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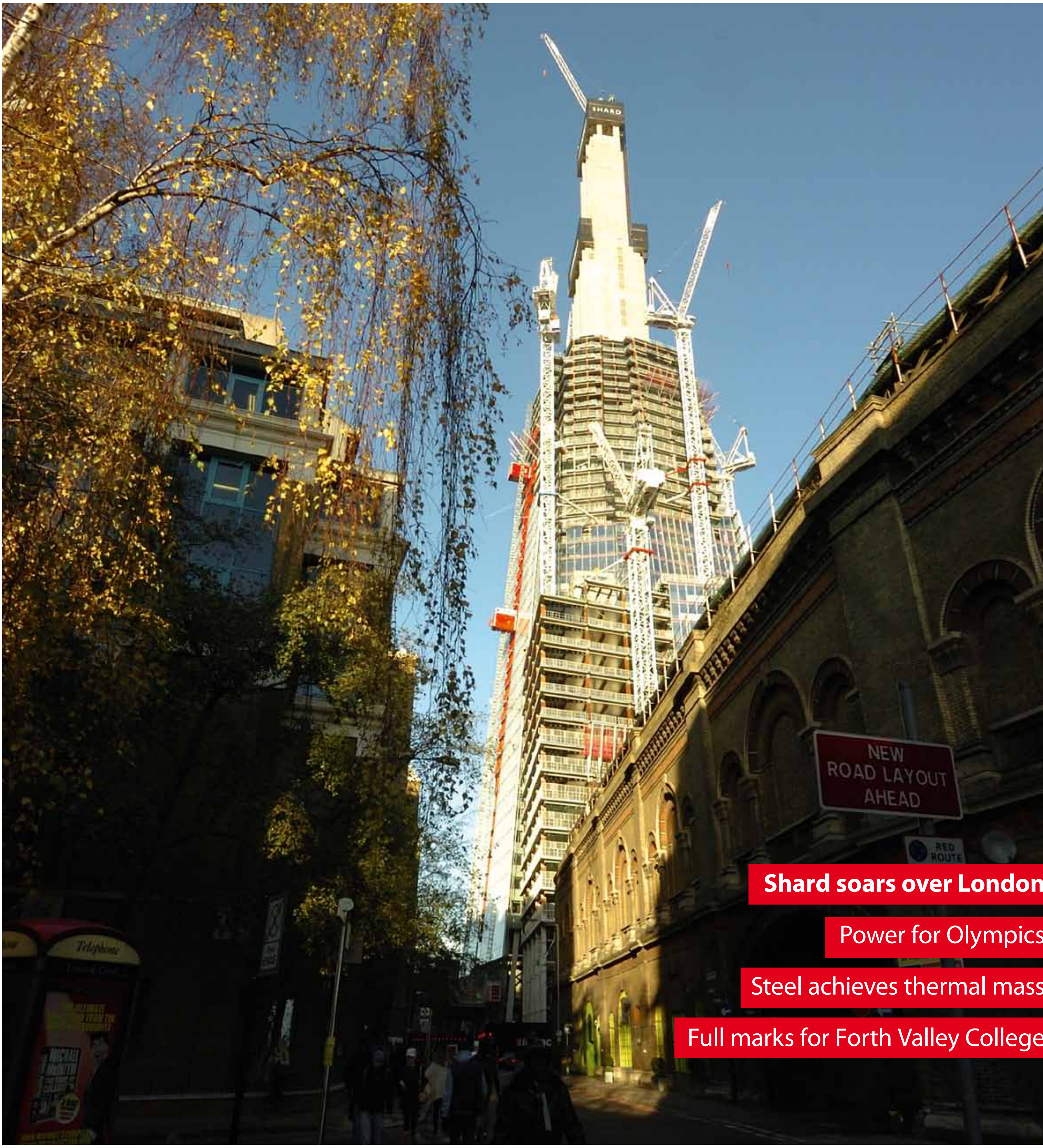
NSC

Design regenerates Greenwich

Vol 19 No. 1 January 2011



Shard soars over London

Power for Olympics

Steel achieves thermal mass

Full marks for Forth Valley College

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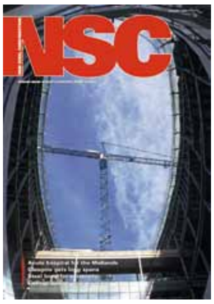

New Steel Construction keeps designers and contractors abreast of all major steel construction related developments and provides detailed technical information on key issues such as the introduction of the Eurocodes. NSC will be the first place most people hear about advances made by the extensive research and development efforts of the steel construction partners – Tata Steel, the British Constructional Steelwork Association, and the Steel Construction Institute, as well as other researchers.

Each issue of NSC is a blend of project reports and more in depth technical material. Taking up our free subscription offer is a guarantee that you will be alerted to significant developments in a sector that retains a commitment to continuous development in knowledge and techniques for timely delivery of cost effective, quality projects across all sectors of construction.

Each issue of NSC is typically 44 pages and contains five pages of news, developments related to Eurocodes, cutting edge project reports from site, and the latest technical updates from the Steel Construction Institute in its Advisory Desk Note series. Popular features are 50 Years Ago and 20 Years Ago, looking at key projects of the past by revisiting the pages of 'Building With Steel' and 'Steel Construction'.

A recent development has been the introduction of Steel Industry Guidance Notes, SIGNS, with each issue of NSC, a loose leaf insert series aimed at students and designers new to steel construction. SIGNS provide essential introductory explanations of basic steel related design topics and point the way towards where more detailed, free, support can be accessed in the steel sector.

NSC is available free of charge each month to subscribers living in the UK or Ireland by simply filling in the reply paid card bound into this issue, or by contacting us by email, post or fax as described on the card.

