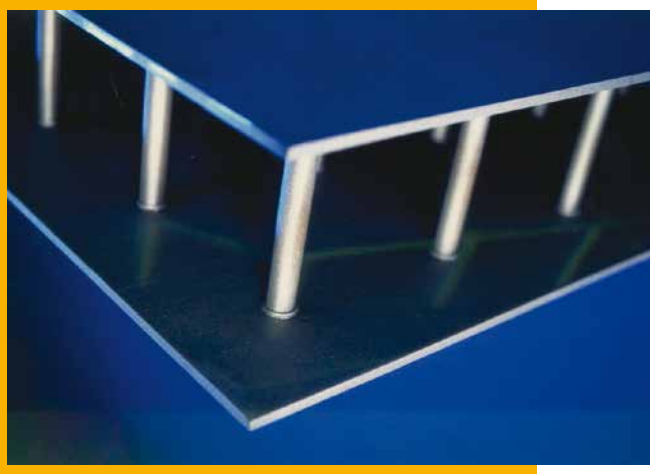
Originally, larger assemblies were constructed by welding Bi-Steel modules together. Corus undertook research and development to allow simpler mechanical or bolted connections to make Bi-Steel cost-effective for markets such as construction — in shear walls, for example. The result, introduced in 2003, was called Surefast.

Corefast was a further development with the specific application of stair and lift cores in mind. As at Dundrum, for this application the Bi-Steel panels are formed into bigger assemblies and delivered to site as prefabricated modules which can readily be fitted together. Door and window openings can be pre-formed and even staircases can be pre-installed.

Bi-Steel Construction and Industrial Manager Scott Kent says Corus can supply the plain modules, which is likely to be preferred if the client is a steelwork contractor. However, if the client prefers then Corus can offer a complete turnkey solution covering material supply to installation as well as subcontracting the fabrication and erection work.

Kent says the system should be cost-effective for six storeys upwards. The size of the module as delivered to site is only limited by what can be transported and by site crane capacity. Typically a module is around 13m or three storeys in height.

Bi-Steel recommends building three to six storeys of core and leaving this unfilled while the rest of the building is erected around it. However is is possible to erect the entire core in advance of the building frame, subject to design checks. The concrete infill is not normally needed for stability until the cladding is fixed.



System benefits include speed, the ability to erect on average one storey a day taking the lift off the critical path. As at Dundrum, large openings can be accommodated in the lift shaft. In addition the core walls need only to be half to two-thirds as thick as a concrete core of equivalent strength. "This can represent a considerable lettable area," says Mr Kent.

Following Dundrum, Bi-Steel has received a number of enquiries for using the system and has been investigating which of them would be practical applications. The first is likely to go on site in spring this year. "From then we expect a steady stream of work," he says.

Contact: Scott Kent, 01344 751670

areas had a major impact on the detailing of the structure. "There was a significant amount of work in accommodating the acoustic requirements," says Mr Duffy. For example, the seating terrace support beams connected into the main frame steelwork at different levels and in some cases varying angles. "The bearing details each had to be considered separately," says Mr Duffy. However, he adds: "The steel contractors took it all in their stride."

In common with many projects, the stair and lift core on the cinema building was on the critical path. Mr Duffy says there were a number of reasons for seeking an alternative to a reinforced concrete core.

"The main driver to look at alternatives was the programme. Steel erection would have been delayed because a concrete core has to be complete from top to bottom before the steel contractor can start on site."

In addition, because the architect wanted a scenic lift, meaning that, in effect, one core wall was missing, there was a problem with lateral stability. "It would have been necessary to increase the concrete section considerably to get enough lateral support," he says. "So we spoke to Corus, who said they could make it work at the size shown on the architectural drawing."

The method was to use the Corefast system. Corus's Bi-Steel division supplied modules to steelwork contractor Fisher Engineering, based in County Fermanagh. Fisher assembled these into larger units, prefabricating door and window openings where required and attaching all the necessary brackets and cleats. Site welding was kept to a minimum.

"A lot of co-ordination was involved," says Mr Duffy. "We consulted with Otis, the lift manufacturer, at a very early stage so that we could include their setting-out information on Corus's, Fisher's, and our drawings."

The entire 22m core was ultimately supplied to site as just four units, coated with intumescent paint inside. Erection of each module took around two hours. The whole core was completed in five working days over two and a half weeks, six weeks

FACT FILE

Dundrum Town Centre (Cinema Building)

Client:
Crossridge Investments

Architect:
Burke-Kennedy Doyle

Structural Engineer:
TJ O'Connor & Associates

Main contractor:
John Sisk & Son

Steelwork contractor:
Fisher Engineering

Total steel:
27,000 tonnes

Cinema Building:
2,000 tonnes

Three-storey core was erected in just four sections. Erection of rest of frame could start immediately.

quicker than a conventional core would take. Once all four modules were in position the horizontal joints were site-welded. The vertical joints used the Corus Surefast connection system.

The core was initially attached to the foundations using cast-in holding down bolts. This provided adequate stability during construction without the need for propping. The concrete infill was done in two stages, the first pour being completed before the installation of the last two core modules. The second pour was carried out when the main frame and top floor decking was in place to provide a safe working platform.

Mr Duffy says the installation went very smoothly, with the only snag being four holes for safety lines which had to be enlarged from 27mm to 35mm. “All the fixings were in the right place and all the beams connected in,” he says. “It was very quick to erect, even though everyone was exercising a lot of caution because it was the first one. On a future project, where the contractor had done it before, it would be even quicker. The quality, the alignment and plumbness, were very good.”

