JANUARY 2005 VOL 13 NO 1

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Cover Image
ST RICHARD'S HOSPITAL, CHICHESTER
Structural Engineer: Gyoury Self
Steelwork Contractor: F H Dale

NEW STEEL CONSTRUCTION
NSC
www.new-steel-construction.com

EDITOR
Nick Barrett Tel: 01323 422483
nick@new-steel-construction.com
DEPUTY EDITOR
David Fowler Tel: 01892 538191
david@new-steel-construction.com
CONTRIBUTING EDITOR
Ty Byrd Tel: 01892 524455
ty@barrett-byrd.com
PRODUCTION EDITOR
Andrew Pilcher Tel: 01892 524481
andrew@new-steel-construction.com
ISDN: 01892 557302
ADVERTISING SALES MANAGER
Sally Devine Tel: 01424 833871
sally@new-steel-construction.com

PUBLISHED BY

The British Constructional Steelwork Association Ltd
4 Whitehall Court, Westminster, London SW1A 2ES
Telephone 020 7839 8566 **Fax** 020 7976 1634
Website www.steelconstruction.org
Email postroom@steelconstruction.org

The Steel Construction Institute
Silwood Park, Ascot, Berkshire SL5 7QN
Telephone 01344 623 345 **Fax** 01344 622 944
Website www.steel-sci.org
Email reception@steel-sci.org

Corus
Corus Construction and Industrial, PO Box 1, Brigg Road,
Scunthorpe, North Lincolnshire DN16 1BP
Telephone 01724 404040 **Fax** 01724 404224
Website www.corusconstruction.com
Email tsm@corusgroup.com

CONTRACT PUBLISHER & ADVERTISING SALES
Barrett, Byrd Associates
Linden House, Linden Close,
Tunbridge Wells, Kent TN4 8HH
Tel: 01892 524455
www.barrett-byrd.com

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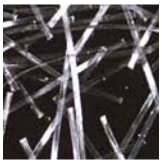

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The British Constructional Steelwork Association Ltd

The Steel Construction Institute

Kingspan Metl-Con Ltd. Sherburn, Malton, North Yorkshire, YO17 8PQ. England.
Tel: 01944 712000 Fax: 01944 710555 e-mail: sales@kingspanmetlcon.co.uk

Exciting times ahead

Nick Barrett - Editor

Welcome to the expanded New Steel Construction, which will now come out monthly to open a more frequent window into the steel construction industry. Our focus will be on the industry's successes and on how challenges are overcome in design, fabrication and steelwork erection.

Regular readers will notice a few changes in this issue, and there will be more over the coming months as we develop our ideas in line with reader feedback on what the steel sector's flagship magazine should be like. We look forward to hearing your comments.

A key idea behind the changes is to provide more timely accounts of what is happening in the industry. This will mean more reports from projects which are at the construction stage. We will still look back to ask if things might have been done better and to learn lessons, but essentially New Steel Construction is about what is happening now.

It is encouraging that Corus has further signalled its support for the sector by joining the British Constructional Steelwork Association and the Steel Construction Institute as a full and equal partner in the magazine. Among other things, this will bring a wider readership to be catered for in our spread of articles and news stories. But whoever the reader is, New Steel Construction aims to be the first place to look to find out what is happening in the steel sector of the construction industry. Exciting times lie ahead for the steel sector and if New Steel Construction reflects that it can hardly fail to be an interesting and essential read.

Keeping the market supplied

The year 2004 was a turbulent one in the steel market, when price rises captured the imagination of newspaper headline writers across the world. Some were more imaginative than others, of course, and a lot of effort has been expended by the industry's lobbyists in correcting some of the more unjustifiable headlines. That might be the case again in 2005, but there are some encouraging signs of more stability in steel prices. The Chinese market, for example, looks like cooling down as a result of government anti inflationary policies which should take pressure off scrap, coke and freight prices.

All major steel consuming markets worldwide saw demand growth in 2004, not just China. Global demand looks like rising again in 2005 and iron ore, coke and scrap shortages will no doubt grab headlines again. It's part of the price we pay for steel being so popular worldwide as a structural framing material, but it's worth remembering that all primary construction materials are feeling upward pressure on prices.

One thing which stood out during the turbulence of 2004, and which is likely to be repeated in 2005, was the ability of steel producers to maintain supplies to their customers during what were extremely challenging times. Prices today are still well below the levels of almost 20 years ago in real terms, and often in absolute terms as well. This reflects the fact that massive improvements in efficiency across the steel sector have been passed on to customers, ensuring that steel is the cost effective construction material of choice for most applications.

Corus has said that it remains dedicated to doing all it can to maintain the competitiveness of its customers, and is confident of being able to keep them supplied during 2005. So when you see the scare headlines arising again, ignore them. Check with New Steel Construction if you want the facts.

Trade Centre tower rises in steel

The last building to collapse as a result of the September 11 attacks is the first to rise from the ashes of New York's World Trade Centre. The main steel frame of the 52 storey, 158,000m^2 WTC7, which contains around 4000t of steel supplied by Corus, has topped out after a fast track construction programme.

The new primarily glass and steel structure, designed by David Childs of Skidmore Owings & Merrill, is the first of a projected nine buildings that will be erected on the site. The building which it replaces collapsed after the attack on the Twin Towers. New safety features include added load path redundancy for structural steel framing, durable fire proofing materials, reinforced concrete infill walls around the concrete core, and exit stairs 20% wider than US codes specify.

The main steelwork contractor was required to purchase half the steel from the US and sourced the rest from its long-standing supply partner Corus. Completion of the project is scheduled for 2006.

Eurocode safety factor victory promises more economic steel buildings

Steel structures designed to the new Eurocode EN 1993 will be lighter and more efficient thanks to a successful battle by the Steel Construction Institute over factors of safety.

SCI has persuaded ministers that the UK should adopt the recommended factors of safety for materials, overruling the 'no-change' brigade who wanted to adjust them to neutralise the effect of the new code. The potential improvement in design efficiency over the old code, BS5950, is expected to be around 6% to 8%, which compares favourably with profit margins in the steel fabrication industry.

The industry has complained that the cost of implementing the codes, including training and dissemination of the changes, could run into millions of pounds.

SCI Director Dr Graham Owens said: "There will be worthwhile economies for designs governed by gravity loads. This will be an important driver for implementation of the Eurocodes, especially for design and build projects."

The economy arises from the fact that the factors of safety for dead and live loads in Eurocode 3 are lower, at 1.35 and 1.5 respectively, than the values in the old code of 1.4 and 1.6. The recommended factor of safety for materials, γ_m, remains at 1.0.

However, γ_m is a 'nationally determined parameter' for which individual countries are not obliged to adopt the recommended value. Civil servants and the British Standards Institution had planned to adopt a γ_m of 1.05 to 1.1 to make the new code neutral compared with BS5950.

"That would have meant that after all the efforts the industry had put in to developing the new codes, there would have been no benefit," said Dr Owens. "It's been a sustained fight to get back to unity [ie to a value of 1]." It was not until he raised the matter with Construction Minister Nigel Griffiths at a meeting of Co-construct that he began to make progress.

BCSA has been awarded the contract from the Office of the Deputy Prime Mininster (ODPM) to draft the National Annex to EC3. An agreed document on 'Development of the National Annexes' to the Eurocodes, the documents that will specify the nationally determined parameters, says that recommended values should be adopted where differences between the old and the new are less than 10%. Recommended values should also apply where differences are greater but research data or the evidence of successful overseas practice justifies the change. National parameters should only depart from recommendations where neither condition is met. "We think that's a reasonable outcome," said Dr Owens.

The efficiency gains will apply to structures where wind loading does not govern the design, such as low rise office buildings. The situation for portal frames is more complex and has not yet been fully investigated.

New team takes over production

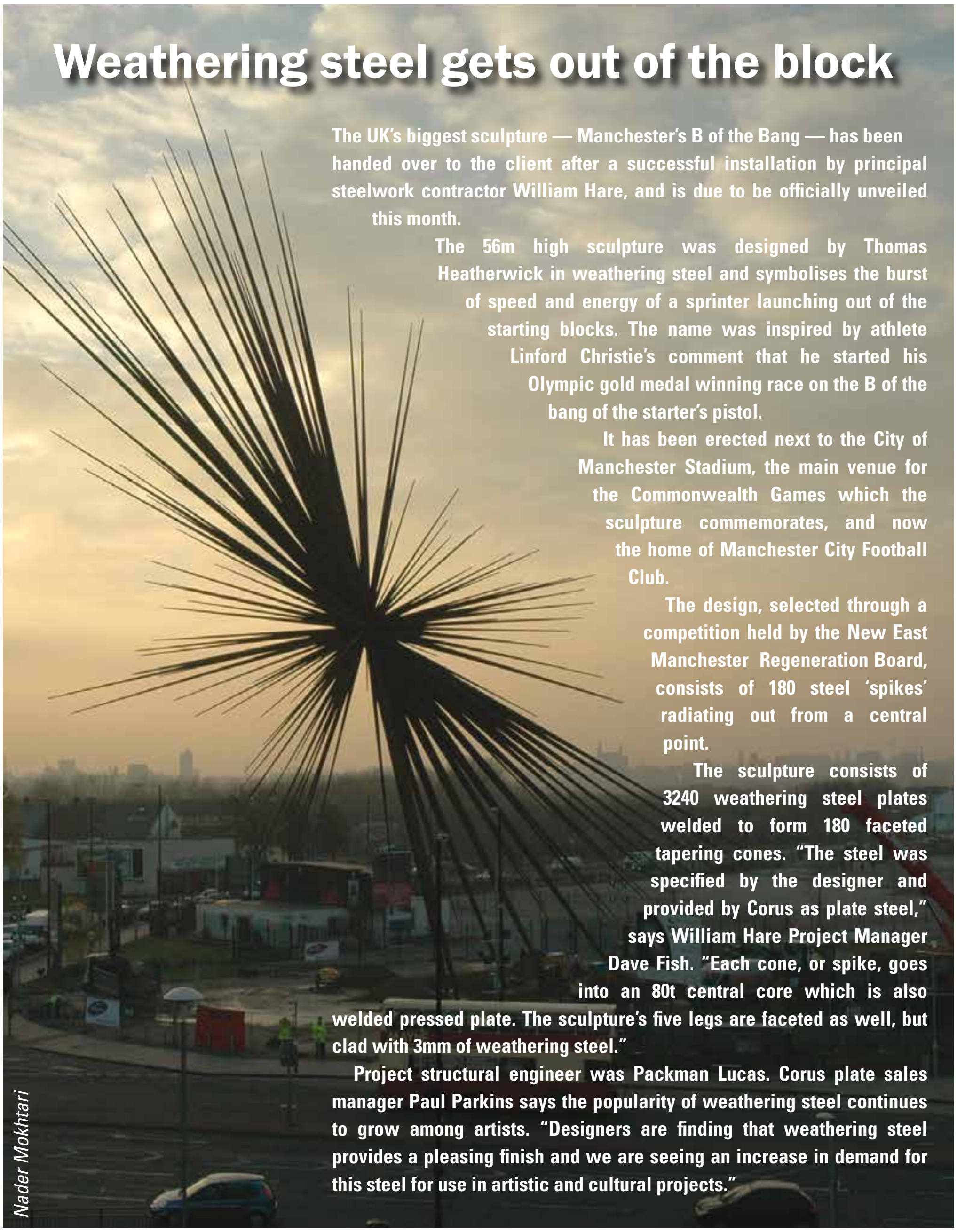
Production and advertising sales of New Steel Construction have been handed over to Barrett Byrd Associates, contract publishers with a long track record of working for the construction industry. BBA has appointed a highly experienced team to take the magazine forward and manage the new demands of monthly publication.

The editorial team is headed by Editor Nick Barrett, who has worked for a wide range of specialist magazines including New Civil Engineer. Deputy Editor is David Fowler, also a former NCE staff writer, and former NCE Editor in Chief Ty Byrd is a Contributing Editor. Advertising Sales Manager Sally Devine has worked in senior roles on construction magazines for over 15 years, mostly with publisher EMAP.