If the card has already been removed from this issue you can fill out this form and fax it to **020 7747 8199**, or scan and email it to **admin@new-steel-construction.com**

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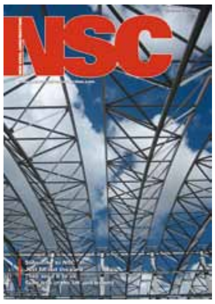

Cover Image
The Shard
Client: Sellar Property Group
Architect: Renzo Piano
Steelwork contractor:
Severfield-Reeve Structures
Steel tonnage: 13,000t

BCSA TATA STEEL SCI Steel Knowledge

January 2011 Vol 19 No 1

These and other steelwork articles can be downloaded from the New Steel Construction Website at *www.new-steel-construction.com*

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Thermal mass – the sustainable view

Nick Barrett - Editor

As the drive towards sustainability gathers pace, the steel sector is devoting considerable resources on a number of fronts to ensure that designers have all the information and assistance that they might need to help create a truly sustainable world. Target Zero, for example, is a steel sector initiative to provide building designers with all the information they need to contribute towards the government's ambitious carbon elimination targets, and the latest developments about that can be read in News.

Carbon reduction is a priority for designers of buildings and other infrastructure today and for the foreseeable future. Huge amounts of money will be invested globally as we grapple with the problem of building a low or zero carbon future – amounts of four per cent of global gross domestic production have been suggested as a likely tally. It is obviously crucial that this is spent wisely with zero waste, which is going to mean shedding some outdated notions as we go along. Chief among them is the notion that heavyweight concrete buildings perform sustainably better because of thermal mass.

Thermal mass is a straightforward concept, but not always easy to apply in practice. There are a lot of factors to take into account for a building to reap the full benefit, as is explained in the feature article on page 30. The designer must strike a balance between mass of the structure and responsiveness. Research has shown that the optimum thermal mass is provided by 100mm thickness of concrete floor slab, which is provided by lightweight steel construction.

The extra mass provided by inherently heavier concrete framed buildings is in fact a waste, which is itself unsustainable. As the author of the Thermal Mass article highlights in this issue, designers wanting to use thermal mass should provide an optimal amount and not a wasteful excess which might in fact reduce thermal performance. Steel is the sustainable solution when thermal mass is properly considered.

Hopes pinned on private sector

As we start the New Year, details still remain scant about the investment plans of government spending departments and other public sector agencies. We are all eagerly cheering the private sector on as it races to create jobs as fast as the public sector looks likely to shed them over the next few years.

Choosing which investment programmes to cut to meet its deficit cutting objectives was never going to be easy for the government. Predicting precisely where the axe will fall though could be key to corporate survival, allowing marketing strategies to be adapted to new market realities.

NSC has no crystal ball and has no more idea than you what programmes will be slashed and which spared. But after reading of the widely publicised research into the state of the UK's health infrastructure from the BBC in early December, it is especially hard to see how the pace of investment in hospitals and other healthcare facilities can be slowed down by much or for long.

Health could be a strong bet for those with a presence in that market already. Yet the public sector does not have the funds, so alternative funding sources like the PFI could come more to the fore. Over to the private sector again.

NSC

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Targeting supermarket guidance

The third of the five Target Zero guides, covering supermarket buildings, has been published and is available for download in pdf format at *www.targetzero.info*

Target Zero Supermarket Guidance provides invaluable information for designers, construction clients and their professional advisors on how to design and construct supermarket buildings that meet current and future sustainability requirements.

The Target Zero guidance is based on recently constructed buildings. The basecase building for the supermarket report was a simplified design of Asda's food store at Stockton-on-Tees. All of Asda's stores follow a comprehensive energy efficiency programme, which includes identifying renewable sources of energy to power its stores and distribution warehouses.

In its existing stores Asda is on target to reduce energy consumption by 20% by 2012 (compared to measurements taken in 2005). Asda is also committed to ensuring that all of its new stores use 30% less energy, through the use of new building techniques and materials.

Target Zero is a steel construction sector project designed to provide guidance on the design and construction of sustainable, low and zero carbon buildings.

Five non domestic building types are being analysed in the project funded by Tata Steel and the BCSA. Guidance on schools and distribution warehouses have already been published, while two more building types - medium to high rise offices and mixed use buildings - are being analysed, and these guides are due early this year.

Steel design and construction for aircraft hangar

A major new hangar at London Oxford Airport, increasing total hangarage by 78%, is being erected by Caunton Engineering on a design and build contract.

Known as Hangar 14, it is the largest single facility to be built at the airport over the last five years and it will increase the airfield's hangar space to 78,000m^2.

Main contractor for the project is Kier Marriott and work started on site during August 2010. The steel framed structure measures 120m by 37m and includes independent landside access, offices as well as car parking.

The three internal bays, all measuring 37m × 40m, have been designed to be big enough to accept Global Express or Gulfstream 550 business aircraft or typical regional airliners such as the BAe 146 or Dash-8 aircraft.

Events venue takes shape at Bluewater

Work is progressing on schedule on the £60M Bluewater Events Venue in North Kent. The steel framed structure, being constructed adjacent to one of Europe's leading retail destinations, is expected to further stimulate the regeneration of the area.

Working on behalf of Lend Lease and BAM Constuct, Robinson Steel Structures will ultimately erect 2,250t of structural steelwork for the project.

Designed by Denton Corker Marshall, the 5,200m^2 venue is centred around a 3,000m^2 plaza and will also include 4,000m^2 of catering/restaurant space as well as a number of new stores.

To form the main open plan auditorium space Robinson has erected a series of 20m-long roof trusses. These were delivered to site in three sections, assembled on the ground before being lifted into place by two mobile cranes.

The majority of the trusses have been painted black as they will remain exposed as architectural features.

The final piece of steel erection involves the feature 'bullnose' roof area. This part of the roof curves and bends inwards and forms the canopy over the main road access point. Here Robinson is erecting pre-cambered steel ribs which will eventually support the structure's green sustainable roof.

Mabey Bridge launches energy sector recruitment drive

Chepstow-based Mabey Bridge has launched the first phase of a 240 job recruitment drive for its new £38M wind turbine tower manufacturing plant.

The company is initially seeking 100 skilled workers for its factory in Chepstow, to fulfil roles ranging from paintshop operators and welders to laser inspectors.

The first employees were in place by the end of last year and further recruitment will take place during the coming weeks. The factory is set to be fully operational in February.