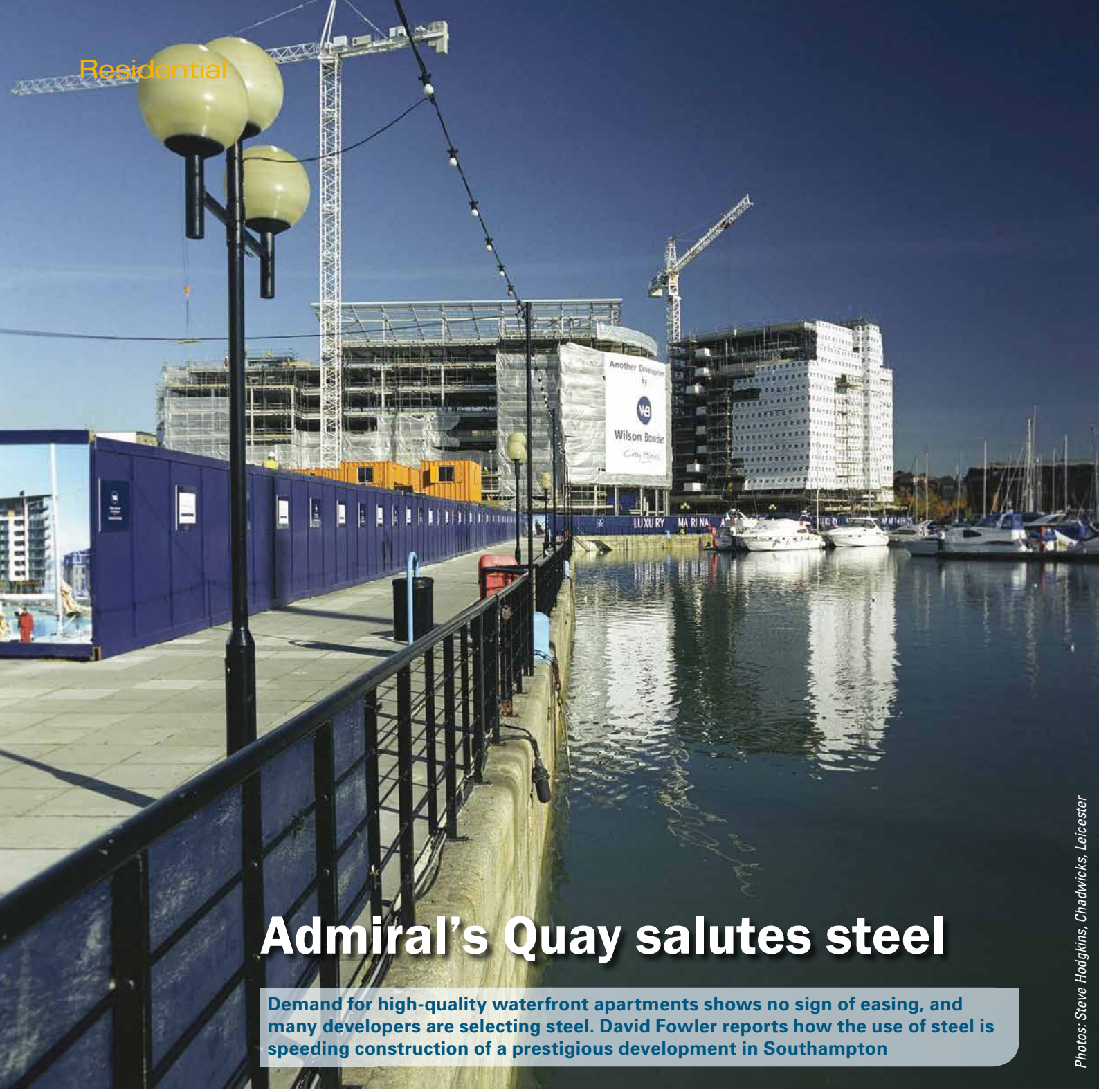
Ernie Fisher, managing director of steelwork contractor Fisher Engineering, says: "We were pleased with how it went. We would prefer to work that way than to fix to a concrete core. You can detail in the exact position of the connections for incoming steelwork rather than having to leave pockets in concrete. It was much faster for the erection of the rest of the steel frame," he says — though he adds that it is probably preferable, as on this project, for the core and the rest of the steel frame to be the responsibility of a single contractor.

TJ O'Connor's Mr Duffy adds that in the light of experience at Dundrum he would consider Corefast to be potentially beneficial on any project where timing was crucial, and particularly where there was no substantial reinforced concrete work other than the core, such as retaining walls or underground structures.

Of the Dundrum cinema building he says: "We all learned a lot. Everyone invested a lot of time and effort to make sure it all went well on site... there was a lot at stake. But it turned out very well."

Dundrum Town Centre, 8km to the south of Dublin city centre, will mark the first venture into Ireland by such retailers as House of Fraser and Harvey Nichols. The 11ha, €400M development will feature a landscaped civic square with a restored mill pond, the multiplex cinema, and a theatre as well as 100 retail outlets on three levels, integrated around an existing residential area. The retail outlets are due to open early next month (March) with the cinema following in autumn.

Complex steelwork for cinema building includes raked beams for seating (top), a rotunda (centre) and transfer structures (bottom) over auditoriums



Photos: Steve Hodgkins, Chadwicks, Leicester

Admiral's Quay salutes steel

Demand for high-quality waterfront apartments shows no sign of easing, and many developers are selecting steel. David Fowler reports how the use of steel is speeding construction of a prestigious development in Southampton

Admiral's Quay in Southampton is one of the biggest city centre residential projects in the UK, consisting of seven blocks of five to 11 storeys overlooking the marina.

Developer Wilson Bowden City Homes changed to steel for blocks two to five after an initial block had been constructed as a flat slab concrete frame.

"Block A went well but a cost analysis caused a rethink," says Paul McCracken, Buildings Director of structural engineer Robert West Consulting. For the next four blocks, of which all but one are now complete, Wilson Bowden went over to steel. Construction of the last two in the development has yet to begin.

The £80M development, part of Southampton's Ocean Village, will eventually comprise 400 apartments, totalling 50,000m² in area.

Various steelwork contractors erected different blocks: Robinson Construction was responsible for the 9-storey C2, which contained 1000t of steelwork; Bone Steel for the seven-storey building C1; Midland Steel for the four-storey Building E and Carnaby Structures for the 10-storey building F.

Extended ground floor storey heights accommodate communal facilities and retail outlets, including restaurants, bars and a Tesco convenience store.

Composite construction has allowed floor spans which minimise the number of columns at ground level and made it possible to create a range of apartment layouts on the upper levels. On a typical floor, five apartments of 80m² to 140m² in area are arranged in a cluster around a central braced steel core containing lifts and stairs.