Production Editor Andrew Pilcher has worked in graphic design since the 1980s, and wrote a daily cartoon strip, Millie, for the Daily Mirror.

Nick Barrett said: "We are delighted to have been given this opportunity to take an already well respected publication on to the next stage of its development. Steel is one of the most exciting sectors of the construction industry and the magazine will help spread that message."

L-R David Fowler, Nick Barrett, Andrew Pilcher, Ty Byrd and Sally Devine



Nader Mokhtari

Weathering steel gets out of the block

The UK's biggest sculpture — Manchester's B of the Bang — has been handed over to the client after a successful installation by principal steelwork contractor William Hare, and is due to be officially unveiled this month.

The 56m high sculpture was designed by Thomas Heatherwick in weathering steel and symbolises the burst of speed and energy of a sprinter launching out of the starting blocks. The name was inspired by athlete Linford Christie's comment that he started his Olympic gold medal winning race on the B of the bang of the starter's pistol.

It has been erected next to the City of Manchester Stadium, the main venue for the Commonwealth Games which the sculpture commemorates, and now the home of Manchester City Football Club.

The design, selected through a competition held by the New East Manchester Regeneration Board, consists of 180 steel 'spikes' radiating out from a central point.

The sculpture consists of 3240 weathering steel plates welded to form 180 faceted tapering cones. "The steel was specified by the designer and provided by Corus as plate steel," says William Hare Project Manager Dave Fish. "Each cone, or spike, goes into an 80t central core which is also welded pressed plate. The sculpture's five legs are faceted as well, but clad with 3mm of weathering steel."

Project structural engineer was Packman Lucas. Corus plate sales manager Paul Parkins says the popularity of weathering steel continues to grow among artists. "Designers are finding that weathering steel provides a pleasing finish and we are seeing an increase in demand for this steel for use in artistic and cultural projects."

Steel stays strong in market

Steel continues to be overwhelmingly the structural framing material of choice for multi storey non-residential buildings, according to the latest survey from independent market research consultants Construction Markets.

The survey, commissioned by Corus, is the latest in a series going back to 1980 and is thought to be the biggest of its type in the UK, involving over 600 interviews with construction specifiers. The results show that steel frames have a dominant 69% share of the multi storey buildings market. The survey also shows that the market grew slightly in 2004, with overall floor area constructed in all multi storey buildings increasing to 12,342,000m^2, from 12,202,000m^2 in 2003.

Steel now has a 71% share of the multi storey offices market. In the 'other multi storey buildings' sector, which includes retail, education, leisure and health, steel has a 68% share.

The decline of in situ concrete as a choice for building frames continues, with a market share of only 16.8%, the lowest since the survey began, compared to almost 20% in 2003 and 28.3% only seven years ago. Load bearing masonry had a 9.5% share, while precast concrete accounted for 2.8% and timber 1.7%.

Alan Todd, Corus Construction and Industrial Technical Sales and Marketing General Manager, said: "These figures clearly show that the key multi storey construction markets value steel above any other framing material. The relative competitive situation against other materials like in situ concrete is essentially unchanged by the price increases of the last year, and we can foresee only continued recognition from the construction industry that steel is the natural choice of framing material where factors like speed, cost, and sustainability are important."

Room at the top

A 1960s south London block of flats is being extended by the unusual method of building six additional storeys in steel on top of the existing reinforced concrete frame.

The 24 storey Aragon Tower council block in Deptford has been acquired by Berkeley Homes, which is refurbishing 80 flats and adding new penthouses.

The £520,000 contract to erect 250t of steel was won by Bourne Group Holdings subsidiary Bourne Steel. Contracts Manager Nick Flexen-Cook says that to use steel was the quickest and simplest way in which the extra storeys could be grafted on. "Apart from more stringent health and safety considerations, it's essentially like building a conventional steel structure which could be founded at ground level, but 75m off the ground."

He added: "We're doing as much pre-assembly at ground level as possible to minimise assembly at height." By assembling around 15 components into a box 8m long by 6m square, the equivalent of four hours of crane time can be compressed into one lift.

Steelwork was finished two weeks early in mid-December. The project will feature in a BBC documentary series fronted by Anneka Rice, following regeneration in Deptford over two years.

AROUND THE PRESS

The Times
10 December 2004
Details are emerging about the Burj Dubai, which will be the world's tallest building when it is completed in 2008. It will rise 160 storeys or almost 800m from a 20-acre base which will also incorporate the world's largest shopping mall. The building is being developed by Emaar. Architect is Skidmore, Owings & Merill and a multinational team of Korea's Samsung, Belgium's Besix and local outfit Arabtec is tipped to win the construction contract.

Construction News
9 December 2004
Contractors and rebar fabricators have been warned not to drop tender prices in response to falling scrap metal prices. Scrap constitutes as much as 95% of rebar, but bar mills have warned that the market is too volatile to predict what the long-term price of rebar will be, and to cut prices now could leave fabricators exposed to later rises.

Contract Journal
8 December 2004
Contractor Buckingham Group has replaced Alfred McAlpine on the £42M contract to design and build the 30,000 seat stadium for football club Milton Keynes Dons. Work will start on the project at Denbigh near Bletchley later this month.

Construction News
1 December 2004
Despite a flat commercial property market the steel sector has unveiled its most impressive figures for 15 years. In 2003 steel accounted for more than 50% of the total deck area of road bridges built. Speed of construction has also helped in the uptake of steel in hospital PFI projects.

Construction News
1 December 2004
"There is potential for steel framing to replace blockwork," says Metsec director Erle Andrews. "Anywhere blockwork is used, load-bearing steel framing can carry out at least an equivalent, if not superior, function."

Calderdale schools construction nears completion

Steelwork installation is virtually complete on five new schools under construction near Halifax in West Yorkshire in the first phase of the Calderdale PFI Schools project. Elland Steel Structures has supplied 2,300t of steelwork and around 20,000m^2 of metal decking for the four high schools and one primary school.

Elland designed steelwork connections, erected the steelwork and installed precast stairs and metal deck floors as part of a £2.75M contract for Babcock & Brown Properties. Main contractor Balfour Beatty's programme of works totals £45M.

Martin Tovey, Associate Director of the project's structural engineer Whitbybird said: "Construction of the schools in steel rather than concrete presented a clear economic advantage at the time of procurement. Steel frames also give greater flexibility to allow future alterations to the buildings that would not be possible with load bearing masonry structures."

Elland Commercial Director Jeremy Shorrocks said that early involvement of his company by the project design team had allowed the introduction of efficiencies in developing the steel frame structures.

Construction began on two of the schools in July 2003 and a start on the remainder followed later that year. Steelwork installation for each of the schools took around four weeks. The primary school was completed in August 2004 and all of the schools are due to have begun accepting pupils by April 2005.

Collapse rules progress to a higher level

Design to resist disproportionate collapse became more complex last month as a new Building Regulation came into effect.

Regulation A3 and Approved Document A, which came into force on 1 December, remove the blanket exemption for buildings of four storeys or less.

And buildings of more than 15 storeys or 5000m^2 must undergo a risk assessment taking into account both 'normal' and 'abnormal' hazards.

Rules on disproportionate collapse were introduced to prevent incidents like the 1968 Ronan Point disaster, in which the removal of one wall by a gas explosion led the corner of the building to fail progressively over the whole 23 storeys.

Under the new regulations buildings are divided into four classes by Table 11, which sets out the extent of horizontal and vertical ties needed according to size and occupancy.

For Class 3, the most onerous category, 'a systematic risk assessment of the building should be undertaken taking into account all the normal hazards that may reasonably be foreseen, together with any abnormal hazards'

Charles King, SCI Senior Manager for Standards, said designers should not be misled into thinking that buildings needed to be designed to meet every eventuality, however unlikely — such as being hit by a meteorite. The approved document only gives guidance, he said. "The reg itself is very simple, and that's what you're obliged to fulfil."

The regulation says only that 'the building shall be constructed so that in the event of an accident it will not suffer collapse to an extent disproportionate to the cause'.

A judgement would have to be made on what is disproportionate in the case of rare or highly unlikely events. Mr King said: "It's not very clear, and the designer will have to rely on a sense of reasonableness."

The approved document also stresses that the structural form and concept should be taken into account, something often overlooked. "If you have a concert hall supported on three columns and a train takes one out then you could have a calamity, whereas if it stood on 30 columns you might be able to take out 10 without a disaster occurring," Mr King said. "You could spend weeks doing statistical analysis of improbable events, but it's better to use a form that's inherently insensitive to having elements knocked out."

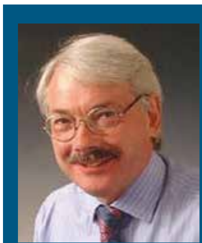
Steel cuts hospital waiting time

Caunton Engineering is well advanced on steel erection for a 16,000m² extension to Stoke Mandeville hospital, near Aylesbury, Bucks. Three new buildings will provide a new public entrance to the site with links to new and existing facilities, including addtional wards with beds for 220 patients and a day surgery operating theatre. In the longer term it will allow a number of older buildings to be demolished.

Part of the main building's curved facade cantilevers over an existing single-storey building. Structurally the cantilever is supported by a one-storey deep lattice girder, with its diagonal bracing concealed in a specially-widened partition.

Structural engineer White Young Green designed the structure to the SCI's 1989 design guide on the vibration of floors. "As operating theatres are not in critical locations the main worry is that footfalls at night would keep patients awake," said Associate Director Jim Seager. Thickened floor slabs, using Holorib decking, which is not so deeply profiled as similar systems, were adopted to increase the mass of the floor and inhibit vibration. The 1989 guide is known to be conservative, and since WYG produced its design the SCI has published updated guidance on minimising vibration in hospitals (see feature page 18).

Work started on site in early June and the extension, which uses over 800t of steel, is due to be completed towards the end of this year. Main contractor for the £39.5M PFI scheme is Alfred McAlpine Capital Projects and Haden Young. Architect is HLM Design International.



New professional challenges for SCI Chairman

Steel Construction Institute Chairman Peter Head is swapping a leading role at FaberMaunsell for one at Arup. The sustainable development and business management specialist is now heading a new business within Arup Consulting intended to put the company at the forefront of urban development.

His remit at Arup is to bring together the company's many skills to create an enhanced, more sustainable offer to clients in urban design and development.

Return to Waterloo

Amec

A £41M project to give a new lease of life to Waterloo station's steel roof was one of five winners in the Institution of Civil Engineers' prestigious Historic Bridge and Infrastructure Awards.

Dating from between 1902 and 1922, the roof covers 19 platforms and is the largest train shed in Europe at 28,000m².

By 1999 maintenance costs had become prohibitive. After a feasibility study of repair and replacement options Network Rail decided to retain the main structure and replace the life-expired roof covering.

Steelwork contractor McNealy Brown dismantled a total of 380 high level trusses which were grit-blasted and galvanised off-site, then replaced in their original location. The primary steelwork was grit-blasted and repainted in situ. A new laminated glazing system completed the transformation.

The judging panel said: "Excellent conservation. The vast roof is essentially the same as when it was built, but daylight without drips can now be enjoyed by the thousands who use Waterloo every day."

Network Rail was client and project manager and Amec was main contractor.

NEWS IN BRIEF

Erection of over 10,000t of steelwork for the new Swale crossing, linking the Isle of Sheppey to mainland Kent, began in December. Working in partnership with Carillion for Sheppey Route Ltd, steelwork specialist Fairfield-Mabey began by lifting temporary frames to the tops of the permanent bridge piers. The frames will support slipper pads to allow the main girders to be launched into place in early spring.

The Sage Gateshead, a £70m music centre comprising a series of concert halls and educational facilities linked by a spectacular glazed concourse, was opened last month. The new home of the Northern Sinfonia, the Sage was designed by Norman Foster.