Peter Lloyd, Mabey Bridge Managing Director said: "We are building this factory specifically to service the needs of the renewable energy industry and are looking to appoint skilled workers from the local area.

"Once the new factory is up and running, we aim to provide around half the UK's requirement for wind turbines."

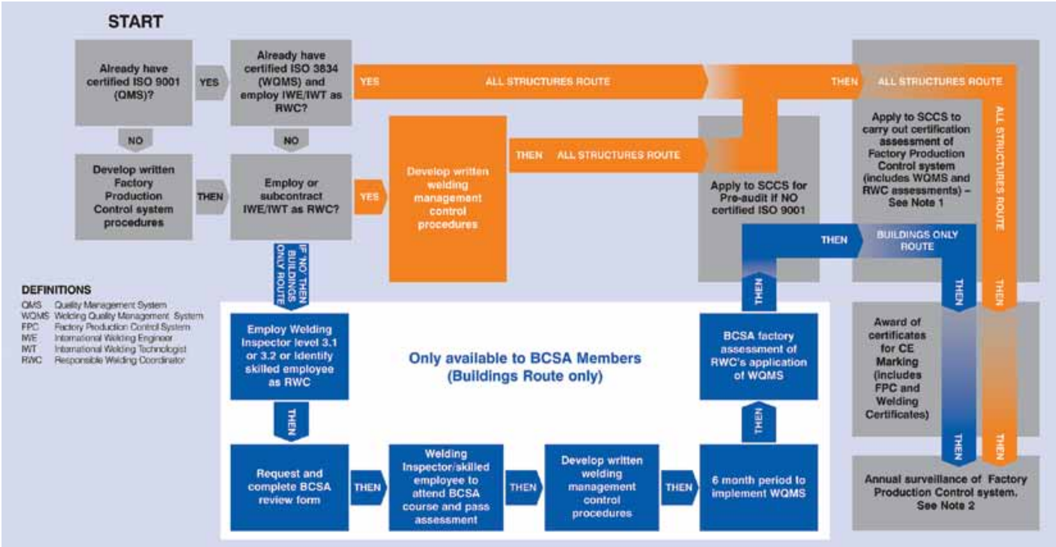
The plant will use the latest manufacturing techniques including computer controlled cutting and rolling, robotic welding, steel blasting up to the highest quality and an automated painting facility. It will be capable of fabricating turbine towers up to 5m in diameter and 40m in length.

CE Marking comes into force

As NSC went to press CE Marking of fabricated structural steelwork, in accordance with BS EN 1090-1, was expected to come into force in the UK and the Republic of Ireland (ROI).

"A CE Marking standard generally has a one year co-existence period when either national provisions or CE Marking may be used," said Dr David Moore, BCSA Director of Engineering.

"This period is to allow steelwork contractors and other manufacturers of steelwork components to put into place the necessary certified Factory Production Control (FPC) and Welding Quality Management systems to comply with BS EN 1090-1, as well as to complete any non CE Marking contracts."



Steelwork contractors will need to have their FPC systems assessed by a Notified Body, which is similar to a certification body. The Steel Construction Certification Scheme (SCCS) has applied for Notified Body status and it is currently able to offer companies a gap analysis to identify any shortcomings in their systems. SCCS can also offer BS EN 1090-1 certificates in readiness for the introduction of CE Marking.

However, CE Marking is likely to remain optional in the UK and the ROI until the Construction Products Directive (CPD) is replaced by the Construction Products Regulations (CPR).

The main difference between the CPD and the CPR is that under the latter CE Marking is mandatory instead of optional. The CPR is expected to come in to force in mid 2013.

The expected timetable for CE Marking of fabriated steelwork is:

CE Marking voluntary – imminent

CE Marking mandatory in most member states – 01 July 2012

CE Marking mandatory in the UK and ROI – mid 2013

Steel cubes form youth village

Steel erection has been completed on the £4M Trafford Youth Village in Partington, Manchester. Working on behalf of main contractor BAM, steelwork contractor EvadX fabricated, supplied and erected 170t of steel for the project.

The Village consists of four two-storey blocks, each measuring 20m x 25m, arranged into a large square pattern.

"Each of the four blocks resembles a cube and they are all interlinked by corridors," said EvadX Contracts Manager Peter Henderson. "The intermediate corridors are covered, giving the job a high and low level roof."

Three of the cube blocks feature internal mezzanine floors, while the fourth building - a sports hall - has a mezzanine level on only three elevations.

"The blocks have been erected with traditional beam and column with 21m long roof trusses," added Mr Henderson. "Externally the blocks feature a steel mullion feature framework."

Once the façades where erected, BAM inserted timber cassettes into the steelwork to form an architectural external feature.

AROUND THE PRESS

The Structural Engineer
19 October 2010
The structural design of One Shelley Street, Sydney
The One Shelley Street building more naturally lent itself to steel construction, for reasons of weight with construction onto an existing substructure, for slenderness of the diagrid frame and to facilitate detailing of the connections between diagrid and floor structures.

Construction News
2 December 2010
Sitting on the dock of the bay for Mary Rose
Along its 42m length (the new Mary Rose museum) there are 12 raking steel columns that rise up the full two storey height of the building. The steel frame spans the dock and ties into the existing steel columns on the southern side.

The Structural Engineer
16 November 2010
Stonecutters Bridge
(Supreme Award for Structural Engineering Excellence) This project not only stands at the cutting edge of long span bridge technology, with its aerodynamically designed twin steel box girder deck, tall slender monopole towers and many other unique features, it is also an elegant, attractive and popular addition to the Hong Kong skyline.

Construction News
18 November 2010
Confidence returns to steel
Dr Tordoff argues that steel still offers better value than other framing materials. "Latest cost comparison studies indicate that for a typical office block, steel framed solutions are still cost competitive."

Construction News
18 November 2010
Slender steel speeds bridge deck
(Reading Station improvement scheme) Tight level limits between the track bed and the crown of Caversham Road as it passes under the 40m long, 17m span bridge meant the designers had to use a steel solution for the new bridge. A concrete bridge deck capable of taking the high loading required would have proven too deep to enable the team to provide the cover required between the top of the deck and the underside of the rail.