FACT FILE
Developer:
Wilson Bowden City Homes
Architect:
Broadway Malyan
Structural Engineer:
Robert West Consulting
Main Contractor:
Wilson Bowden Construction
Steelwork Contractor:
Robinson Construction

Universal column sections spanning 6m to 9m were chosen for all beams. "This minimises the depth and allows them to be contained completely within the ceiling space, giving the architect complete freedom in partition wall layout," says Ivor Drodz, project manager for Robinson Construction. Columns are all located in separating walls between apartments.

A battened floor and suspended ceiling contribute to the acoustic insulation, which tests have shown exceeds the requirements of the Building Regulations by 10dB.

Edge beams were kept to the minimum depth to allow full-height glazing and walk-through balconies. Steel balconies were attached to stub brackets pre-welded to the edge beams. Robert West had only undertaken one previous residential project using steel, Bellway Homes's Neptune project in Ipswich, though Wilson Bowden had prior experience of using steel.

"To make sure it reached the acoustic requirement for a density of at least 360kg/m^3 the first block has 170mm slabs. The others had 140mm slab plus 45mm of screed," says Mr McCracken.

Where undercroft car parking is provided, the steel is fire protected up to the soffit of the first floor. Otherwise, steel members are encased in boarding or built into walls.

The change to steel meant some aspects of the design needed close scrutiny. "We had to look carefully at where we put transfer beams to bring loads down where the buildings step in on the higher floors," says Mr McCracken. "We worked closely with the architects on where to put columns."

Placing of columns on the ground floor also requited close co-operation to keep the number to a minimum, and in particular keep kitchen areas column-free. Using the 3D Max module of CADS, a column load take-down over eight storeys was possible in one and a half days.

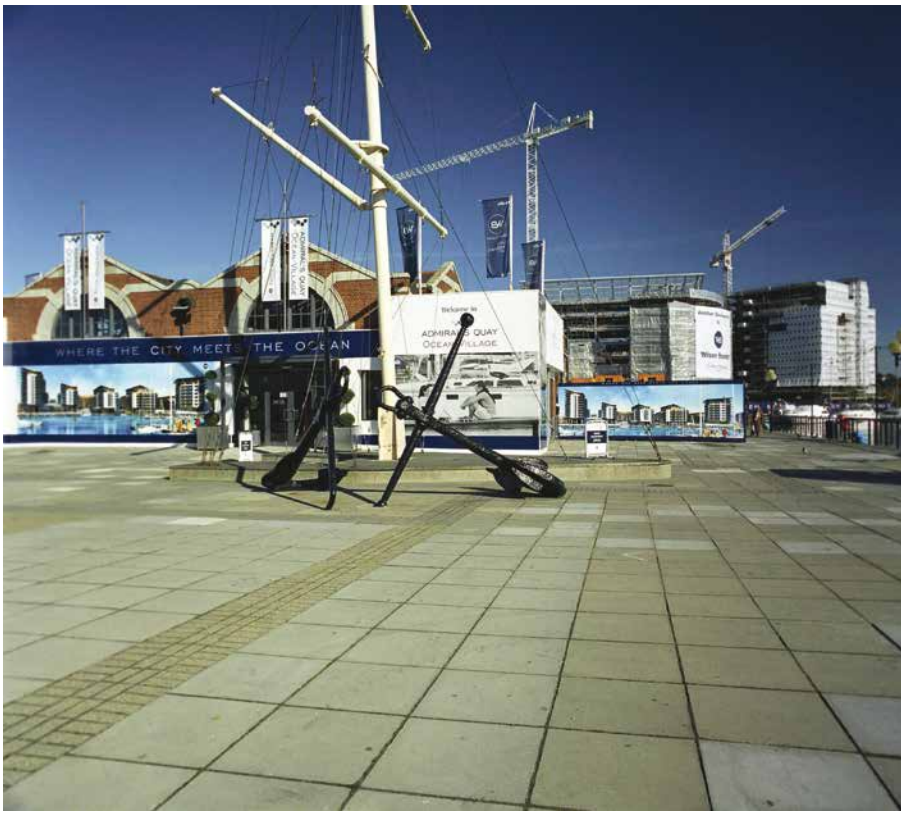
The key advantage of steel was speed of construction. Mr McCracken says: "It's fair to say it was quicker to put up: it definitely had the edge as far as the programme was concerned."

He adds: "You can always build a steel frame quicker, but the overall advantage depends on how quickly you can get through the process with all the follow-on trades. On Admiral's Quay this worked well."

This was helped by the use of lightweight metal stud partitioning for internal walls, so that there were no wet trades. The prefabricated steel balconies were also quick to erect.

A decision on whether to build the remaining two blocks, B and D, in steel has not yet been taken, but the indications are good.

Overall, Mr McCracken says: "With steel, if the detailing and quality of the workmanship is good, it definitely has the edge."



Steel frames were quick to erect; seven blocks will house 400 apartments plus retail outlets, bars and restaurants.

Market warms to steel homes

Steel can make a huge contribution towards providing quality housing for sustainable communities, but first the out of date image problems of system-build need to be overcome. The newly formed Steel Homes Group aims to be up to the task, as SCI's Graham Raven explains

The Challenge

The Government is committed to increasing the volume of quality housing available, especially for key workers, and stimulating the use of Modern Methods of Construction as a significant part of its policy for the development of sustainable communities. The Barker Report, produced for the Treasury, identified the need for between 70,000 and 120,000 homes annually in addition to current output of 150,000 units in order to overcome the current shortages and help stabilise prices.

Government is strongly encouraging industry to achieve a step change in the way that housing is provided in this country. The drivers are both to meet this additional demand and to improve the quality and value of our housing stock. It is clear that increased use of automated off-site manufacture and assembly have a major role to play in the expected step change.

The steel construction sector has demonstrated over the years its ability to rise to a variety of challenges to improve both the speed and quality of delivery of construction needs in commercial and industrial buildings. It is responding to the opportunities in the residential sector with equal enthusiasm. At the suggestions of key system suppliers the Steel Construction Institute has instigated the Steel Homes Group (SHG) to help ensure the opportunities are maximised and the necessary standards are upheld. Unfortunately there are memories of problems with earlier system build solutions to be overcome.