The Metal Cladding and Roofing Manufacturers Association has published a comprehensively revised version of its Metal Wall Systems Design Guide. The guide can be obtained from mcrma@compuserve.com or downloaded from www.mcrma.co.uk

Joe Locke, a Director of William Hare, retired in December after an illustrious career in contracting that involved many high profile projects around the world. He was President of the BCSA 1988-1990 and European President of ECCS 1998-99. (See profile in next month's NSC.)

NSC Deputy Editor David Fowler has won the Automobile Association Trophy in the Guild of Motoring Writers' 2004 awards, for work in the fields of road safety and the environment.

The steel structures department of Spanish contract research and development specialist LABEIN has joined the STEEL project, which is developing web-based guidance to designers using the Eurocodes. (See feature p24)

Corus Construction and Industrial won three categories at the 2004 Construction Marketing Awards organised by Emap Construct. The 'Steel works' series of ads won the Best Use of Advertising award; Campaign of the Year went to the company's integrated marketing on steel-framed hospital design; and Louise Turner was named Young Marketer of the Year for work with the Corus Fire Engineering Consultancy. The Business was also runner up for 'Construction Brand of the Year' and short-listed in the 'Best Technical Literature' category.

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

Ringing in the new

May I on behalf of the Marketing and Membership Services Committee of the BCSA wish the new editorial team of New Steel Construction every success with their new charge. New Steel Construction has proved an increasingly important publication for the structural steelwork industry, giving the opportunity it does for the steel contractor to read a sharply focused account of latest developments affecting his trade, while offering the opportunity to highlight his company's own achievements.

The success of NSC has undoubtedly been due to the professional skills and talents of the outgoing Editor, John Rawson. The publication itself was still in its infancy when in the early 1990s John took over from Professor David Nethercot who had most successfully launched it. Through John's considerable journalistic and editorial talents, NSC has developed such that it has became the force it is today. The new team has a strong act to follow, and we in the industry wish you every success with cherishing the old and introducing the new to New Steel Construction. I know the structural steelwork industry would like to thank John for his contribution, and to wish him a happy retirement.

Geoffrey H Taylor, Caunton Engineering, Chairman, BCSA Marketing and Membership Services Committee

Accoustic innovation

I read with interest the article on No6 Vauxhall Bridge Road. It raised the question in my mind of how this, and other innovative forms of steel construction, could be shown to meet the regulatory requirements of Part 'E'? Is there any further information available?

Martin Double
CADOSS
by email

The Editor replies: To meet the requirements of Part 'E' for new build residential properties two distinct methods are available. The first method uses approved Robust Details (RD) (such as E-FS-1 for composite metal decks), which has been extensively field-tested, and so avoids the need for pre completion testing. It should be noted that every dwelling built using an RD needs to be registered with Robust Detail Ltd and a plot registration fee paid.

The second method is to use pre-completion testing (PCT) where an RD is not specified, and this involves on-site testing of the actual building to prove the acoustic performance. For buildings using innovative construction details such as Vauxhall Bridge Road, PCT would have to be used to prove the acoustic performance.

It should be noted that all forms of construction (including concrete) are subject to the above form of regulation, with no exceptions. The use of an RD only exempts a dwelling from PCT; other forms of residential construction will require PCT to be undertaken.

More information on the above subject can be found in SCI Publication P336 'Acoustic Detailing for Multi-Storey Residential Buildings' or by visiting the following website: www.robustdetails.com

Vibration response

As a grateful beneficiary of support from the SCI with regard to analysis of the vibration response of hospital floors, we write with a structural engineer's endorsement of the SCI's Vibrations Consultancy (NSC November/December 2004). The SCI has clearly put many hours and expertise into the furthering of knowledge in this area and we congratulate it on the effort and its results.

Our experience of analysis support from the SCI relates to design of a new Treatment Centre at Chichester's St Richard's Hospital (see feature p18). Early on the project looked perfect for a steel frame with composite floors and this type of design proved to be the best solution in terms of meeting the tight construction programme. However, standard guidance, from the NHS Building Specification, necessitated heavy beams and considerable cost to meet allowable vibration response factors.

The re-analysis work carried out by the SCI involved some sophisticated finite element software. This enabled the design to be slimmed down and made feasible in terms of cost. As Paul Devine's article in NSC explains, numerical modelling of whole floors with more realistic consideration of relative positioning of loading allows a lot of the conservatism to be taken out of the design.

Most impressive from our point of view though, was the simplicity with which the SCI explained the analysis results. Clearly there can be complex vibrations occurring in multi-element structures, caused by dynamic superimposed loadings, but with the SCI's help, relatively simple checks can now be carried out to help engineers push designs forward while meeting vibration response limits.

Christopher Self
Partner
Gyoury Self Partnership

Diary

27 January
Preparing for and Implementing Structural Eurocodes
RIBA, London W1.
Organised by Emap Conferences. Understanding the impact on your business and developing a cost-effective strategy for transition. Endorsed by the SCI.
Contact constructconferences@emap.com

27 January - 3 March
Steel in Construction CPD courses.
Glasgow, London and Manchester.
Course gives an overview of steel in construction. Six consecutive Thursday evenings with two one-hour lectures per evening, representing 12 hours or two days of CPD. Sponsored by Corus and the SCI.
Contact: Annabel Herrington, a.herrington@steel_sci.com

20–21 September
International Architecture Symposium
Palace de la Méditerranée, Nice
(organised by ECCS)

15 November
Steel Construction Conference,
The Brewery, Chiswell Street, London EC1
(organised by BCSA)

Healthy, confident and in demand

BCSA President Tom Goldberg reviews the current steel construction market

We have experienced a most unusual 2004 in the steel construction industry. I hope it will help our clients and our steelwork contractors if I review what has happened this year, and what is likely to happen in the future.

Right now, our UK steelwork contractors are experiencing high levels of demand — despite the significant cost increases in our basic material supplies over the last year.

Steel continues to be the UK's (and the world's) most popular construction medium. It is the modern, efficient, sustainable building material. It is constantly achieving new designs, new products and higher standards. It is safe, reliable and eco-friendly. Steel framed buildings only contain 33% more steel than an equivalent reinforced concrete building. While a typical steel framed building's foundations and superstructure use around 65kg of all steel products per m^2 of gross floor area, a typical reinforced concrete frame and flat slab solution will use around 40kg/m^2 of rebar for the same elements. Concrete buildings are therefore also affected by material price increases in steel, in addition to the rising costs of cement, aggregates and shuttering.

In the UK structural steelwork remains the favoured framing material for about 95% of all single-storey buildings and 68% of all multi-storey construction. Steel is also now fast becoming the world's first choice — it represents best value for money, it is a modern and efficient material, it is "green", reliable, quality assured, fast and accurate to build with. In the UK steel continues to win new markets in schools, hospitals, residential buildings and car parks.

No surprise, then, that the developing countries of the 21st century are boosting world demand for steel. China, India, Russia and Brazil — and other fast-growing countries — all want the same modern environment as us… "state-of-the-architect" shopping malls, offices, port and airport facilities, distribution hubs, hi-tech parks, schools, hospitals, apartment blocks.

In 2004 worldwide demand for steel increased by 8%. Despite this surge, shortages in the UK have been avoided and there has been no supply problem. Steelwork contractors have worked hard to keep clients informed of increases and early involvement on projects by the steelwork specialists has paid even greater dividends than normal.

The price of raw steel materials has risen 60% in this past 12 months. The effect of this has been an increase of 20–30% in fabricated steelwork prices (dependent upon the type of structure). In turn, the effect upon total building cost will vary between 3% and 20%, with the greatest effect upon predominantly steel buildings like warehouses. However, increases in global raw material prices have also impacted on virtually all other building materials, including concrete and wood.

Where will steelwork prices go from here? Can't say for certain, but the BCSA's evaluation is that for 2005 we will operate in a much more stable environment. Prices for fabricated steelwork used in the construction industry are expected to increase in the range of some 5% for the whole of the forthcoming year. This is good news for our clients and the construction sector at large, as they will be able to more accurately forecast building costs. In real terms, steelwork prices are now still at the same level as 15 years ago.

Steelwork contractors' order books are healthy into 2005 and we do not anticipate any problems with supplies of steel or availability of fabrication capacity. BCSA members have enjoyed very robust conditions in 2004 and BCSA is optimistic that 2005 will continue to see the benefits of building in steel gain further in preference.

City goes long on frame analysis

A large City of London commercial development has been a proving ground for new fire engineering techniques using finite element frame analysis. Nick Barrett reports from a Framed in Steel seminar which heard how it was done.

A groundbreaking application of the developing science of structural fire engineering has delivered a major new high quality office development on a prime site at the heart of the City of London, on the corner of Eastcheap and Mincing Lane.

Plantation Place South is the second of two adjoining buildings which together constitute one of the City's largest developments. Other innovative aspects of the 160,000 sq ft building's design include the use of load-bearing stone rather than simply stone cladding for the envelope. But attention focuses on the use of finite element analysis based software to produce a rigorous analysis of what will happen to a structure in the event of a real world fire — making some conservative assumptions such as that the sprinkler system is not working — and to calculate where extra fire protection could usefully be applied, and where none is in fact needed.

Architects from Arup Associates told the seminar they chose steel frame as a safe and reliable method for the main framework, using a concrete slipform core. Comparisons were made with concrete alternatives but the small number of bays and consequent lack of repetition took concrete multi-bay construction out of consideration. Concrete would also have created foundation loads 20% higher than for steel. The congested nature of the site meant there would be little room for storing formwork for concreting; steel offered off site fabrication and just in time delivery. Overall, for the same floor depth steel offered a 6% saving in frame costs, 10% on foundations and about 5% in programme benefits.

The ambition was not just to save money on fire protection, stresses Dr Barbara Lane of Arup Fire: "We wanted to demonstrate that a building as complex as this one could be safely and robustly designed using the latest structural fire engineering techniques." Nonetheless, a significant saving was achieved on fire protection.

Dr Lane explained that the traditional fire engineering approach is based substantially on looking up a table and making sure a design complies with it. This regime assumes that all fires are the same, and that a fire in an office is comparable to one at an airport. "Building regulations are derived from old buildings," Dr Lane said.

"They ignore facts such as that whereas an unrestrained beam will deflect at 450°C, a restrained beam will not deflect until 800°C is reached." A frame also has a different response to fire than the traditional furnace tests suggest. Dr Lane and her colleagues drew on the known behaviour of steel in fires from the Broadgate fire and Cardington tests.

She explained: "We calculated what happens in a real fire, using real temperatures. We then calculated the heat transfer through all the structural materials and then we were able to calculate the mechanical response of the whole frame. We then know where fire protection is needed, and also where it is not needed."

At Plantation Place South all secondary beams have been left unprotected. Core connection protection was also modified to accommodate thermal effects. Dr Lane said: "Because of the increased emphasis on structural design we were able to demonstrate that the stability and compartmentation requirement would be met with the reduced level of fire proofing." Armed with this in-depth understanding of structural behaviour in fires, Arup was able to satisfy all other interested parties that the solution was robust — including the client, the building control authority which was the Corporation of London, and the building insurers.

FACT FILE
Client:
The British Land Company plc
Architect and Structural Engineer:
Arup Associates
Fire Engineering:
Arup Fire
Steelwork Contractor:
William Hare Limited

For further information see ***Framed in Steel: Plantation Place South*** *available from Corus Literature Line 01724 404400*

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the complete steelwork solution

Added fibre for faster floors

Polymer fibres are replacing reinforcement in composite floors on a pioneering project in Derby, following a research programme supervised by the SCI. David Fowler reports

Composite steel decking is already one of the quickest and most cost-effective ways of constructing floors in multi-storey buildings.

A new development promises to make it even more efficient. A research programme involving the Steel Construction Institute (SCI), Richard Lees Steel Decking and Grace Construction Products has demonstrated that polymer structural fibre reinforcement can replace virtually all the traditional steel reinforcement, both bar and steel fabric, in composite floors.

This is a breakthrough with implications for quality assurance and for health and safety as well as for cost and timing, because the fibres can be incorporated into the concrete mix.