Eurocode 3 development will make the code practical

Working groups have been set up to develop each of the 20 parts of Eurocode 3 in order to ensure it is developed to be useful and practical for desginers.

CB/203, the BSI technical committee responsible for UK input to the Eurocodes, has nominated leading UK experts to serve on each of the working groups (see table).

The experts, who are in some cases supported by mirror groups or panels, are seeking feedback from practitioners with experience of using Eurocodes.

"Some of this may come via queries raised with the SCI or the BCSA," said Dr Roger Pope, Chairman CB/203. "Do not hesitate to inform the UK experts, direct or via BSI, of issues that concern you, as without feedback there is a danger that the Eurocode development will move away from providing practical design codes."

EC3 Part	UK Mirror Group/Panel	UK Experts	Contact Details
1.1	CB/203/-/3	Leroy Gardner	Imperial College
1.2	CB/203/-/4	David Moore	BCSA
1.3	SCI, CRSA, MCRMA	Martin Heywood	SCI
1.4	SCI	Nancy Baddoo Leroy Gardner	SCI Imperial College
1.5		Leroy Gardner (buildings) Chris Hendy (bridges)	Imperial College Atkins
1.6		Michael Rotter	Edinburgh University
1.7		Michael Rotter	Edinburgh University
1.8	BCSA/SCI Connections Group	David Moore (open sections) Steve Whitfield (tubes)	BCSA Tata Steel
1.9	CB/203/-/5	Martin Ogle	TWI
1.10	CB/203/-/6	Martin Ogle	TWI
1.11	CB/203/-/7	David MacKenzie	Flint & Neill
1.12		pending	
2	Contact B/525/10	via Clare Price	BSI
3.1	CB/203/-/2	John Rees	Flint & Neill
3.2	CB/203/-/2	John Rees	Flint & Neill
4.1		Michael Rotter	Edinburgh University
4.2		Michael Rotter	Edinburgh University
4.3		Michael Rotter	Edinburgh University
5	UK Steel Piling Group	David Rowbottom	Tata Steel
6	CB/203/-/8	Colin Taylor	via Clare Price (BSI)

Fabricator opts for CNC efficiency

Steel bridge specialist Briton Fabricators is one of the first UK companies to purchase a FICEP Gemini CNC machine. Launched at this year's MACH exhibition, the machine is claimed to be one of the most technologically advanced systems for profile cutting, drilling, machining and scribing.

Carl Powell, Briton Fabricators Operations Director said: "Our existing manual drilling machines were creating bottlenecks in our fabrication process, the new Gemini machine has now dramatically improved productivity and material handling times have been drastically reduced.

"We now have one process from loading to assembly, rather than the six processes. Drawing office times have also been reduced as the Gemini's software enables programmes to be generated directly from our AutoCAD package."

Some of the features of the Gemini 25 or 32 include: variable length cutting bed; plasma cutting up to 64mm; up to three gas torches capable of cutting up to 120mm; fully integrated nesting software, and an additional magnet table to enable machining on both sides of cut pieces.

Tata Steel launches highways division

Tata Steel Construction Products has launched a new division, Tata Steel Highways.

Bringing together all the highways expertise previously available from a number of Tata Steel businesses, the new division has been created to specifically address the needs and requirements of the highways industry.

Sam McCloy, General Manager Tata Steel Construction Products, comments: 'The launch of Tata Steel Highways division consolidates our understanding of the material properties of steel, as well as our in-depth experience of the construction, engineering and automotive sectors, under the auspices of one business to create value for our customers.'

All of the products and solutions available from Tata Steel Highways have been developed to exceed the requirements of the European Standard (EN1317) for highways safety systems – meeting the long term needs of the highways industry and delivering lifetime value once installed.

Dynamic testing by MIRA using EN 1317 test criteria means that all the product combinations from Tata Steel Highways have been evaluated to perform in worst case scenarios.

Olympic Park bridge provides boost for local residents

A new bridge link between Hackney East Marsh and the Eton Manor site in the north of the Olympic Park was recently lifted into place.

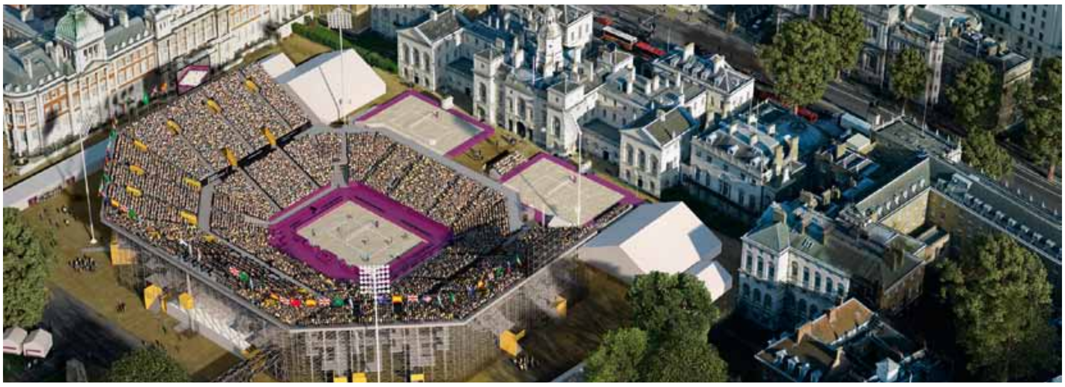
The 42m-long steel bridge will be the main route into the Olympic Park for spectators arriving at the Northern Spectator Mall. After the Games, the bridge will become an essential link for local residents, providing access into the new sports and leisure facilities in Eton Manor as well as the wider Park site.

One of Europe's largest cranes was used to lift the 200t permanent bridge structure into place across Ruckholt Road. Featuring a distinctive arched design, the 6m wide bridge was fabricated and erected by Mabey Bridge.

An adjacent temporary bridge structure was also lifted into place that will accommodate the extra spectator numbers during the Games and which will then be removed afterwards, leaving the permanent legacy bridge in place.