A Difficult History

Along with the US, France and Germany, the UK developed several steel framed housing systems after both the World Wars. While they were successful at alleviating short-term housing need, most of them suffered from significant design faults. The ungalvanised steel frames were generally exposed to temperature fluctuation and therefore prone to condensation and corrosion. Insulation was either non-existent or inadequate if present, typically only 1" or 2" of mineral wool. External cladding systems were frequently flimsy; they included painted steel panels and render on expanded metal mesh. There was no separate vapour barrier and significant water ingress on exposed sites occurred. No attention was paid to acoustic performance.

Despite all these faults, a range of surveys by the Building Research Establishment identified relatively few homes with serious deterioration. However, the houses were architecturally unattractive and were not popular with either occupiers or funding agencies. They created a significant psychological barrier which has to be overcome if the current opportunities for the sector are to be fully realised and long term product quality is to be assured.

Robust Technology

In the late 1980s, British Steel (now Corus) undertook a major initiative to develop the effective use of light gauge, galvanised steel sections in modern construction. Its target markets were broad and included residential construction. In consultation with leading industry figures, a comprehensive programme of testing work was conducted in its laboratories with underpinning research and design development at the Steel Construction Institute and associated universities. Potential corrosion issues were resolved by rigorously adopting 'warm frame' principles with all the steel elements being contained within the insulation envelope, and elimination of any potential cold bridges. Galvanised steel is now more or less universally employed. Technical development also addressed overall building stability, holding down systems, connection methods, elemental and system design methods, modern cladding systems and acoustic attenuation. A series of SCI publications through the 1990s made this information available to the sector and this guidance now forms the basis for today's systems.

Because of its pre-competitive nature, the programme of work was substantially supported by the Construction Support Unit of the then Department of the Environment and the benefits of the development programme are now apparent in the emerging success of steel framing in residential solutions.

Graham Raven, Senior Manager, Construction Technology, The Steel Construction Institute

The Atrium at Torquay for Westbury Homes built by Metframe

Demonstration Projects

Two demonstration projects were significant in the launch of this technology. An outstanding low energy house with a steel frame was constructed for the Ebbw Vale Garden Park in 1992.

In 1994, the SCI attracted major funding from the European Coal and Steel Community to carry out demonstration projects in France, Germany, Sweden and the United Kingdom. The UK project was a multi-purpose residential block of apartments and a semi-detached house. It was constructed at Oxford Brookes University in 1997 and encapsulated the value of the previous six years development. It was instrumented and has provided valuable performance data in use. Subsequently other pioneering pilot projects have been undertaken by a range of industry players for several leading clients, notably the Peabody Trust.

Current Position

Despite the technical development programmes the uptake of steel framing in residential construction has been somewhat slow until the last couple of years. The market is now receptive to the benefits of offsite production of quality units and there has been a rapid upturn in growth rates over the past two years.

It is estimated that approximately 40,000 accommodation units will have been constructed in 2004 with steel framed structures. This number is the total for the wider residential market that includes student, key-worker and military accommodation.

This total includes some 10,000 units of domestic accommodation in high rise apartment blocks. This related application of steel uses the hot rolled frame and the composite floor technologies that have been so successfully developed for the multi-storey office market. These are combined with the use of light steel for infill walling to achieve an integrated steel solution.

The Steel Homes Group

As mentioned earlier, this group has been formed under the auspices of the Steel Construction Institute to provide a focus for the development of the rapidly growing market for steel framed housing. Mindful of the requirements of the market place the objectives are:

- To provide a professional and authoritative voice for the steel homes industry.
- To ensure high standards of construction are designed and delivered.
- To advance the use of steel products and systems in residential construction.

The growing membership includes: Advance Housing/Terrapin, Banro Projects, Corus Living Solutions, Corus Strip Products UK, Fusion Building Systems (UK), Kingspan Off-Site, Metek Building Systems, Metsec plc, Spaceover, Yorkon and UNITE Modular Solutions.

Portishead Quays for Crest Developments built by British Steel Framing (now Framing Solutions)

The Future

This emerging industry has a substantial platform of knowledge, product development and a growing market demand on which to build. It is aware of the needs to satisfy the customer demand for variety, quality, longevity and efficient delivery. Examples of the variety of buildings being delivered are shown in these photos.

There is now confidence in the manufacturing companies to invest in the levels of plant with high degrees of automation and flexible output and it is estimated that plant representing some £50m investment will be operational within the next year. It is the depth of development not just in structural solutions but in total systems to meet the requirements of increasingly demanding Building Regulations together with the levels of investment in manufacturing and assembly solutions that are now capable of making the step changes demanded by the political imperatives of today's society.

Hard work and an innovative outlook are again features of the steel construction sector that is part of another success story.

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Unite Modular Systems' works at Stonehouse.

Payment practice needs to catch up

Specialist contractors need to take the bull by the horms and demand fair payment for work done before it is brought to site, says BCSA Legal Director Marion Rich

How many times does the situation arise where work has been undertaken prior to starting work on site? For steelwork contractors, and increasingly for other trades, most of their work has been done before site is reached but this type of work is frequently not regarded as 'work' undertaken under the sub-contract for which payment needs to be made. Under most subcontracts the payment cycle does not start until work on site begins.

The suspicion must be that the system arose in the days when most work was done on site. Those days are long gone. Steelwork contractors are highly specialised in the use of new technology for fabricating steel, for planning and delivery. Payment practices should reflect what happens now, not what happened 100 years ago.

Standard Forms

A review of the standard forms of contract shows that the problems largely lie with DOM/1 and DOM/2. DOM/1/2 and its 'bespoke' derivatives are by far the most common form of sub-contract despite JCT's publication of DSC. Like the JCT forms, the procedures and wording have become so familiar within the industry to have become regarded almost as a form of 'construction common law'; people feel 'that is how things are done'. While it is not fair to say that most standard sub-contract forms perpetuate the practice of refusing to acknowledge work done before site is reached, it is fair to say that most sub-contracts do.

The payment terms of DOM/1 provide that the first payment is due one month after the date of commencement of the Sub-Contract Works on-site or if agreed, related off-site works.