The first major building to use the technique is currently under construction in Derby. The £12M Joseph Wright Centre is a sixth form college which will form part of Derby College when it opens in September 2005, providing nearly 7000m^2 of classrooms, labs, and IT facilities grouped around a central atrium.

In composite flooring, the profiled steel decking fulfils the function of permanent formwork for the floor slab during construction, and of providing tensile reinforcement when the concrete has cured. Shear connectors are welded through the steel decking to the top flange of the supporting beams prior to placing the concrete to develop the composite action between the beams and slab.

Additional reinforcement is needed in the form of welded wire fabric over the whole floor area to control shrinkage cracking and to spread the forces generated by the shear connectors through the slab. Additional bars over supporting beams resist bending stresses in the top of the slab. The reinforcement is also needed in a fire, when the strength of the exposed decking is reduced.

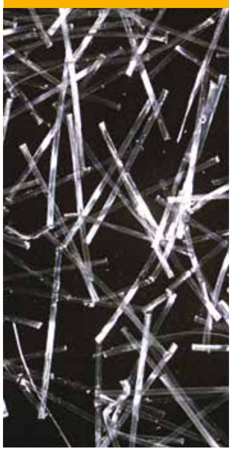
Synthetic microfibres have successfully been used for many years to control shrinkage cracks in ground floor slabs, but not as structural reinforcement in this way. Grace Construction Products had developed Strux 90/40 synthetic structural fibre reinforcement with structural applications in floors and sprayed concrete in mind.

European Product Manager Graham Balmer says: "We wanted to look at steel decking as an application for Strux. We knew we needed partners to assist with the development. The SCI was our first port of call, and from those initial contacts we identified Richard Lees Steel Decking as market leader and approached them."

Richard Lees Steel Decking was interested, having briefly looked into the use of synthetic fibres itself several years ago.

Strux 90/40 was developed by Grace Construction Products' parent company in the US for applications ranging from structural slabs to sprayed concrete.

Strux is a flat fibre manufactured from a co-extrusion of two polymers. The length of the fibres, 40mm, was chosen as the optimum compromise between reinforcement, the ability of the fibres to disperse through the mix, and ability to achieve the required finish.



Before and after: Fibre reinforcement eliminates nearly all steel mesh, along with attendant health, safety and logistical problems

There are a number of potentially significant advantages from being able to omit the reinforcing fabric from a concrete floor slab. "It's difficult getting the steel fabric into the building and it disrupts the critical path," says Richard Lees Steel Decking's Technical Director Adrian Shepherd.

In the traditional approach the sheets of fabric have to be craned up to the required floor. This disrupts construction of the steel frame itself and means that either a section of floor has to be left out all the way up the building to allow lifting to take place, or else the fabric must be offered in through the side of the building. If it is not to be fixed in place immediately, the fabric then has to be stacked until needed.

Specialist labour is needed to fix the reinforcement. Checking to make sure all the reinforcement has been fitted correctly is a significant task in itself.

When fixed, it forms a tripping hazard and it provides a far from ideal surface on which to stand while placing the concrete floor slab. This operation is usually carried out by pumping, and the pump nozzle is likely to snag on the fabric.

Mike Atkinson, Project Manager for Bowmer & Kirkland, the main contractor on the Derby project, adds that other tricky operations include trimming the reinforcement around columns. Another problem arises when the steel fabric moves under the traffic of the concrete placing operatives, causing one end to rise up into the finished surface, with implications for the concrete finish and for corrosion.

By contrast, synthetic structural fibres can be added to the concrete at the supplier's plant and pumped into place in one operation, completely avoiding all these potential problems.

Before any of these advantages could be realised, however, the data to persuade clients and structural engineers of the merits of fibre reinforcement had to be gathered. Grace and Richard Lees Steel Decking commissioned the SCI to oversee a test programme.

Tests included full-scale fire tests to demonstrate that the target fire resistance periods could be met. Small-scale specimens were tested to measure the relationship between cube strength, dosage of fibres and longitudinal shear resistance. Push tests to demonstrate the performance of stud connectors in composite slabs were carried out in which two vertically mounted sections of composite slab were symmetrically loaded in shear through a beam fixed between them.

Mr Balmer says the test programme was extremely rigourous. "The SCI wanted to see a lot of information from first principles, for example how the mechanical properties of the fibre and concrete varied with temperature. So it was a bigger exercise than we initially anticipated."

SCI reported on the tests the partners carried out and produced from the results a set of safe load tables to assist designers using Richard Lees Steel Decking's profiles. The outcome was that the use of fibre allowed all the steel fabric to be

FACT FILE

Joseph Wright Sixth Form Centre, Derby

TEAM

Client
Cedar House Investments

Architect
Maber Associates

Structural engineer
BWB

Main contractor
Bowmer & Kirkland

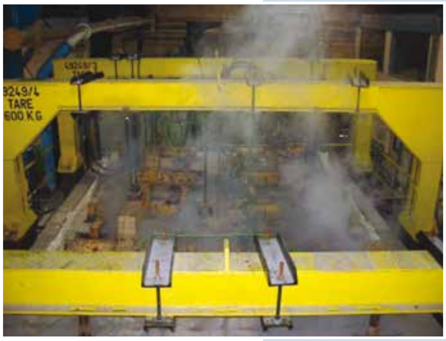
Steelwork contractor
Severfield-Reeve Structures

Steel floor contractor
Richard Lees Steel Decking

Civil contractor
C J Haughey

Project value
£12M

The SCI was commissioned by Richard Lees Steel Decking and Grace Construction Products to supervise a year-long R&D programme. It provided technical backup, produced a report and devised design guidance in the form of safe load tables on the use of their products in fibre reinforced composite floors.



Programme included full scale fire tests and push tests to check composite action was being developed

The SCI Building Engineering Manager Dr Stephen Hicks says: "One of the main questions was: with no bars crossing the shear connectors, could you rely on the forces being transferred into the slab?"

There were also questions over fire resistance. "It wasn't obvious how well the slab would perform at the fire limit state. Because the fibres have a relatively low melting point, you'd expect some loss of strength."

Richard Lees Steel Decking had fire-tested a slab in 1988 using standard polypropylene microfibres, the type used for crack control in ground floor slabs. Though the test slab successfully met all the criteria needed to achieve a fire rating, there was concern regarding the extent of cracking over the intermediate support beam and the company did not take the research any further.

Two full-scale fire tests using Holorib and Ribdeck E60 were carried out at Warrington Fire Research Centre. These modelled 3m spans in the most onerous condition, an end bay. The spans were subjected to an imposed load of 6.7kN/m^2 and both satisfied the test criteria for load bearing capacity, integrity and insulation. Grace Construction Products supplied additional information on the behaviour of the fibres at elevated temperatures, derived from tests undertaken at their headquarters at Boston, Massachusetts.

Tests to BS5950 on small scale specimens were carried out at Bath University to evaluate shear resistance. The specimens have two built-in slots designed to induce failure in pure shear when an axial load is applied. From this SCI was able to produce a design equation relating shear resistance to cube strength and fibre dosage. Three dosages were considered, of which the intermediate value of 5.3kg/m^3 was found to be the optimum.

Push tests on two sections of composite deck mounted vertically either side of a vertical steel beam were undertaken at Cambridge University to demonstrate the ductility of the welded shear studs and to assess the effect of the geometry of the steel decking. In profiled steel sheeting the geometry of the deck affects the behaviour of the shear connection, and the test allowed an accurate reduction factor, relating the shear resistance of the profiled deck to that of a rectangular slab, to be determined.

This test was carried out in accordance with BS EN 1919 so that it will be applicable to designs to the forthcoming Eurocodes. It showed that both ductility and shear resistance were slightly higher in the fibre reinforced deck than a conventionally reinforced one.

From the test data SCI developed a numerical model which could be extended to other slab conditions and loads.

"Initially we hoped to demonstrate you could reduce the amount of fabric needed," says Dr Hicks, "but the tests showed you could dispense with it altogether. We also proved that you don't need any reinforcing bars to prevent the splitting effect between the deck and the slab."

Complicated reinforcement details around columns are avoided

omitted, as well as loose bars over internal beams, for slab spans and floor loading regimes typically required of this form of construction. The fibres are equivalent to transverse shear reinforcement consisting of T20 bars at 100mm centres. U-bars around shear studs on external beams are the only additional reinforcement needed.

Experience on the Derby project showed that the required quality of finish can be achieved. Techniques such as power-floating can still be used.

Bowmer & Kirkland's Mike Atkinson is enthusiastic about the use of fibres. "Every process has productivity, quality and safety implications," he says. "If you take a whole process out you take out all the implications."

The fact that the fibres are added by the concrete supplier at his plant is a major advantage, says Atkinson: "It's done under their QA process so it's a controlled regime." As much as 10% could be saved from the structural cost, and a huge 25% saving in construction time.

Overall, he says: "Using fibre reinforced floors produced a big programme advantage and a substantial reduction in the time taken to prepare the slab."

Mr Balmer says of the performance on the Derby contract: "We're very pleased. We've learned a lot from this project which we'll be able to build into future ones." He makes the point that it is important to be involved with discussions with the main contractor and flooring contractor about what finish will be required and to make sure the right admixtures are specified. "We're pumping concrete with a high fibre dosage and attention to detail is important," he says. "It's important to pay attention to the business of mix design. We would want to advise on the right admixtures to make sure the concrete is workable and finishable."

He adds that there have been a number of enquiries about the use of the technique from other projects. In summary, he says: "I think it'll make a lot of people's lives easier."

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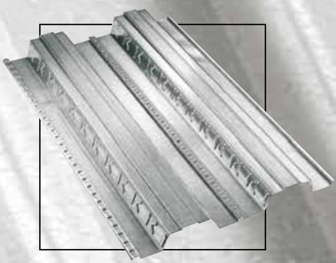

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www.rlsd.com

RICHARD LEES STEEL DECKING

New guide's subdued response factor

Use of the latest design guide on hospital floor vibration has allowed a new Treatment Centre to be constructed in steel to a very tight programme. Jon Masters reports.

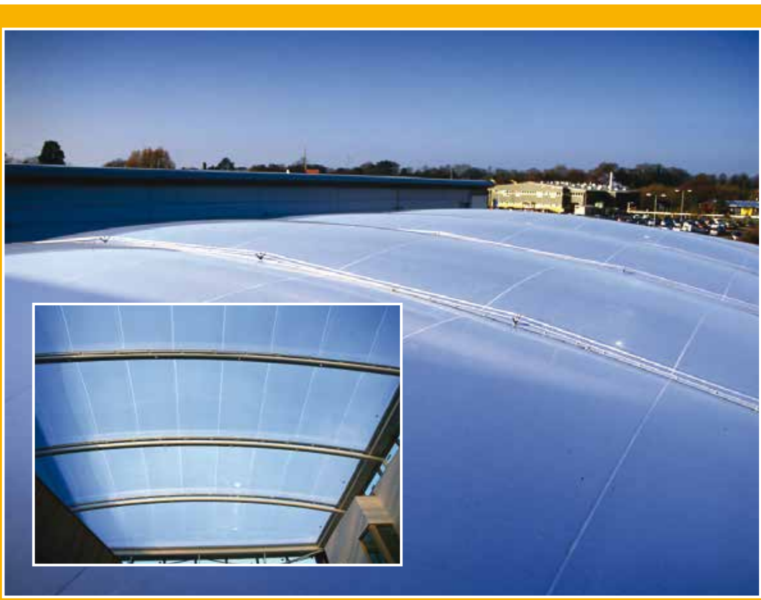
FACT FILE
Chichester Treatment Centre
Client:
Royal West Sussex NHS Trust
Project Architect:
Nightingale Associates
Engineer:
Gyoury Self Partnership
Main Contractor:
Henry Jones
Steelwork Contractor:
F H Dale

Rapid construction of a new Treatment Centre for diagnosis and surgery at Chichester's St Richard's Hospital is on schedule for the first patients to be admitted in April 2005. That the building is being delivered on time owes much to new knowledge of vibration which confirms steel is a viable option for hospital structures.