Olympic Delivery Authority Director of Infrastructure Simon Wright said: "Lifting in the bridge was a huge engineering challenge and a significant achievement that paves the way for another important new link for the Olympic Park."

Temporary volleyball stadium for Westminster



Plans for a 15,000 seater stadium in Horse Guards Parade to host Olympic beach volleyball have been submitted to Westminster City Council.

The temporary steel framed venue, created by architects Populous and engineering consultancy Atkins, will be dismantled after the Games. It will be erected in the space of six weeks and will be roughly the same size as Wimbledon's Centre Court.

The arena will consist of two separate parts: an inner or lower bowl, and a three sided upper tier that will offer views of Big Ben and other notable London sights. Adjacent to the venue will be two warm courts, while the stadium will also have floodlights allowing evening competition.

Horse Guards Parade is London's largest single open space, and was constructed in 1745 to house the King's personal guards.

Jeff Keas, Principal of Populous said: "We have designed and will create a sporting arena where you would least expect it in the heart of historic London."

New BCSA technical manager for Ireland

The BCSA has appointed Andrew Bisp as its Regional Technical Manager for Ireland within its Structural Advisory Service.

Andrew will provide support to designers and users of steel on a range of topics including specification, structural fire engineering, sustainability and Eurocodes. He will also ensure that engineers and architects are aware of all the useful resources available from the BCSA, Tata Steel and the SCI.

"My job is to spread the word that steel construction is more cost-effective than alternatives, as is proven by a long standing series of Cost Comparison studies," said Mr Bisp.

Steel has a solid pedigree in both Northern Ireland and in the Republic. Recent prestige projects include the Aviva Stadium in Dublin, Dublin airport's new terminal, the National Convention Centre, and flagship retail and commercial developments. Many of the highway bridges built in recent years have been steel, taking advantage of the longer spans that are possible using steel sections.

NEWS IN BRIEF

Hilti has launched free-of-charge health and safety checks, along with its bit and chisel services, available at all of its centres in UK. The service allows customers to achieve greater safety and higher productivity with their tools as they receive comprehensive advice. Customers are also provided with an understanding of how Hilti's tools can improve safety and reduce risk.

SCI Assessed Metfloor from **CMF** has been used on the Westfield shopping centre, adjacent to the London 2012 Olympic Park. The deck profiles where the first to complete the SCI Assessed scheme for properties in accordance with Eurocodes. Structural properties important for the design and specification of composite floor decking have been assessed for sheeting manufactured in 0.9, 1.0, 1.1 and 1.2mm thickness for S350 and 1.2mm for S550 galvanized steel. The assessment included the analysis of tests on profiled steel sheeting performed on behalf of CMF at Imperial College London, and the subsequent derivation of characteristic properties for use in design. MetFloor 55 is a re-entrant profile with a depth of 55mm; MetFloor 60 and MetFloor 80 are trapezoidal profiles with a shoulder height of 60 mm and 80 mm, respectively.

Building products manufacturer **Steadmans** is celebrating its centenary year and the company is using the occasion to remember its heritage and look forward to continued growth. Steadmans was established in 1911 in Warnell, Carlisle, when George Steadman set up Caldbeck's blacksmith to serve the local agricultural community. Steadmans opened further facilities in Livingston, Scotland, and Banbridge, Northern Ireland.

AceCad Software's StruCad evolution has been awarded winner of the Structural Design and Engineering Product of the Year at the recent Construction Computing Awards. The annual awards are voted for by Construction Computing and CAD User magazine readers. AceCad's spokesperson said: "StruCad evolution is already receiving superb feedback from users around the world and forms part of AceCad's new product suite for structural supply chain delivery."

Bridge works for flood damaged Cumbrian town

Work has started on a new steel bow-arch bridge in Workington that will carry both pedestrians and cyclists across the River Derwent and provide an important connection between two local communities.

With a span of 68m, the new structure is being constructed on the site of the former Navvies bridge that was damaged beyond repair during the floods of 2009.

The new structure will be far more resistant to the risk of future flooding events as it spans the river without the need for any supporting piers, which can be damaged when rapids and debris hit them during floods. It will also be more than twice as wide as the old bridge (3m wide compared with 1.2m), meaning it is more cycle-friendly and will be able to form part of the Hadrian's Cycleway network, which runs from Ravensglass to Wallsend.

The steelwork contractor for the project is Rowecord Engineering.

Paul Morell (R), the Government's Chief Construction Adviser, presents the award to Barry Chapman, CSC's Regional Director for UK and Europe.

Design software wins accolade

CSC's Fastrak Building Designer software has been unanimously voted "Structural Analysis Product of the Year 2010" at the prestigious 2010 Construction Computing Awards, held at The Guoman Tower Hotel, overlooking Tower Bridge in London.

Fastrak is software for automating the design and drafting of structural steelwork buildings, which automatically produces calculations, drawings, material lists, connection forces and column schedules, all from a single model. It also integrates bi-directionally with leading BIM solutions such as Autodesk and Revit Structure.

"Winning such a prestigious award is a very strong validation of our commitment to the product and our clients," said Mark Roberts, CEO of CSC. "Our team have worked extremely hard to provide leading edge software for the analysis and design of steel buildings, and this award is a testament to their dedication."

Also during the event, Sir Robert McAlpine won the "Best Use of IT in Construction (Private Sector) 2010" for London's Watermark Place development – another project on which Fastrak Building Designer was used for the overall structural design.

Steelwork creates cost effective manufacturing plant

A £20M manufacturing plant for Aggreko, the leading temporary power and temperature controls producer, is currently under construction at Lomondgate, Dunbartonshire

The new facility will see Aggreko relocate its existing plant to the new single storey building, consisting of 14,864m^2 of manufacturing space and 2,322m^2 of office and ancillary accommodation.

"The manufacturing sector is showing encouraging signs of growth in Scotland," said Harry Thorburn, Morgan Sindall Managing Director in Scotland.

"We are experts in creating these specialist facilities, constructing better and more cost effective solutions for our customers."