In other words, if the Architect and Employer choose, then the Sub-Contractor may be paid for off-site goods and materials. It is viewed as some type of concession to get paid at this stage at all.

DOM/2 conditions are in essentially the same terms; this is itself of interest, as one would have thought that there is good reason for a design and build contract to allow payment to be made at the design stage. In practice, of course, much design is done by subcontractors even when engaged on a DOM/1 basis.

This payment provision sometimes leads to another problem: materials are often brought on site too early, under the provisions of clause 21.4 of DOM/1, simply for the purpose of starting the payment cycle.

In the other major forms of contract, the same problem does not arise to the same extent. In the Civil Engineering Contractors Association form of sub-contract, the sub-contractor's valuation of all work properly done under the sub-contract is to be submitted to suit specified dates or as otherwise agreed and the Engineering and Construction sub-contract ties start of payment to the 'sub-contract starting date' set out in the sub-contract data.

SPC 2000, the specialist contract that goes with the PPC 2000 partnering contract, gives the opportunity for payments to be made under a Specialist Pre-Possession Agreement.

The GC/Works Subcontract provides for first payment date to be agreed, with a default position of no later than 42 days after date of commencement of Sub-Contract Works – definition to be supplied in the Abstract of Particulars.

In all the above contracts, it is very much up to the sub-contractor to ensure that it gets the contract right for payment to start at the right time.

DSC/C provides for the first payment to become due on the date of issue of the Main Contract Interim Certificate immediately following the commencement of the Sub-Contract Works. This is described in the Numbered Documents. If the works are described adequately in the Numbered Documents, therefore, the commencement would presumably be the time that the first action covered by the description was begun. However, it is apparent that the fall back position is still for the start of the payment cycle to be linked to start of work on site.

Modern Forms of Working

There is an important point for the industry as a whole here. It is not simply individual sub-contractors that find their lives made more difficult because they are funding the project bottom up. Off-site fabrication has come to be seen as the way forward. It allows faster, more certain, safer construction. However, who in their right mind is going to move to off-site fabrication when they

will not start to get paid until after start of work on site?

Supply chain integration requires of sub-contractors a great deal of work in the design and planning stages. This is going to be a huge change in working practice in any case for a number of smaller contractors; linking payment to start of work on site is not going to make it any easier.

The obvious answer is that new forms of working will bring in new forms of payment and work is being undertaken at the moment by the Strategic Forum for Construction on payment mechanisms for integrated supply teams.

But change may not come easily; even the most innovative contract writers have had to compromise. The Guide to SPC 2000 justifies the need for a separate specialist contract as follows:

'The terms of... performance, supply and payment vary considerably between the different types of Specialists and are broken down in different ways for different Projects. Accordingly, the diverse relationships between the Constructor and its Specialists need to be set out in separate forms of Specialist Contract.'

The way forward

There is a lot that the industry itself can do at a company level. It is clear that the feeling that 'this is the way things work in the construction industry' needs to be dispelled; we are dealing with a simple matter of contract. Individual specialists need the confidence to take the bull by the horns and demand fair payment mechanisms that reflect the work they do off-site.

Those higher in the contractual chain need to accept that work carried out before site is reached is work under the contract, and deserves payment.

With the publication of DSC, the DOM/1/2 sub-contracts are no longer going to be updated; eventually (although I suspect it may take a long time), these forms will fade away. DSC, NEC and PPC2000 will become more commonly used, the new payment mechanisms being developed for integrated supply chains and teams will come on stream. The 'norm' will eventually change and payment will begin to be made for work done. My purpose is to encourage that change and speed it along.

A version of this article appeared in Volume 14 Issue 7 of 'Construction Law'.

Advert

Corus/BCSA

Sustainability

New and Revised Codes and Standards

(from BSI Update November & December 2004)

BRITISH STANDARDS REVIEWED AND CONFIRMED

Confirmation indicates the continuing currency of a standard.

BS 4395:
Specification for high strength friction grip bolts and associated nuts and washers for structural engineering.
BS 4395-1:1969
General grade.
BS 4395-2:1969
Higher grade bolts and nuts and general grade washers.

BS 7419:1991
Specification for holding down bolts.

BS 7644:
Direct tensions indicators.
BS 7644-2:1993
Specification for nut face and bolt face washers.

BS 1449:
Steel plate, sheet and strip.
BS 1449-1
Carbon and carbon-manganese plate, sheet and strip.
BS 1449-1.1:1991
General specification
BS 1449-1.8:1991
Specification for hot rolled narrow strip based on formability.
BS 1449-1.14:1991
Specification for hot rolled narrow strip supplied in a range of conditions for heat treatment and general engineering purposes.

BRITISH STANDARDS WITHDRAWN

If any standard in this list has been amended since publication, all amendments published to date are also withdrawn.

BS EN 10137:
Plates and wide flats made of high yield strength structural steels in the quenched and tempered or precipitation hardened conditions.
BS EN 10137-3:1996
Delivery conditions for precipitation hardened steel.

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT

04/30109891 DC
BS 4449
Steel for the reinforcement of concrete. Weldable reinforcing steel. Bar, coil and decoiled product. Specification 4.

04/30109893 DC
BS 4482
Cold reduced steel wire for the reinforcement of concrete. Specification.

04/30109896 DC
BS 4483
Steel fabric for the reinforcement of concrete. Specification.

04/30123011 DC
ISO 4992-1
Steel castings. Ultrasonic examination. Part 1. Steel castings for general purposes.

04/30123014 DC
ISO 4992-2
Steel castings. Ultrasonic examination. Part 2. Steel castings for highly stressed components.
04/30117557 DC
ISO 9364
Continuous hot-dip aluminium/zinc-coated steel sheet of commercial, drawing and structural qualities.

04/30117561 DC
ISO 4999
Continuous hot-dip terne (lead alloy) coated cold-reduced carbon steel sheet of commercial, drawing and structural qualities.

04/30123271 DC
ISO 10340
Steel castings for structural uses.

04/30123693 DC
EN 15048-1
Non-preloaded structural bolting assemblies. Part 1. General requirements.

04/30123712 DC
EN 15048-2
Non-preloaded structural bolting assemblies. Part 2. Suitability test.