In designing the innovative structure, consulting engineer Gyoury Self was substantially assisted by the Steel Construction Institute's Dr Stephen Hicks, who provided a pre-publication draft of the new 'Design guide on the vibration of floors in hospitals'. The guide, officially published in February 2004, encouraged the use of steel at Chichester and allowed the centre to effectively demonstrate that steel structures can meet stringent vibration criteria for hospitals both efficiently and affordably.

"The timing was perfect," says Partner Chris Self of structural engineer Gyoury Self. "We were facing a problem just as Dr Hicks was finishing the new design guide that would ultimately provide the solution. Concrete construction was ruled out early on because the given programme of just 15 months demanded a quicker method of construction. A steel frame was the answer but meeting the existing design criteria meant quite large section sizes."

Vibration is the dominant criterion in hospital design. It is measured by a response factor that compares acceleration on a floor with the 'base value' defined in BS 6472, which defines the threshold of human perception to vibrations. Response factors for hospitals, set to cause minimal disturbance to patients and sensitive equipment, are limited to 1.4 in wards during the night and 1.0 for day- and night-time use in surgical theatres. This compares with a typical response limit for offices of 8.0.



Project Architect Nightingale Associates was given a brief of making the Chichester Treatment Centre a new entrance and focal point of St Richard's Hospital. The response is a dramatic design. The two storey building is a U-shape, 45m wide by 50m deep in plan, wrapped around a 15m wide central atrium. This also leads to the core of the main hospital via a naturally lit corridor that bridges across other existing hospital buildings.

The atrium is an open space to the full height of the building, containing a new main reception area which is topped with a lightweight Texlon cushion roof supported by circular hollow sections. The roof has two skins of self cleaning Texlon, joined to create a pillow effect and inflated by a continuous supply of air to prevent condensation and create a naturally lit space protected from direct sunlight.

Another requirement was provision for future changes of building use. This has been accommodated by use of metal stud work for all internal walls with the exception of wet areas and lift shafts. Additional steel framing has been needed to support lead doors to X-ray rooms and bracing is provided by both diagonal cross-bracing and some portal frames to suit the architectural layout.

1 *The centre will form a new focal point to St Richard's Hospital*
2 *Slimdek floor's shallow depth left space for services*
3 *New guide allowed steel section depth to be reduced by up to 40%*

Gyoury Self was initially working to the 1989 vibration design guide SCI Publication 076 for the design of the Chichester Treatment Centre. The firm had selected Corus' Slimdek steel and concrete composite floor system for the two and three storey structure.

"Slimdek enables fast track construction and its relatively thin overall depth, of 335mm at Chichester, gives a lot of flexibility for services, which was essential as a performance specification had been set for the M&E works," Self says.

"It also requires no additional fire engineering for one hour fire resistance and Slimdek's in situ concrete slab provided sufficient mass to meet the desired vibration response. On an elemental basis, though, the guidance current at the time demanded heavy asymmetric steel beams to adequately stiffen the floor."

"We had a scheme that worked but did not present cost effective use of the steel," says Gyoury Self Senior Engineer David Simmonds. "That was until Corus put us in touch with Dr Hicks who gave us a draft copy of the new guide. This permitted us to reduce section size by about 40% overall and get rid of some intermediate beams altogether."

The timing dates back to the spring of 2003 when the new design guide was in draft form after five years of work at the SCI dedicated to updating Publication 076. The research included dynamic testing of existing hospital floors with various structural steel arrangements. After determining the walking pace that produced the biggest floor response, controlled walking tests were performed to assess principal response factors.

Comparison with acceptance levels in the NHS performance standard Health Technical Memorandum 2045 followed and the steel composite floors were found to be well within minimum vibration requirements.

Writing the new design guide was the next step, working back from the response test results to refine analytical modelling of the floors' dynamic properties. The resulting guide was published in February 2004. Crucially, it advises assessment of whole floors as an extension of the traditional practice of checking individual elements.

This was the critical difference made to the Chichester scheme. Simmonds says: "Dr Hicks modelled the whole floor in one hit using some quite sophisticated finite element software. This took the analysis one important stage further and backed up what the guide produced, which was an affordable design that met the vibration criteria."

Confirmation of Gyoury Self's new design was the green light for the Chichester Treatment Centre. Work started on site in October 2003 with erection of the steel frame beginning in January 2004. "Main contractor Henry Jones was casting floors by the February, which shows how quickly the steel went up," says Simmonds. "The load-bearing masonry of an adjoining catering building was still only just coming out of the ground."

Construction had to progress rapidly. Client the Royal West Sussex NHS Trust wanted the Treatment Centre to be accepting patients by April 2005 to improve service and waiting times.

The £12M Chichester Treatment Centre is one of around 15 currently being built as part of a national NHS building programme aimed at meeting Government waiting list targets. Treatment Centres are a vital part of the drive for more reliable treatment programmes because they will only provide routine diagnosis and surgery, without interruption from the demands of accident and emergency.

With several months of fit-out and equipment commissioning involved before the Chichester Treatment Centre could be declared open, a main construction programme of just 15 months was set. Henry Jones' contract includes fit out of services and the contractor was able to start this towards the end of 2004, with more than a little help from the result of five years of steel vibration analysis.

VIBRATION TESTS

Results of real tests on real hospital floors have shown how well steel framed composite construction performs against the strict NHS vibration criteria. Limits set down in the Health Technical Memorandum 2045 are easily met by long-span composite beams of the type used so extensively in UK offices.

The longest span tested so far is 15m supporting a 175mm slab, which produced a response factor of 0.49 and a fundamental frequency of 7.6 Hz. This design provided enormous flexibility of the space below and a floor that comfortably met the required response factor of 1.0.

Steel frames are now the standard in the health sector and these are being chosen for their economy and efficiency. Now that it has become well known how easily standard steel floor designs meet vibration criteria, steel is being chosen for the speed and quality of build and the flexibility generated by long spanning solutions.

Logistics centre rises rapidly

FACT FILE
G.Park Bedford
Client -
Gazeley Properties
Main Contractor -
UK GSE Limited
Architect -
Chetwood Associates
Structural Engineer -
Roscoe Capita
Steelwork Contractor -
Atlas Ward Structures Limited

A mammoth distribution shed being erected in Bedford demonstrates the growing market demand for large logistics centres

Close working relationships between the members of a regular team helped Atlas Ward Structures fabricate and erect a massive 1500-tonne distribution shed in just 13 weeks.

The 42,000m^2 G.Park Bedford is one of a number of centres being developed by Gazeley Properties across five UK sites. The completed building was handed over to the client in November.

The speculatively-built structure consists of four 29m portal frames and overall is 360m long, 116m wide and has a clear height of 15m. Its location in Bedford gives it good strategic links via both the M1 and the A1.

Atlas Ward Structures Engineering Manager Jim Martindale says the project was technically relatively straightforward: "The challenge was in the turn-round time," he says. "From receipt of order to handover we had 13 weeks: seven weeks' fabrication and six weeks' erection."

It was possible to achieve this speed through experience on other contracts, Martindale said. The project was one of a number of recent design and build contracts it has carried out with the same team. This comprises Gazeley, main contractor UK GSE, consulting engineer Capita Symonds, architect Chetwood Associates and quantity surveyor W H Stephens. GSE is responsible for the design and construction of logistics facilities developed by Gazeley throughout Europe, specialising in the construction of bespoke, turnkey buildings.

"The benefit of working with familiar faces is that we know what the client wants. This eliminates variations and helps us to achieve a fast programme," says Martindale.

Estimating Manager Ian Rackham adds: "As Gazeley use the same two or three architects and engineers on a regular basis, the teamwork approach works a treat.

"The flow of information is always a difficulty on construction projects, so the benefits of keeping the same team together from one project to the next are clear for all to see. For example, using the same details at eaves, valleys or doors can chop out long periods of time waiting for details to come through, which ultimately improves both the lead-in time and the overall programme period."

Rackham says there is still scope to make the process even more efficient, which will benefit the Gazeley team and create repeat business from other key clients.

The market for large distribution sheds of around 20,000m^2 to 80,000m^2 is growing. Atlas Ward built around 15 in 2004 and demand appears to be continuing into the first half of this year, Rackham says.

This reflects healthy growth in the industrial sector generally, fuelled by the rise in consumer spending. Atlas Ward's industrial portfolio rose 85% to £29M in 2004.

Gazeley, a subsidiary of WalMart which specialises in developing distribution property, has 12% of the UK market and has developed over 2,000,000m^2 of space in the UK in the last 15 years. This includes Europe's largest dedicated distribution park, Magna Park in Leicestershire. It has started to introduce the concept across Europe where it plans to develop 30 logistics parks, based on the Magna Park model.

Bridges breakthrough

Steel overbridges are increasingly appearing on major new highways where once concrete dominated. Nick Barrett analyses the factors behind changing trends in the key part of the bridge market in the UK.

Steel composite construction is increasingly favoured for ease of construction when crossing live carriageways or difficult terrain as seen in the A1(M)/M62 interchange at Ferrybridge, above, and Pont Dewi Sant and the new Swale crossing, opposite.

Steel has been the economic solution for medium and long span bridges since the mid 1980s, but for short span bridges on greenfield sites in particular steel has struggled — until now. Steel was typically used on only a limited number of locations, for example where its advantages of speed and ease of installation came into their own. New procurement routes like Design & Build, Private Finance Initiative and Early Contractor Involvement are giving contractors a greater say in the choice of structural material, and with greater freedom to select steel, many are taking that option.

Price is partly the reason. Steel has become more competitive. Main contractors have a detailed knowledge of the relative economics of steel versus concrete and a good understanding of project costs, which are lower for steel. Also, the Highways Agency has started taking speed of construction into account in assessing tenders, which also brings steel to the fore.

Traditional views that steel bridges involved greater whole life costs are being revised. Thanks to a relaxation of Highways Agency standard minimum headroom requirements for weathering steel road overbridges, low maintenance weathering steel is being selected for an increasing number of locations. Another reason for the improving whole life cost profile of steel bridges is that there have been significant advances in coating technology: the latest coating systems are expected to have a working life in excess of 40 years.

Steelwork contractors say steel is increasingly appreciated for ease of maintenance — and concrete is no longer regarded as quite the maintenance free material it once was. The condition of steelwork can be easily viewed, giving bridge owners the reassurance that all is well. Any problems are readily apparent, and can swiftly be addressed by repainting. The first sign of problems with concrete bridges is often spalling due to the expansive forces created by corroding reinforcement bars.

The privately financed Birmingham Northern Relief Road, now the M6 Toll, was a major success for steel, where concrete might have been expected to capture most of the work in the past. All the 46 overbridges here are in steel — 10 years ago steelwork contractors would have expected to get hardly any business on a new motorway. The M6 Toll is significant primarily because steel composite bridges were chosen even though it was a “greenfield” site, which traditionally favoured concrete bridges.

“There were no overbridges on the M6 Toll in concrete at all, other than an extension to an existing bridge which was built in concrete some years ago,” says steelwork contractor Fairfield Mabey’s Managing Director Dr Peter Lloyd. “We have always thought that bridges with spans of over 25m should be in steel for economy if nothing else,

Steel was chosen for the recently completed £38.5M Chieveley A34/M4 junction 13 improvement contract, awarded to design and build contractor Costain with designer Mott MacDonald. It is believed to be the first contract where the Highways Agency assigned a monetary value to speed of construction in assessing tenders. It is also one of the first projects to benefit from the Highways Agency's reduction in the minimum headroom for weathering steel girders over roads from 7.5m to the standard 5.3m.

The contract includes five steel overbridges carrying A34 slip roads and a local road which crosses the A34, all of steel composite construction using weathering steel, despite having been shown as concrete in the illustrative design on which tenders were based. David Place, Project Engineer in Mott MacDonald's bridges department, says: "We had to come up with the lowest capital cost, the lowest whole life cost and a solution that would be quickest to build. Without a doubt, for a bridge over a motorway or dual carriageway, for a two, three or four span structure 40m to 100m in overall length, we regard steel composite as the market leader."