Atlas Ward is fabricating, supplying and erecting all structural steelwork for the project which is scheduled to be completed by June.

Diary

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

11, 18 & 25 January 2011
"New" On-line Steel Building Design to EC3 Part 3 Internet

12 January 2011
Steel Building Design to EC3
Croydon

23 February 2011
Stability of steel framed buildings
Leeds

USFBs or CONCRETE ?

ULTRA FAST CONSTRUCTION

From ex-stock steel, so accelerates any site programme. Supplied through any steelwork contractor.

Engineer: PWP Consulting Engineers

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ULTRA COMPETITIVE PRICES

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Engineer: Whitby Bird

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ULTRA SHALLOW FLOORS

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Engineer: SKM Anthony Hunt

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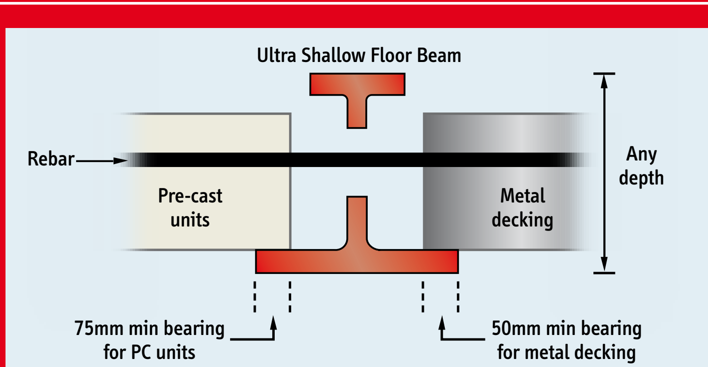

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ULTRA SHALLOW FLOOR BEAM

Flagship centre is Very Good

Steelwork forms an internal central atrium

FACT FILE
Grimsby Institute of Further and Higher Education, University Centre
Main client: Grimsby Institute of Further and Higher Education
Architect: Ryder
Main contractor: Miller Construction
Structural engineer: AECOM
Steelwork contractor: Barrett Steel Buildings
Steel tonnage: 300t
Project value: £20M

How to achieve a Very Good rating

BREEAM is the leading and most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable design and has become the measure used to describe a building's environmental performance.

"We are targeting a 'Very Good' rating with 95% of the heating and all of the cooling of the building being provided by air source heat pumps," says Jaime Harper, Miller Construction Project Manager.

"Regarding the structure the only requirement was for the responsible sourcing of materials and minimising waste and transporting of materials."

In this regard the steelwork has been provided by Barrett Steel Buildings, based in Bradford which is just a short motorway journey from Grimsby.

The building is being constructed from materials that have received an A-Grade in 'The Green Guide' and which will reflect the natural local habitat.

The design also includes provision to attract more wildlife to the site with the incorporation of specialist boxes for bats, birds and other animals. This provision is being made with the hope of bringing more wildlife to the site, which in turn will help control insect populations and crop pests.

Built around a centrally positioned feature atrium, Grimsby's University Centre is set to usher in a new era for higher education in North Lincolnshire.

Work is under way to transform the Grimsby Institute of Further and Higher Education campus at Nuns Corner into a regional state of the art facility.

The construction of a new five-storey University Centre will provide the campus with an impressive landmark structure, not just for the town but also for the wider North East Lincolnshire region.

Designed to achieve a BREEAM 'Very Good' rating the Institute's new University Centre is an iconic structure designed to seamlessly and sympathetically blend with the existing campus buildings.

Constructed on the footprint of a former sports hall, the building will include lecture theatres, research facilities, clinical skills rooms, laboratories for science and sports physiology, computer suites, studios for television and radio broadcast and a fully licensed bar with food outlets all based around a central atrium.

The atrium forms a central element of the project, in more than one way, as all of the internal accommodation wraps around this five-storey high structural opening. To allow plenty of natural daylight to penetrate into the building, the atrium will be covered by a curved 580m^2 ETFE roof light.

The structure consists of a steel frame supporting a 150mm thick composite deck for the flooring. Externally, the design intent, according to Ryder architects is for a white reflective, monolithic block with deeply grooved and brightly coloured window reveals. The white ceramic granite cladding of the building's façade will reflect the colours and shapes of the adjacent mature trees and plants.

Steelwork erection and design has been undertaken by Barrett Steel Buildings, working as a design and build subcontractor to main contractor Miller Construction. The overall project structural engineer is AECOM, and it initially designed the steel frame. Barrett Steel Buildings then took on AECOM's steel design, keeping the majority of the frame as it was, but doing some value engineering.

"The basic grid for the structure, which is 6m × 8m, was retained but we rationalised the beams, specifying less but bigger members, which gave a more economical design," explains Chris Heptonstall, Associate Director (Design) for Barrett Steel Buildings.

Erecting the project's 300t of structural steel was completed during an eight week programme, which also included the installation of three sets of precast stairs and one lift shaft. The stairwell's are braced, and this provides the structure with its stability.

Because of the nature of the building, with its many IT suites and media laboratories, the first, second and third floors are heavily serviced. This required a larger structural void than would ordinarily be used on a structure of this size.

All of the steel was erected using one 50t capacity mobile crane and two cherrypickers. Commenting on the erection programme, Richard Chapman, Barrett Steel Buildings Site Manager, says: "Erecting the main frame steelwork was fairly straightforward. The grid pretty much stays constant right through the building, no matter what the final usage of the rooms."

The majority of main columns were brought to site in complete 16m lengths - the full height of the building. Internally, around the perimeter of the atrium, the columns are feature CHS members, which are spliced at fourth floor level.

Another 4m-long tubular section was added to these main columns to form the raised support for the atrium's ETFE roof. Sitting higher than the rest of the roof area, the ETFE is fixed to a steel tubular grill that straddles the CHS columns either side of the atrium's top.

This curved feature tubular steelwork arrived on site as eight individual units which were then lifted into position by crane and installed at 8m centres over the atrium. Each tubular unit is made from 300mm diameter tube and is 12m long. Steel brackets are fixed to the tubular unit which accept the ETFE roofing system.