AD 281
The Use of Discontinuous Columns in Simple Construction

In recent years the use of discontinuous columns and continuous beams as a form of simple construction has emerged in the residential sector. This development has occurred for a variety of technical and commercial reasons; however, the form of construction need not be restricted to the residential sector alone. This AD provides general advice on construction for this innovation and is the first in a series. Subsequent ADs will provide advice on structural design, dealing with column design, connection design and robustness, and in-plane stability.

The principles of connections and bracings using discontinuous columns are illustrated in Figures 1 & 2 for a typical medium-rise project in the residential sector.

Beams

The floor beam in this form of construction may be designed as continuous, thereby either reducing the overall floor depth or increasing the beam spans. However, the loss of composite action in the hogging region of the beam must be allowed for in design if required by the floor system.

Transport restrictions or handling requirements often necessitate the inclusion of splices in the floor beams and these are located close to the beam column-connection as shown in Figure 2. These beam splices are designed and detailed as simple shear connections, assumed to act as 'pins' for flexure in the vertical plane, but also capable of resisting any additional axial forces and torque that may arise in the permanent or temporary conditions. Axial forces may arise from forces carried to the bracing system. Torque may arise from floor loading along only one side of a beam. This may occur on all beams during the construction sequence and also in the permanent condition for edge beams. Careful consideration must be given to the locations of the beam splices in relation to the braced bays as illustrated in Figure 2 in order to ensure a simple erection sequence. The frame should be analysed and designed for this arrangement of beam splices. Different ASB beams may be used in the same floor plate as a result of variation in loading intensity or span but will result in different column lengths for the

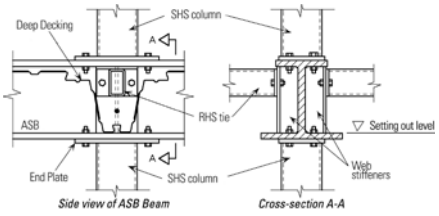

Figure 1. ASB Continuous Beam and Discontinuous (Storey-High) Tubular Columns

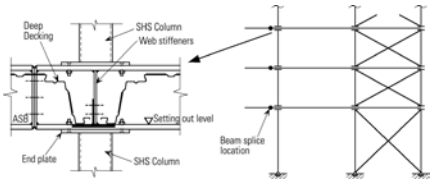

Figure 2. Floor Beam Splice Location and Details

same storey. It should be noted that ASBs are usually aligned so that the upper surfaces of the bottom flanges (the setting out levels) are at the same level and hence the top of steel level for the floor beams will vary.

Columns

Circular hollow section columns are often left exposed internally for clear floor solutions. Alternatively, RHS or SHS columns are chosen so as to be compatible with internal wall dimensions and to provide flat surfaces for fixing. In addition, the hollow columns may be concrete-filled offsite prior to erection if required for load capacity or fire resistance. It is prudent to have some rationalisation in the number of wall thicknesses used on a project where most of the columns will have the same nominal size. With standard column end plates, all the columns will look the same on site without a clear marking system and the risk exists that weaker columns will be used in the wrong location.

Column–beam connections

The column end plates are bolted directly to the flanges of the floor beam in the depth of the floor, often using countersunk bolts. This detail removes the inconvenience of obtrusive column splices using cover or flange plates. The rolled pattern on the top flange of the ASB beams has no effect on the transfer of axial load or shear in the connection. As the column end plates are connected above and below the floor beams, the beam's rolling tolerance on overall depth as well as the fabrication tolerance on column length will affect the setting out level for each floor. In medium and high-rise projects, shims should be allowed for in the connection every few floors in order to ensure that the erected setting out levels for each floor are within tolerance. The combination of shims and tolerances will affect the diagonal length for brace members and hence it is prudent to use flats in cross bracing with this type of construction. Flats may be drilled on site to suit.

Stability

Clause 2.4.5.2 in BS 5950-1: 2000 requires that each column at each floor level be held in position in two directions and hence it is imperative that the RHS tie in Figure 1 or the Structural Tee in Figure 2 be used. This is particularly the case for the temporary condition in order to ensure a stable structure during erection and placing of concrete.

It is recommended that full depth web stiffeners are used at all column-beam connections unless the stability of the web against sway can be demonstrated in both the temporary and permanent conditions.

With regard to temporary stability it is necessary that the entire bracing system for a floor be installed before the concrete element of the floor plate is placed or poured. Additional temporary bracing is often required to assist with the lining and levelling of the structure during erection and this may double as temporary bracing for stability purposes.

Construction sequence

A construction sequence that allows steelwork to be erected from a completed floor plate will often be most convenient. In this sequence, two or three floors are completed before erecting the steelwork for higher floors. Note that pockets must be left in the concrete to allow the column endplate to be connected to the upper flange of the floor beam.

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AD 282
Frame Stability and Load Combinations

This advisory desk note reminds designers that in-plane stability varies with each load combination considered. This is because the loads applied to a structure are different for each load combination. In BS 5950-1: 2000, frame stability is generally considered with reference to λ_{cr} which is calculated using Notional Horizontal Forces (NHF). Because the partial factors change between load combinations, the NHF change, and therefore the value of λ_{cr} is different in each load combination. Comments are made on both multi-storey structures and portal frames.

Multi-storey structures.

Four load combinations may be considered for multi-storey frames. (See table below)

Clearly, since the NHF are 0.5% of the factored dead and imposed loads, the maximum NHF are found in combination 1. In this combination, λ_{cr} will be the minimum (i.e. the most sensitive combination for second-order effects) and if the frame is sway-sensitive in this combination, k_{amp} (see 2.4.7.2) will be at a maximum. Conservatively, frame stability may be considered in load combination 1, and if the frame is found to be sway-sensitive under this load combination, the resulting k_{amp} may be used in all load combinations. However, for economy of steel, it will often be advantageous to investigate frame stability in the other load combinations, as the NHF will be smaller, λ_{cr} will be larger (i.e. less sensitive), and k_{amp} will be smaller, or 1.0.