A key reason for the growing popularity of steel is that steel decks can be quickly lifted into place during limited carriageway possessions, whereas concrete needs a lot of scaffolding which effectively closes carriageways for extended periods. Even on greenfield sites where lane closures are not a factor, steel appeals because it allows haul roads to be kept open during bridge construction. The main steel for each bridge was erected in under a week.

Place said the Highways Agency's reduction in the minimum headroom requirement for weathering steel beams over roads means weathering steel can compete on more equal terms. The old 7.5m headroom, based on fears about the effect of de-icing salt spray, meant higher earthworks and significant add-on costs.

Dr Lloyd says: "Steel bridges can also be strengthened to meet changing needs easier than concrete bridges. In the event of a bridge-bashing incident steel girders will deflect and can be put back on line using a process of heat straightening. But in a concrete bridge the edge beam may need to be completely replaced if a tendon is broken."

but on the M6 Toll we saw bridges with spans as short as 20m. We are seeing this trend throughout the country and not only on PFI projects."

Dr Lloyd says choice of steel is being increasingly justified by a range of factors, including price, whole life cost, ease of installation and because of recent technical breakthroughs in coating technology and steel fabrication. Price is still quoted by designers and contractors as a deciding factor, despite recent steel price rises. "There is a lot of steel even in a concrete deck," says Dr Lloyd. "A typical steel bridge might contain 326t of steel while a reinforced concrete one still has some 226t. Rebar prices have risen over the past year, with the percentage rise far exceeding that for the steel plates that are normally used for bridge fabrication, and the concrete industry has issued further price warnings recently due to rising energy and raw material costs. Consequently, the competitive situation remains largely unchanged."

It is difficult to compare prices due to the difficulty of comparing like with like. "Until very recently, there have been no reliable figures for the market share of steel versus concrete bridges, and no long term evidence of price trends specifically for bridges has been collated," says Chris Dolling of Corus. "But we can use structural steel versus in situ concrete figures as reasonable proxies. Although these relate to buildings rather than bridges, they come from a neutral source, the Department of Trade and Industry.

"These figures show that concrete construction prices have risen by 20% more in real terms than steel over the past ten years or so, despite the recent steel price rises. Today's structural steelwork prices are the same in real terms as they were in 1995."

A market survey produced for Corus by Construction Markets shows that in 2003, in terms of deck area, steel accounted for 88,900m² out of a total of 165,000m², with 23,000m² precast and 53,300m² in situ concrete. Dolling said: "We do not have comparable figures for earlier years but the figures confirmed to us that steel has made a major breakthrough into the market for road bridges."

Technical breakthroughs have also enhanced the prospects of steel. For example, says Dr Lloyd, being able to curve steelwork in plan without cranked joints is a major development in bridge fabrication of the past five years. "This gives two major advantages, firstly by significantly improving the aesthetic appearance of a structure as all of the main structural members can form smooth curves throughout its the entire length; and secondly, the construction of a typical concrete composite deck is much simpler, allowing a standard size of precast "Omnia" planks and a standard edge cantilever formwork system to be used throughout. There may be some additional costs associated with the steelwork fabrication and erection, but these are far outweighed by the savings in the deck construction."

STEEL ensures economical design

First fruits of a unique, pan-European effort to help designers use the new Eurocodes will be going online later this year. David Fowler reports on progress.

The introduction of the Eurocodes in a year's time will herald a fundamental change in the way buildings are designed. Though there will be a transition period until 2010 before the old codes are withdrawn, public sector clients could insist on the use of the Eurocodes from day one.

The Institution of Structural Engineers identified provision of guidance for designers on using the codes as an urgent priority in a report this year to the Office of the Deputy Prime Minister. It called for government support to help industry develop the relevant documents.

But the steel industry is already addressing the problem. A unique pan-European initiative, STEEL (a Supranational Tool for the Enhancement of the Eurocodes on-line), will provide simple to use web-based information to help construction teams design effectively to the new codes.

The project is being led by the Steel Construction Institute, with steel information centre partners in France (CTICM), Germany (RWTH Aachen), Spain (Labein) and Sweden (SBI). The project is 50% funded by steel producers, led by Corus and Arcelor, and 50% by the European eContent programme. CSC (UK) and e-Training International (Ireland) are also partners. SCI is responsible for information technology management.

Steel designers already have more on their plate than those using other materials. Not only will there be more parts to the steel Eurocode, covering specialist structures such as bridges, masts, silos and pipelines. Designers will also have to refer to more sources of information than in the past.

"To design a low-rise office building to Eurocode 3 could require 34 documents," says Dr Graham Owens, Director of the Steel Construction Institute and Technical Co-ordinator for STEEL.

Traditionally, UK codes of practice such as BS 5950 were intended to be essentially complete design guides. The Eurocodes omit anything considered 'text book material' — such as calculating the critical stress for a frame. The idea is that such information will be included in guidance documents written by the industry and approved by the BSI in the UK, referred to as 'non-contradictory complementary information' or NCCIs.

Other parameters are not specified in the codes, but are to be determined nationally and set out in National Annexes to the codes, which the Office of the Deputy Prime Minister has commissioned the BCSA and the SCI to write. These include deflection limits, factors of safety (see News) and even the effective length of columns, on which the drafting committee could not agree.

The STEEL website aims to fill this information gap, at the same time as taking account of national variations. By making simple design guidance available, it also aims to dispel the myth, current in many European markets, that steel is more complex or specialist than concrete.

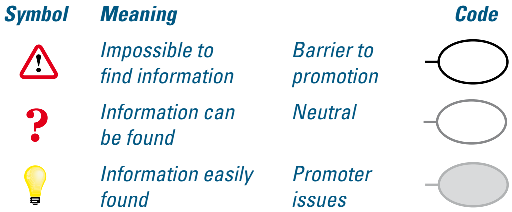
"It's cheaper to design in steel than concrete in the UK because so much help is available. That's not true in the rest of Europe," says Dr Owens. "And the leap from most national standards to the Eurocode is bigger for steel than for concrete. The

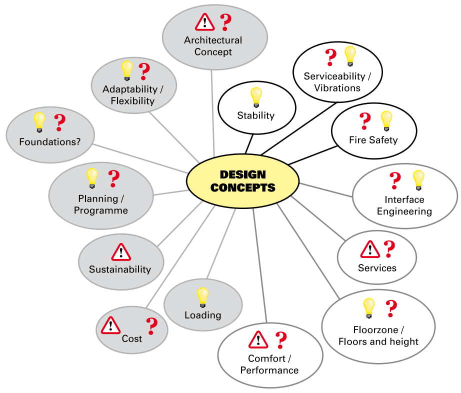
Avant garde: Terrell International (Partner John Hanlon, left) woke up the French market to steel with buildings such as Le Colisée (below) and La Sequana (right)

Paris-based structural consultant Terrell International, founded by British engineer Peter Terrell, has been instrumental in gaining acceptance for steel-framed buildings in a market where concrete previously dominated. Once developers saw the market's eagerness for offices with large column-free spans steel began to make an impact.

France had no code of practice for composite design until the draft Eurocode ENV 1994 was introduced in the mid-1990s. This enabled Terrell to pioneer composite floors in 1994's Le Colisée. Partner John Hanlon says: "The use of ENV 1994 on composite construction was a key factor in the more widespread acceptance of steel frames in Paris in the 1990s. Careful implementation of the full Eurocodes could create major opportunities for growth in the use of steel in construction elsewhere in Europe."

SCI's "mind maps" summarise barriers to use of steel and where information was lacking





SCI Director Dr Graham Owens: new codes omit "text book material"

threat is that if people don't make the transition there is a risk of losing market share to concrete."

He adds: "I think that in this country we'll do what it takes to make sure the tools are around for engineers to design effectively. In the rest of Europe the steel market is less strong and there is less investment in design aids, so there is more risk."

Conversely, the opportunity exists to make big inroads into overseas markets where steel has a much lower share of the market than in the UK. There is also the opportunity to encourage technology transfer. Composite construction, for example, was virtually unused in France until the draft Eurocode ENV 1994 was published in the mid-1990s, because there was no French code for composite design.

STEEL is concentrating on four areas of design: multi-storey buildings; industrial buildings; residential construction; and cost-effective fire performance. The website will go live with the first of these around the middle of next year, with the others following over the next two years.

There has been extensive consultation with potential users. "The overriding message to us was: we want you to keep the guidance simple, not too academic," says Christine Roszykiewicz, SCI International Co-ordinator and STEEL Project Manager. There will be three levels of information. Level one will include concepts and case studies and will be aimed at clients as well as designers. Level two will be design development information both for architects and engineers, covering topics such as building layout. Level three will be detailed design information for the engineer.

A user-needs analysis workshop involving 100 structural designers from 21 countries held in Brussels last July was used to decide what information STEEL should provide. After briefings on the codes, delegates split into groups for each of the areas of interest — residential, industrial and office buildings. Fire safety engineering was a feature of all three groups. It is such an important topic in continental Europe that it was subsequently decided to treat it as a separate application.

The groups identified stakeholders in each country, including members of the supply chain, and produced flow charts to summarise the design process. It was "a pleasant surprise" to find that these came out pretty similar in each locality, says Dr Owens.

The groups then considered what information clients and contractors needed and what factors were barriers to or promoters of the choice of steel. Flow charts or "mind maps" identifed these factors together with an assessment of how much information was available about each. The intention is that STEEL will concentrate on the areas, whether promoters or barriers, where information is lacking.

Because it would be impossible to provide all the information identified, delegates were then forced to prioritise it. The mechanism was to assign notional monetary values to each parcel of information, with everything on offer adding up to 1500 monetary units. The delegates were given 600 units to 'spend'.

The delegates' choice was simplified information for the design of a complete building, to guide designers through each step in the sequence. It was to be harmonised across Europe and was to include worked examples, NCCIs, flow charts of the design process and guidance on using the Eurocodes for specific applications.

SCI and its partners are now at work to produce this. Information for multi-storey office buildings is most advanced and is on target for the planned website launch this summer. Guidance on industrial buildings, residential blocks and fire engineering will follow over the ensuing year.

The database will be translated into the EU's four main languages — English, French, German and Spanish. A pan-European steering committee will ensure it takes account of local variations.

Each piece of information on the website will be tagged to show whether it is completely harmonised across Europe, or where there are national deviations. Users of the database will have registered the country in which they are working at the outset and when they conduct a search, only items relevant to their locality will come up. Country representatives on the steering committee will be able to say how they want each piece of information flagged. So an item which does not apply in Spain, for example, could either be completely ignored by the search engine or brought to the user's attention with a comment in Spanish attached if that is thought appropriate. In due course the website could be translated into other languages, though that is beyond the scope of the current project.

Funding for the current project runs to June 2006, but Mrs Roszykiewicz says: "We will be disappointed, if the project is as successful as we expect, if there is not interest within the steel industry in adding further content after that."

The Eurocodes are coming... but does the steel know?

Steel's fundamental behaviour is unchanged by the advent of the Eurocodes, and under the surface of the new documents there is much that should be familiar, says SCI Deputy Director David Brown

SCI Deputy Director David Brown

Plenty of articles are starting to appear about the imminent arrival of the Eurocodes. From the Government down, there is an awakening of interest. In the constructional steelwork sector, projects are in place to support the implementation of the Eurocodes across Europe, and closer to home, detailed guidance for the UK is under way.

But, of course, no-one told the steel. Steel's behaviour is entirely independent of any code — it obeys the laws of structural mechanics, whatever a national standard might say. The Eurocodes cover the very same structural mechanics as our own British Standards, so we would not be surprised to find that capacities (or resistances, in Euro-speak) are quite similar. We would also not be surprised to find that the approaches in, say, BS 5950, are often mirrored in BS EN 1993 (or EC3 for short) — although the methods are cunningly disguised to look different. Remove the disguise, and the methodology often looks comfortingly familiar. This article looks at just some of the significant technical areas in the Eurocodes, and tries to show that for BS 5950 designers, it's not a step change to the Eurocodes. BS 449 designers take note...