Most of the building accommodates functioning teaching rooms, meeting areas or lecture theatres. The exception is the uppermost fourth level which is split evenly between administrative offices and a large plant area.

Surrounding the edge of the roof there is a high steel parapet, strengthened with steel rods, which acts as a safety barrier for maintenance workers on the roof.

The Grimsby University Centre is due for completion in July 2011.

The steel frame makes speedy progress

"Erecting the main frame steelwork was fairly straightforward. The grid pretty much stays constant right through the building no matter what the final usage of the rooms."

The completed University Centre will blend in with the existing buildings and landscape

Power to the Olympics

The venues and buildings on the London 2012 Olympic site will require power and to supply this need one of the most sustainable energy centres in the UK has been constructed.

FACT FILE
London 2012 Olympic Energy Centre
Main client: Olympic Delivery Authority
Owner and operator: Cofely
Architect: John McAslan & Partners
Main contractor: P J Carey
Structural engineer: Adams Kara Taylor (AKT)
Steelwork contractor: The AA Group (TAAG)
Steel tonnage: 500t

The London 2012 Olympics is drawing closer by the month with many of the larger venues now either completed, such as the Velodrome, or entering the final stages of construction.

Providing the power to these buildings on the Olympic Park is a state-of-the-art Energy Centre, the largest such scheme to be built so far in the UK and certainly one of the most sustainable.

The facility will provide an efficient low carbon heating and cooling system across the site and will contribute towards the Olympic Delivery Authority's (ODA) overall target to reduce carbon emissions by 50% across the Olympic Park.

Once the Games are over, the Centre will provide the energy for new buildings and communities that will encompass the site. To this end it has a flexible modular design allowing further capacity and new technologies to be added, as and when they are developed.

"The building's future-proofing and flexibility were two of the main criteria for the project's design. If new equipment needs to be installed a number of key structural elements can be removed, without affecting its integrity," explains Stelio Papastylianos, AKT Associate.

A steel frame allows the building to be adaptable and future-proofed

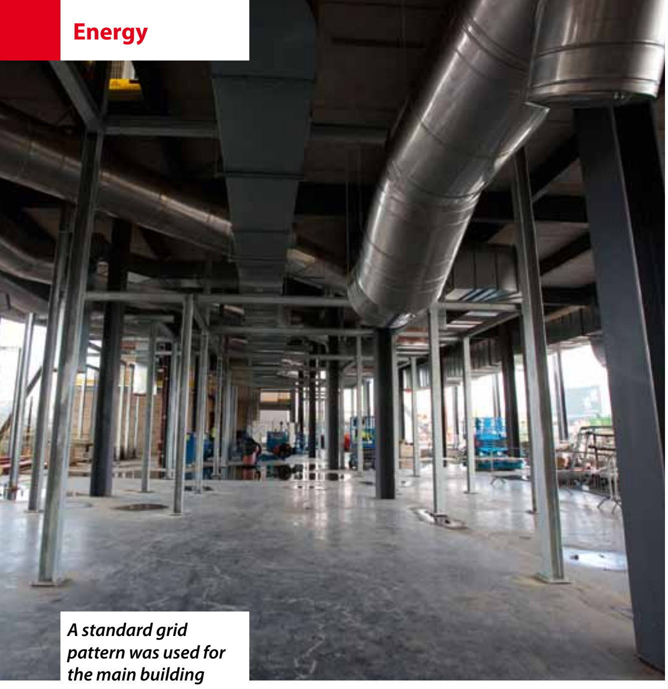
For stability the Energy Centre is heavily braced around its perimeter by cross bracing made from large hollow sections. The cross bracing members act as tension and compression sections and it is these stability giving members which theoretically can be removed.

For these reasons a steel framed solution was chosen for the project as steelwork lends itself to flexible design and a job where loadings were also likely to fluctuate.

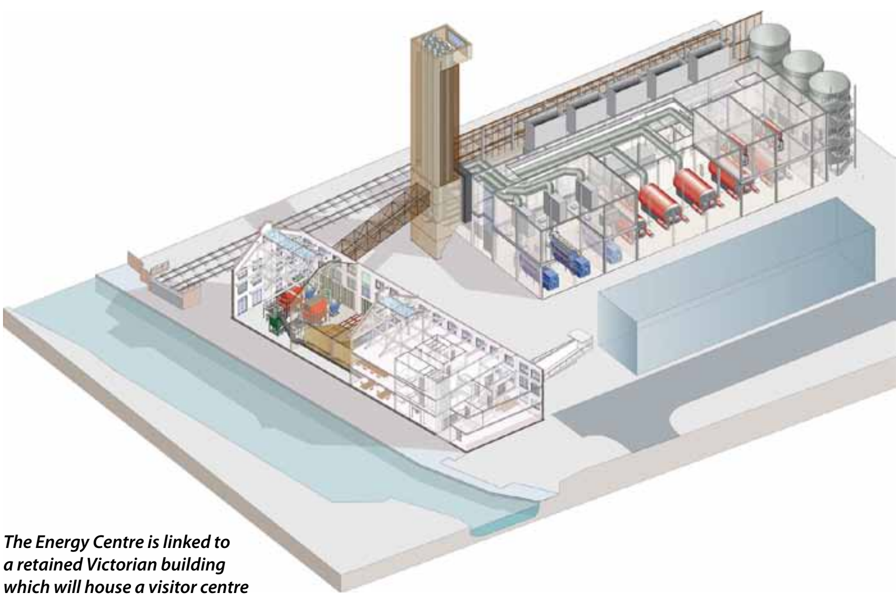
Included in the structure is a gas-fired Combined Cooling Heat & Power (CCHP) plant to capture the heat generated by electricity production. It also includes biomass-fired boilers using sustainable biomass fuels (woodchip) to generate heat and deliver low carbon energy. Cooling is provided through a combination of electric, ammonia based chillers and absorption chillers which are driven by heat recovered from plant in the Energy Centre.