Combination	Load factors (D = Dead; I = Imposed; W = Wind)
Load combination 1	1.4D + 1.6I
Load combination 2(a)	1.0D + 1.4W
Load combination 2(b)	1.4D + 1.4W
Load combination 3	1.2D + 1.2I + 1.2W

Portal frames

When checking the in-plane stability of portal frames, three options are available in BS5950-1: 2000, as described in Clause 5.5.4.1. The sway-check method, described in Clause 5.5.4.2, utilises NHF, with some specific rules for portal frames.

In Clause 5.5.4.2.1 the Standard states that the NHF applied to the top of each column are to be taken as 0.5% of the vertical reaction at the base of the respective column for the relevant load case. Note that the NHF should be applied at each column top and not as a single load at the top of one column.

In load combination 1, the vertical reactions are only due to the 'gravity' loads and the NHF at each column top may be calculated from the product of the roof area carried by a column and the factored vertical load.

When calculating λ_{sc} in load combinations with horizontal load (see Clause 5.5.4.2.3), the NHF should be recalculated, since the factors on the dead and imposed loads reduce. The Standard encourages this by referring to the horizontal deflections under the NHF 'for the relevant load case'. However, the contribution that the wind load makes to the vertical load and therefore the NHF must not be ignored, as this can be significant in a portal frame. By following the advice in the Standard to take the NHF as 0.5% of the vertical reaction at the base of the column, the effect of wind on the vertical loads and on the NHF will automatically be taken into account.

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The 'Sunday Times' builds in Steel

In 1937 a steel frame building for the *Daily Sketch* was constructed in Gray's Inn Road, London. It was erected only up to second floor level, with allowance for the addition of four more storeys at a future date. The war brought the scheme abruptly to a halt.

Subsequently Thomson Newspapers acquired the property and in 1960 decided to complete the building by adding five storeys instead of four allowed for in the original scheme. This was accomplished by reducing the superimposed floor loading, through employing lighter forms of construction and making use of the higher stresses now accepted. The weight of the steelwork involved in this part of the scheme is in the region of 650 tons.

The design of the original structure was of a traditional nature, which was abandoned when the work was recommenced. It was, however, necessary to follow up the original stanchion lines, which one would have preferred to avoid had it been possible. The difficulty was overcome by carrying the curtain walling outside the stanchions so they do not appear on the exterior except at ground level.

An interesting feature is the way in which steel has been employed to give a clear span in the basement housing the 30-ft. high presses. There is, in fact, a clear span of 69 ft. To achieve the necessary strength the upper floors are carried on 30 plate girders 59 in. deep each weighing 25 tons. There is a complete absence of stanchions, so allowing the presses with their conveyors and switch-gear to be installed in straight lines, without the need for manoeuvring around roof supports.

As mentioned earlier, the design of the building differs completely from that originally planned. It was felt that the time had come to make the curtain walling much more interesting than in the past. This was made by a leading window manufacturer and 'mock-ups' were carefully studied at their works before commencing production. Glass with a sealed copper backing was used for finishes and set in aluminium frames. Black granite panels set in similar frames were selected in lower parts of the building to give contrast to the area above. Around the top is a parapet of coloured plastic coated steel.

Lanchester College of Technology

The Lanchester College of Technology, Coventry, named after the famous local engineer and motor car designer, has considerably grown and broadened its horizons since 1958, following the increased national emphasis on advanced technical education. The last phase of the project, the Students Union and the Administration and Lecture Theatre block, has just been completed. The proximity of Coventry Cathedral influenced the design. It was felt that the buildings should be of a quiet and dignified expression, but at the same time truly representative of technology. The buildings are of steel-frame construction and an 80 in. module has been employed throughout, expressed as vertical steel joint mullions.

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

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

KEY

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

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

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

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

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

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Tel 01226 340666 **Fax** 01226 755947

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Regis, West Mids B65 8BZ
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Tel 0151 236 5656