Load combinations

The load combinations in EC3 look different, with an abundance of unfamiliar symbols, and we will find them to be different, especially as our familiar friend of 'gravity loads only' will have disappeared. The 'gravity load combination' will include some wind load, albeit with a reduced load factor. This is how the Eurocodes approach load combinations – with varying mixes of imposed loads. Thus one case will include full floor loads combined with reduced wind loads, while another will include full wind loads but reduced floor loads.

For further finesse, you could choose to combine higher factors on the dead (or permanent in Euro-speak) loads with lower factors on the imposed loads, and a second combination with lower factors on the permanent loads and higher on the imposed loads. Until the all-important National Annex is published, there is little point in speculating on what the factors will be, but considering different combinations is unlikely to challenge the Eurocode designer.

Brittle Fracture

The Eurocode approach does follow a different approach to BS 5950. We are all familiar with looking at the state of stress, and the stress raisers present in the steelwork to give a K factor from Table 3 of BS 5950. (At least we should be – but the vast majority of designers leave this important area untouched.) In BS 5950, we can then choose an appropriate sub-grade, depending on the thickest element and the service temperature. The approach in the Eurocode is to calculate a notional 'reference temperature', which is colder than the lowest air temperatures, and depends on the state of stress, strain rate and so on. For colder reference temperatures and thicker elements, a tougher steel sub-grade is required. Again, until the National Annex is published, direct comparisons with BS 5950 cannot be made.

Notional Loads and Sway Stability

One day, designers will thank the authors of BS 5950-1:2000 for introducing issues of sway stability with clarity into the national standard. Without such an introduction, the frame stability clauses in EC3 would be quite new – as it is, they appear as familiar friends. EC3 advises that frame imperfections must be modelled, and offers the diagram shown here as Figure 1.

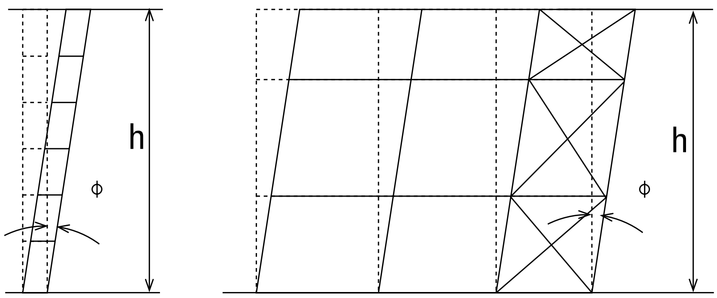


Figure 1. Modelling of frame imperfections.

Fortunately, the Eurocode also says that instead of modelling the frame with a real out-of-plumb, equivalent horizontal loads can be used. Here a sense of comfort takes over, as the equivalent horizontal loads are 0.5% of the factored vertical loads – our very own Notional Horizontal Forces (ie NHFs) in BS 5950. One interesting difference is that the Eurocode insists that NHFs are included in every load combination – whereas in the UK we only apply them in the 'gravity load only' combination. Many times, delegates on SCI courses have pointed out that the UK practice implies that frame imperfections switch themselves off when the wind blows. Our UK NHFs are so much more intelligent than their continental cousins, we reply.

Having just got used to measuring frame

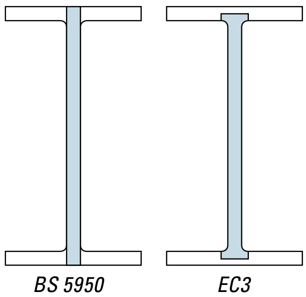


Figure 2. Diagram of shear areas

stability by λ_{cr} we must change to α_{cr} and a slightly different calculation. But the difference is modest, and becomes insignificant in most buildings – so our structures do not suddenly become unstable. The Eurocode offers various other degrees of finesse in calculating the equivalent horizontal loads, depending on column height ("they can't lean that much all the way up") and numbers of columns ("they can't all lean over like that"), which do look rather enticing to pursue. This can be helpful in reducing the lateral loads to be carried by bracing, for example. The reduced equivalent imperfection loads might also look attractive when calculating α_{cr}. Investigating this for a recent course, however, we discovered that though the reduction looks attractive, the eventual impact in an amplification factor (equivalent to k_{amp} in BS 5950) was a difference only at the third decimal place. C'est la vie!

Member resistances

It is not surprising that the resistance of a steel section is well understood, after all these years. Section classification is a modest change, but cleverly disguised by new symbols and changes to, for example, how outstands are measured. The familiar plastic, elastic and effective moduli are used for bending resistances. Shear and torsion are covered, and become new and exciting when found in combination with bending. Many unfamiliar equations are available. At the simpler end, shear resistance of a rolled section is no longer based on an area of web × depth, but is instead presented as an area which is less than full depth, but includes the root radii and half the flange (see Figure 2). The difference must be tiny!

Member buckling

Again, since Euler discovered the basic rules of column buckling, we have understood the structural mechanics. Unfortunately, slightly different understandings have been adopted throughout Europe, and agreement on a unified set of checks has been difficult to reach. Whilst the calculated resistance may be very similar to the value according the BS 5950, the approach in the Eurocode will take some time to become familiar.

Axial Compression

Instead of calculating a p_c value (in BS 5950), the Eurocode approach is to have a reduction factor on the design strength. Thus in S275 steel, a p_c value of $100N/mm^2$ will appear as a reduction factor of $\chi = 100/275$ or 0.36.

Slenderness is also presented differently, as we are used to $\lambda = l/r_y$. In the Eurocode, we will meet $\bar{\lambda}$, which is approximately $\lambda/90$. Instead of a $\lambda = 50$ or $\lambda = 180$ to BS 5950, we will become used to $\lambda = 0.5$ 0r $\lambda = 2$. Despite

29 ▶

◀27

the different numbers, the buckling curves are almost identical.

Lateral Torsional Buckling

In much the same way as flexural buckling, we will calculate λ_{LT} instead of λ_{LTB} and find a relationship as shown in Figure 3.

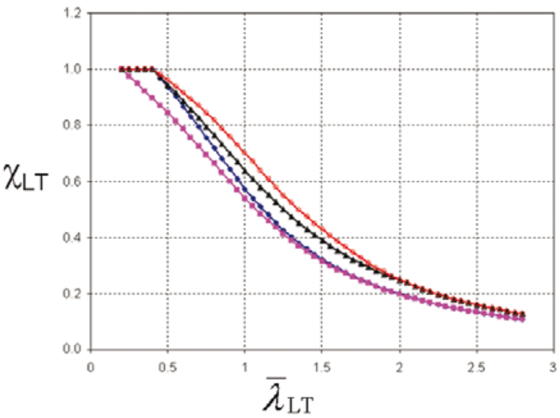


Figure 3. Lateral Torsional Buckling Curves

The form of the curves in Figure 3 is familiar, and once we become used to calculating λ_{LT} and finding a reduction factor, χ_{LT}, rather than a bending strength, we will not notice the difference in the final result.

Combined axial and bending

Here be dragons! There is a host of possibilities here, with increasing degrees of deviousness in the calculations. At this stage, it is difficult to predict which approach the National Annex will recommend, and what simplifications may be possible.

This article has looked briefly at a few of the significant technical changes that will appear in the Eurocodes. More detailed articles will follow over the next couple of years, and once the Eurocodes are introduced. In summary, the presentation will be different, and there will be a different approach in some areas, but the calculated resistance will look familiar. If something suddenly becomes half as strong, assume you have made a mistake!

The Institute is running regular courses for those keen to understand the Eurocode approach. Details can be found at www.steel-sci.org/education/ and in the events diary on Page 10

AD 278
Changes to the Building Regulations and Approved Document A3 Disproportionate Collapse — Interim Guidance on the use of BS 5950-1: 2000

This AD provides interim guidance in dealing with the changes to Section A3 of Approved Document A – Structure (2004 Edition) in connection with the England and Wales Building Regulations. The changes came into effect from 1 December 2004. Section A3 has been completely rewritten and should be studied. The main change is that the regulation now applies to all buildings, including those of less than five storeys. Now, all buildings have to be classified according to one of effectively four building classes, 1, 2A, 2B and 3. The forthcoming amendment to BS 5950-1 will revise Section 2.4.5 to be compatible with the changes in Section A3 of Approved Document A – Structure (2004 Edition). However, proposals for the revision of BS 5950-1 must first be issued for public comment before being accepted and this process may take some time.

In the meantime the SCI recommends that:

- Hot-rolled-steel framed buildings classified as 1 or 2A should be designed to Clause 2.4.5.2 of BS 5950-1: 2000.
- Hot-rolled-steel framed buildings classified as 2B should be designed to Clauses 2.4.5.2 and 2.4.5.3 of BS 5950-1: 2000.
- Hot-rolled-steel framed buildings classified as 3 should be designed to Clauses 2.4.5.2 and 2.4.5.3 of BS 5950-1: 2000 in addition to resisting the design conditions that can reasonably be foreseen as possible during the life of the buildings, to the extent that collapse is not disproportionate to the cause. Approved Document A requires that these design conditions be identified by a systematic risk analysis of normal and abnormal hazards.

Contact: Thomas Cosgrove
Email: t.cosgrove@steel-sci.com
Telephone: 01344 623345

AD 279
Brittle Fracture

This AD gives the limiting thickness t_1 (mm) for plates, flats and rolled sections for S275 JR and S355 JR material that are expected to be included in the forthcoming amendment to Table 4 (K=1) of BS 5950-1.

The prohibition of the use of S275 JR and S355 JR material in external conditions has caused much comment since the release of BS 5950-1:2000. Hence the code committee has been working on the issue for some time. Relaxations for t_1 values in normal temperature conditions in BS 5950-1:2000 have been proposed as shown below but they will not revert to the thickness in the 1990 standard.

Readers should remember that the forthcoming amendment must first be issued for public comment and the above values may change. However, the SCI advises that the values in Table 1 should be used for design in the interim.

Table 1 *Limiting thickness t_1 in mm for K=1*

Standard	Normal Temperature		Lower Temperatures
	Internal	External	
BS EN 10025	- 5°C	-15°C	
S275 JR	36	15	0
S355 JR	25	11	0

Contact: Thomas Cosgrove
Email: t.cosgrove@steel-sci.com
Telephone: 01344 623345

AD 280

Structural Integrity of Light Gauge Steel Structures Building Regulations Approved Document A (2004)

The England and Wales Building Regulations and Approved Document A have been revised. The new revision came into force on 1 December 2004. Section A3 has been completely rewritten and should be studied. The main change is that the regulation now applies to all buildings, including those of less than five storeys. Now, all buildings have to be classified according to one of effectively four building classes, 1, 2A, 2B and 3. The forthcoming amendment to BS 5950-1 will revise Section 2.4.5 to be compatible with the changes in Section A3 of Approved Document A – Structure (2004 Edition). However, proposals for the revision of BS 5950-1 must first be issued for public comment before being accepted and this process may take some time.

BS 5950-1:2000 is the structural steelwork Standard referred to by Approved Document A, but this is not directly applicable to the design of the majority of light gauge steel structures. Recommendations for light gauge frames are available in:

1. BS 5950-5:1998 Structural use of steelwork in building – Code of practice for design of cold formed thin gauge sections, in Clause 2.3.5 Structural Integrity
2. SCI publication P-301 Light Steel Framing in Residential Construction, in Section 2.1.5 Robustness of light steel frames.

P-301 was written to satisfy the England and Wales Building Regulations in force before the 2004 revision. It gives more extensive guidance than BS 5950-5:1998, including design loads for splices in vertical members, removal of elements and the design of key elements. As interim guidance, the SCI recommends that designers use P-301 to satisfy the 2004 regulations for light steel frame buildings, applying Section 2.1.5 as follows:

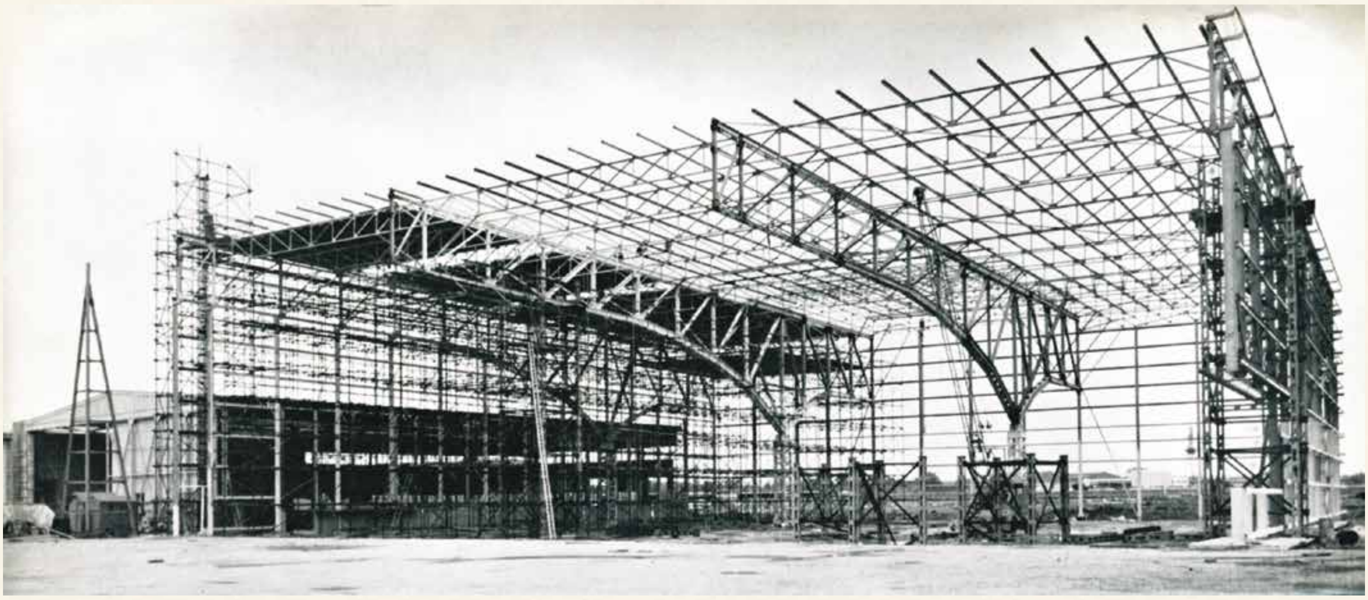
- Buildings of Classes 1 and 2A: only paragraphs (1) to (4) and (11) need be applied.
- Buildings of Class 2B: paragraphs (1) to (11) should be applied.
- Buildings of Class 3: paragraphs (1) to (11) should be applied as a minimum design requirement. In addition, Class 3 buildings should be designed to have a structural form that reflects the critical conditions that can reasonably be foreseen as possible during the life of the buildings, to the extent that collapse is not disproportionate to the cause. Approved Document A requires that these critical conditions be identified by a systematic risk analysis of normal and abnormal hazards.

Designers choosing the "removal of columns" option in Section 2.1.5(8) should note that the 2004 Approved Document A necessitates a change from P-301. Clause 5.3 defines the length of external steel stud wall that must be considered to be removed as "the length measured between vertical lateral supports". For internal steel stud walls, the length considered to be removed remains 2.25 times the storey height.

Where buildings combine both hot rolled and light gauge construction, designers are advised to use a logical combination of the recommendations of this AD and AD278.

Contact: Charles King
Email: c.king@steel-sci.com
Telephone: 01344 623345

BUILDING WITH STEEL



The VC10 Hangar at London (Gatwick) Airport

When British United Airways purchased Vickers VC 10 jets the dimensions of these machines, particularly the height of the tail, made it necessary to provide a new hangar to accommodate them for servicing purposes. It is a steel framed building with double sandwich asbestos cladding and no other material other than steel could have been employed with such success.

The hangar is unique in that it is possibly the largest of its kind in the United Kingdom, and perhaps in Europe. Although it has a floor area of approximately 33,000 sq. ft. only two internal columns are used and they are positioned to give minimum interference to the various type of craft likely to be parked inside. An interesting feature is the provision of a slot in one side wall through which a wing of a second aircraft can project, allowing the complete fuselage to be under cover during servicing. By careful planning it has been established that the hangar can in fact house at least three machines simultaneously, e.g. a VC 10 in the centre and a Britannia or a BAC One-Eleven on each side.

Steel framed hangars for the Middle East

During recent years the Air Ministry has placed orders for a number of large steel-framed hangars for destinations abroad. For this type of work steelwork has several important advantages over other methods of construction, apart from those concerned with design. For instance the structural members can be completed in this country, ready for erection, and occupy minimum cargo space when shipping them abroad. On arrival the hangars can be conveniently transported and easily erected on site by local semi skilled labour.

Composite Construction

Recently, a Joint Working Party of the Ministry of Public Building and Works and the British Constructional Steelwork Association has been studying the economic design of multi-storey steel-framed buildings. A complete and factual survey of the investigations into 10-storey office blocks is contained in the paper entitled 'Composite Construction' presented by Mr. L. R. Creasy, O.B.E., B.Sc., M.I.C.E., M.I.Struct.E., Deputy Chief Civil Engineer of the Ministry at a meeting of the Institution of Structural Engineers in London on 10th December 1964.

Both in his paper and at the meeting Mr. Creasy emphasised the advantages to be gained from the use of high yield stress steel and from modern design techniques such as composite construction, ultimate load design and lightweight fire encasement. That these procedures result in designs which make steel highly competitive with other constructional media is evidenced by the fact that the ministry has decided to use structural steelwork for a number of important new Government buildings now under construction.

Increasing Use of Steel in Country's Housing Programme

The use of steelwork for domestic housing is increasing so rapidly that its demand upon the heavy steel industry is likely to be a major factor in the anticipated 50 per cent increase in the use of steel in the Construction Industry by 1970.

New systems for dwelling houses with steel frames are now available which combine speed of erection with economical cost. One typical system devotes just one hour for the erection of the steel frame. Six men can finish a pair of semi detached houses of this type and have them ready for occupation in 14 days. An 880-sq. ft. three-bedroom house costs from £1,900 to £1,950; a 950-sq. ft. three-bedroom house, £2,350.

New and Revised Codes and Standards

(from BSI Update October 2004)

BS EN PUBLICATIONS

The following are British Standard implementations of the English language versions of European Standards (ENs).

BS EN 1011:
Welding. Recommendations for welding of metallic materials

BS EN 1011-7:2004
Electron beam welding
No current standard is superseded.

BS EN ISO 15609:
Specification and qualification of welding procedures for metallic materials. Welding procedure specification.

BS EN ISO 15609-4:2004
Laser beam welding
Supersedes BS EN ISO 9956-11: 1997

BS EN ISO 15609-5:2004
Resistance welding
No current standard is superseded.

BS EN ISO 15612:2004
Specification and qualification of welding procedures for metallic materials. Qualification by adoption of a standard welding procedure
Supersedes BS EN 288-7:1995

BS EN ISO 17641:
Destructive tests on welds in metallic materials. Hot cracking tests for weldments. Arc welding processes

BS ISO 17641-1:2004
General
No current standard is superseded.

BS EN ISO 17642:
Destructive tests on welds in metallic materials. Cold cracking tests for weldments. Arc welding processes

BS EN ISO 17642-1:2004
General
No current standard is superseded.

ISO PUBLICATIONS

It is BSI policy to supply the UK version of all adopted standards, which are published as British standards, unless otherwise requested.

ISO 15609:
Specification and qualification of welding procedures for metallic materials. Welding procedure specification

ISO 15609-3:2004
Electron beam welding
Will be implemented as an identical British Standard

SCI Courses January-March 2005

IN-HOUSE TRAINING

All the courses that the SCI offer can be taken as part of company in-house training programmes. In-house courses are a cost-effective way of training employees and can be configured to suit your company's needs.

For further information on in-house training contact Sandi Gentle (Courses Manager) on 01344 872776 or email s.gentle@steel-sci.com

For detailed information and programmes for all courses please see www.steel-sci.org/courses

Multi-Storey Steel Frames	13 Jan	London
Key Construction Issues	20 Jan	Dublin
Fire in Boundary Conditions	25 Jan	Dublin
Preparation for Eurocode3	25 Jan	Southampton
Steel in Construction - Evening CPD	27 Jan - 3 Mar	Glasgow
Steel in Construction - Evening CPD	27 Jan - 3 Mar	London
Steel in Construction - Evening CPD	27 Jan - 3 Mar	Manchester
Frame Stability	02 Feb	London
Portal Frame Solutions	10 Feb	Dublin
Excel for Engineers	17 Feb	Edinburgh
Portal Frame Solutions	22 Feb	Manchester
Welding for Engineers	01 Mar	Rotherham
Connection Design Workshop	01 Mar	Manchester
Welding for Engineers	08 Mar	Glasgow
Curved Steel - Angle Ring	10 Mar	Tipton
Preparation for Eurocode3	16 Mar	Swindon
Curved Steel - Practical Applications	22 Mar	Leeds
Floor Vibrations - The problems identified and explained	23 Mar	Birmingham
Preparation for Eurocode3	30 Mar	Edinburgh

SCI Members

The Steel Construction Institute

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

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

Details of SCI Membership and services are available from:
Pat Ripley, Membership Manager, The Steel Construction Institute, Silwood Park, Ascot, Berks.
Telephone: +44 (0)1344 623345 Fax: +44 (0)1344 622944
Email: pat.ripley@steel-sci.com Website: www.steel-sci.com

All full members of the BCSA are automatically members of the SCI. Their contact details are listed on the BCSA Members pages

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The Institution of Structural Engineers

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**New corporate members since last short list in November/December 2004 issue*

The British Constructional Steelwork Association Ltd

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
- **G** Footbridge and sign gantries
- **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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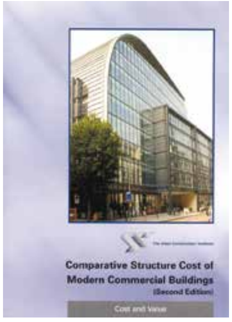

Comparative structure cost of modern commercial buildings (Second Edition)
S J Hicks, R M Lawson, J W Rackham and P Fordham
ISBN 1 85942 157 1, 94 pp, A4 paperback, Nov 2004

NEW BOOK

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This publication presents the results of a study carried out in 2003/2004 and updates the first edition published in 1993 that proved to be one of our best sellers.

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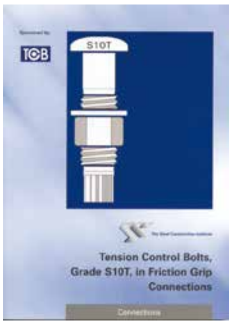

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TC Cosgrove
ISBN 1 85942 156 3, 86 pp, A4 paperback, Nov 2004

NEW BOOK

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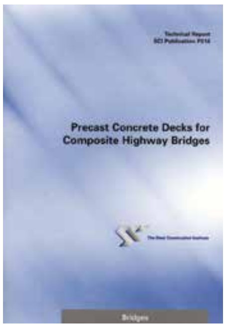

Technical Report: Precast concrete decks for composite highway bridges
E Yandzio and D C Iles
ISBN 1 85942 155 5, 86 pp, A4 paperback, Nov 2004

TECHNICAL REPORT

Precast Concrete Decks for Composite Highway Bridges

The purpose of this Technical Report is to suggest ways to encourage the use of full-thickness, full-width, precast deck slabs in highway bridges, installed on top of steel girders and made to act compositely in carrying live loads and superimposed dead loads.

The publication introduces the reader to precast deck construction for single span and continuous multi-span bridges. The report considers and compares the different types of precast deck configurations that have already been built or proposed and includes recent research information that supports the use of this form of construction. A recommendation is made as to the most appropriate form of precast deck construction, based on the supporting technical information that is currently available. It is noted, however, that client authorities may need test evidence before accepting this form of construction for any particular project.

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