HIGHWAYS AGENCY
Tel 08457 504030

ROGER POPE ASSOCIATES
Tel 01752 263636

The Register of Qualified Steelwork Contractors

BUILDINGS SCHEME

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

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

Company Name	Telephone	A	C	D	E	F	H	J	K	L	M	N	S	QA	Contract Value (1)
ACL Structures Ltd	01258 456051				●	●	●				●				Up to £2,000,000
Adstone Construction Ltd	01905 794561														In process of audit
Atlas Ward Structures Ltd	01944 710421	●	●	●	●	●	●	●	●	●	●			●	Up to £3,000,000*
B D Structures Ltd	01942 817770			●	●	●	●								Up to £1,400,000*
B & K Steelwork Fabrications Ltd	01773 853400		●		●	●	●	●	●		●			●	Up to £4,000,000*
A C Bacon Engineering Ltd	01953 850611				●	●	●								Up to £800,000
Ballykine Structural Engineers Ltd	028 9756 2560				●	●	●	●				●		●	Up to £2,000,000
Barrett Steel Buildings Ltd	01274 682281				●	●	●							●	Up to £6,000,000
Betgate Structures Ltd	01608 677551				●	●	●								Up to £100,000
Billington Structures Ltd	01226 340666	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Bison Structures Ltd	01666 502792			●	●	●	●							●	Up to £2,000,000
Border Steelwork Structures Ltd	01228 548744		●		●	●	●	●				●			Up to £800,000
Bourne Steel Ltd	01202 746666	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Briton Fabricators Ltd	0115 963 2901		●			●	●	●	●	●	●			●	Up to £800,000
CTS Ltd	01484 606416						●	●							Up to £800,000
Carnaby Structures Ltd	01262 401325		●	●	●	●	●								Up to £4,000,000*
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Compass Engineering Ltd	01226 298388		●		●	●			●						Up to £800,000
Leonard Cooper Ltd	0113 270 5441		●			●	●		●		●			●	Up to £800,000
Coventry Construction Ltd	024 7646 4484				●	●	●	●		●	●			●	Up to £400,000
Curtis Engineering Ltd	01373 462126					●									Up to £400,000
Frank H Dale Ltd	01568 612212				●	●								●	Up to £4,000,000
Dew Construction Ltd (Fabrication Division)	0161 624 5631				●	●	●		●					●	Up to £800,000
EAGLE Structural Ltd	01507 450081				●	●	●	●		●					Up to £400,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●		●			●		●	Up to £4,000,000
Emmett Fabrications Ltd	01274 597484				●	●	●								Up to £800,000
EvadX Ltd	01745 336413				●	●	●	●		●	●	●		●	Up to £1,400,000
Fairfield-Mabey Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Fisher Engineering Ltd	028 6638 8521	●	●	●	●	●	●	●	●	●	●	●		●	Up to £6,000,000
Glentworth Fabrications Ltd	0118 977 2088					●	●	●	●	●	●	●		●	Up to £2,000,000
Graham Wood Structural Ltd	01903 755991	●	●	●	●	●	●	●	●	●	●	●			Up to £2,000,000
D A Green & Sons Ltd	01406 370585				●	●	●	●						●	Up to £3,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456		●		●	●	●	●	●	●	●			●	Up to £6,000,000
James Bros (Hamworthy) Ltd	01202 673815				●	●	●	●				●		●	Up to £2,000,000
James Killelea & Co Ltd	01706 229411		●		●	●	●					●			Up to £6,000,000*
Meldan Fabrications Ltd	01652 632075		●		●	●	●	●	●		●			●	Up to £2,000,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●				Up to £2,000,000
Harold Newsome Ltd	0113 257 0156				●	●	●								Up to £1,400,000
Normanby Wefco Ltd	01724 875555		●						●		●			●	Up to £800,000
Oswestry Industrial Buildings Ltd	01691 661596				●	●	●		●		●				Up to £400,000
Quantrill Steel Ltd	01953 881853				●	●	●	●		●	●			●	Up to £40,000
RSL (South West) Ltd	01460 67373				●	●	●				●				Up to £800,000
John Reid & Sons (Strucsteel) Ltd	01202 483333	●	●	●	●	●	●	●	●	●	●	●			Up to £6,000,000
J Robertson & Co Ltd	01255 672855									●	●		●		Up to £100,000
Robinson Construction	01332 574711		●	●	●	●	●							●	Up to £6,000,000
Roll Formed Fabrications Ltd	028 7963 1631				●	●	●	●		●	●	●		●	Up to £800,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000
Rowen Structures Ltd	01623 558558	●	●	●	●	●	●	●	●	●	●	●			Up to £6,000,000
SIAC Butlers Steel Ltd	00 353 502 23305		●	●	●	●	●	●				●		●	Up to £6,000,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Henry Smith (Constructional Engineers) Ltd	01606 592121		●	●	●	●	●	●							Up to £2,000,000
Traditional Structures Ltd	01922 414172				●	●	●	●	●		●	●		●	Up to £800,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●	Above £6,000,000*
Webcox Engineering Ltd	01249 813225				●	●	●				●				Up to £400,000
H Young Structures Ltd	01953 601881		●		●	●	●	●				●			Up to £800,000

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

RQSC
The Register of Qualified Steelwork Contractors Scheme

BRIDGEWORKS SCHEME

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

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

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

Company Name	Telephone	FG	PT	BA	CM	MB	RF	X	Contract Value (1)
Allerton Engineering Ltd	01609 774471	●	●	●	●	●	●		Up to £1,400,000*
Briton Fabricators Ltd	0115 963 2901	●	●	●			●		Up to £800,000
Butterley Ltd	01773 573573	●	●	●	●	●	●		Up to £3,000,000*
CTS Ltd	01484 606416	●							Up to £800,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●		Above £6,000,000*
Coastground Ltd	01493 650455								in process of audit
Fairfield-Mabey Ltd	01291 623801	●	●	●	●	●	●		Above £6,000,000*
William Hare Ltd	0161 609 0000							●	Above £6,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●		●	●	Up to £6,000,000
Interserve Project Services Ltd	0121 344 4888						●		Above £6,000,000
Interserve Project Services Ltd	020 8311 5500		●	●		●	●		Up to £400,000*
Mandall Engineering Ltd	0114 243 0001								in process of audit
Meldan Fabrications Ltd	01652 632075	●	●	●	●	●	●		Up to £2,000,000
'N' Class Fabrication Ltd	01733 558989	●	●	●		●	●		Up to £1,400,000
Normanby Wefco Ltd	01724 875555	●	●	●			●		Up to £800,000
Nusteel Structures Ltd	01303 268112	●	●	●	●				Up to £2,000,000*
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●		Above £6,000,000
Taylor & Sons Ltd	029 2034 4556	●	●	●	●	●	●		Up to £800,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●		Above £6,000,000*

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

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- Corrosion Protection
- Fabrication
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- Information Technology
- Fire Engineering
- Light Steel and Modular Construction
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Supporting services from structure: Guidance for a defect-free interface
R Bunn and M Heywood
ISBN 0 86022 634 4,
32 pp, A4 paperback,
Nov 2004

NEW BOOK

Supporting Services from Structure

This guide, the fourth in a series called 'Interface Engineering Publications', aims to provide guidance on the best ways to engineer the interface between structural design and service distribution. BSRIA and SCI have pooled their technical knowledge to provide structural and services engineers with consistent, interlocking advice.

Most buildings require a labyrinth of ducts and pipes, together with miles of cables. All of these need to be supported in a way that safely transfers the load without causing damage to the services or to the structure. This publication, repackaged from existing BSRIA and SCI guidance, begins with an introduction to the design issues faced by structural and building services engineers and examines the implications of certain key design decisions on the integration of building services into the structure. There are many ways in which the services may be attached to the structure and several of the most common options are discussed in detail. These include fixings to beam flanges, steel decking and solid concrete slabs.

PRICES: Non-member £45 Member £22.50 (plus P&P)

Quicon® design guide to BS 5950-1
M D Heywood
ISBN 1 85942 160 1, 42 pp,
A4 paperback, Nov 2004

NEW BOOK

Quicon® design guide to BS 5950-1

Quicon® is a new type of simple connection for steel beams in buildings. It offers significant potential savings in the time taken to erect a steel framed building.

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The design method is based on the well-established design checks developed for other types of simple connection, as presented in SCI publication P212, *Joints in steel construction: Simple connections*. These have been supplemented by additional checks that are supported by laboratory tests. Designers are referred to a comprehensive series of design tables in an appendix, which covers a range of Universal Beam sizes from 610mm down to 305mm. These tables should be used with the standard details to ensure a safe design.

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