With so much large equipment installed inside the Energy Centre, and the likelihood of further items of power generation to be added, the two-storey steel frame is heavily loaded. Larger section sizes than normal

Biomass boilers use woodchip to generate heat



A standard grid pattern was used for the main building



The Energy Centre is linked to a retained Victorian building which will house a visitor centre

were specified to take these parameters into account.

A lot of emphasis has been placed on the architectural design to ensure the Centre fits in with the wider Olympic Park. A key element of the ODA brief was that the facilities should add to the design legacy of the Olympic Park, and contribute strongly to the developing urban character of the Lea Valley as a whole.

Reflecting the heritage of the surrounding Victorian buildings also played a key role in the design as well as drawing inspiration from iconic London power stations such as Bankside (now the Tate Modern) and Battersea power station.

A structural steel tonnage of 500t was needed to erect the two-storey Energy Centre which also includes a 45m-high flue extractor tower.

As well as a very tight programme, in which to complete the project, the steelwork contractor, TAAG, had to contend with a very confined site.

"The project's footprint is hemmed in by railway lines and a large water main," says Kevin Nickson, TAAG Project Manager. "This meant we had to carefully plan in advance where our crane and cherrypickers could be located."

During its three week programme TAAG used a small mobile tower crane for the majority of its steel erection, as no single piece was heavier than 5t and this crane was easily manouevred around the site. When it came to putting up the flue tower, the company had to use a 62m reach access unit.

As well as steel erection, TAAG also installed 3,500m^2 of concrete planks to form the floors and roof of the Energy Centre.

"Designing the flue tower required a lot of design studies to determine its constraints and possible movement," adds Mr Papastylianos. "This was particularly relevant when designing the tower's secondary steelwork which carries the cladding system."

The Olympic Park's Energy Centre actually consists of two further buildings, an electricity sub-station and a retained Edwardian building which will be linked to the main energy centre via a bridge carrying pipework.

Within the early Nineteenth Century retained façade, and also giving it stability, a new two-storey steel frame has been inserted.

"The building's future proofing and flexibility were two of the main criteria for the project's design."

As well as accommodating further power generation equipment, this building will also house a visitor's centre in the future.

ODA Chief Executive David Higgins said: "The opening of the Energy Centre was a significant milestone for the Olympic Park and demonstrated the sustainability features that underpin this project. The Energy Centre will deliver essential services throughout the Olympic Park well before the Games begin and ensure a lasting legacy of green power for generations to come. The delivery of this facility is a considerable achievement and sets a model for future urban regeneration schemes."

Another similar energy centre has been constructed on the adjacent Stratford City development, supplying the power for Westfield's large retail site. Both projects deliver new operational benchmarks for power generation and meet the client's plant, maintenance, durability and expansion requirements.

Situated at opposite ends of the Park, both energy centres will act as signposts to the London Games' site. The Olympic Energy Centre, is easily viewed from Victoria Park and all routes coming from the west, while the Stratford City Energy Centre will be easily seen from the surrounding eastern suburbs and transport links.

Inspiration for the design has been drawn from iconic London power stations such as Battersea

Large hollow sections were used for the arch because of the excessive loads from above

College inspired by design

Hidden behind a mathematically patterned façade a new art and design college has made use of structural steelwork to create two interconnected atria. Martin Cooper reports.

FACT FILE
Ravensbourne College of Design and Communication, North Greenwich, London
Client: Ravensbourne in partnership with Greenwich Peninsula Regeneration
Architect: Foreign Office Architects
Main contractor: Bovis Lend Lease
Structural engineer: Adams Kara Taylor
Steelwork contractor: Billington Structures
Steel tonnage: 385t
Project Value: £70M

Work has been completed on the Ravensbourne College of Design and Communication situated on the north Greenwich peninsula in south London. The 17,000m² structure, which provides specialist teaching facilities for 1,400 students as well as 140 members of staff, has been designed to stimulate the local environment and the working practices of future creative professionals.

The building forms a central element of the area's on-going regeneration and is opposite the O_2 Arena (formerly Millennium Dome). With such as prominent position it is of little surprise that Foreign Office Architects (FOA) have designed a building with a striking façade and elaborate innards.

Designed to achieve a BREEAM 'Excellent' rating, the college has been constructed with a number of interesting internal steel elements. It is the exterior however that first grabs the attention of the visitor or casual passer-by. The façade features 28,000 anodised aluminium tiles which are wrapped around the entire structure. They are made up of Penrose tiling, a complex but non-repetitive pattern invented by Sir Roger Penrose, an Oxford university professor.

This abstract pattern has allowed the design team to build seven different types of windows out of only three different tiles.

The building is roughly rectangular with a slight crank on plan down the middle. Internally the building is then divided into three main sectors, with both the east and west wings constructed with concrete, while in the middle, straddling the crank, there is a central wedge constructed with steel and precast planks. The central wedge or hub, remains largely exposed leaving the steelwork as an architectural feature.

FOA says the main theory in the design of the building was to produce a structure which would encourage collaboration between the different disciplines and practitioners within the College. This will be achieved by structuring the building around a system of two interconnected atria within the hub, each piercing through three levels of the structure.

The atria have been systematically attached to the external façade in order not only to use them as ventilation spaces, but also to connect visually to the core of the building. The north atrium extends upwards from ground floor level to third floor, while the adjacent southern atrium sits above a lecture theatre and media centre and consequently begins at third floor level, extending upwards to the roof.

To form the accommodation space below the southern atrium a large storey-high truss was installed. Measuring 5m deep × 16m-long, the truss houses a media centre and a plant room within its depth, while the bottom cord forms the roof of the ground floor column free lecture theatre.

The warren-type truss was fabricated offsite by steelwork contractor Billington Structures. It was delivered in two halves - split horizontally - with each section weighing approximately 10t.

"Splitting it horizontally was necessary as there could not be a splice in the exposed main chords. The bolted connections were therefore at mid depth, which kept forces and the number of connections to a minimum," explains Steve Williams, Billington Structures Project Manager.

A large two-storey high Vierendeel truss was also installed to form the roof of the northern atrium as well as the two levels of workspace that sit above it on levels four and five. This truss was brought to site in individual pieces and then erected in sequence, with the girders for the fourth

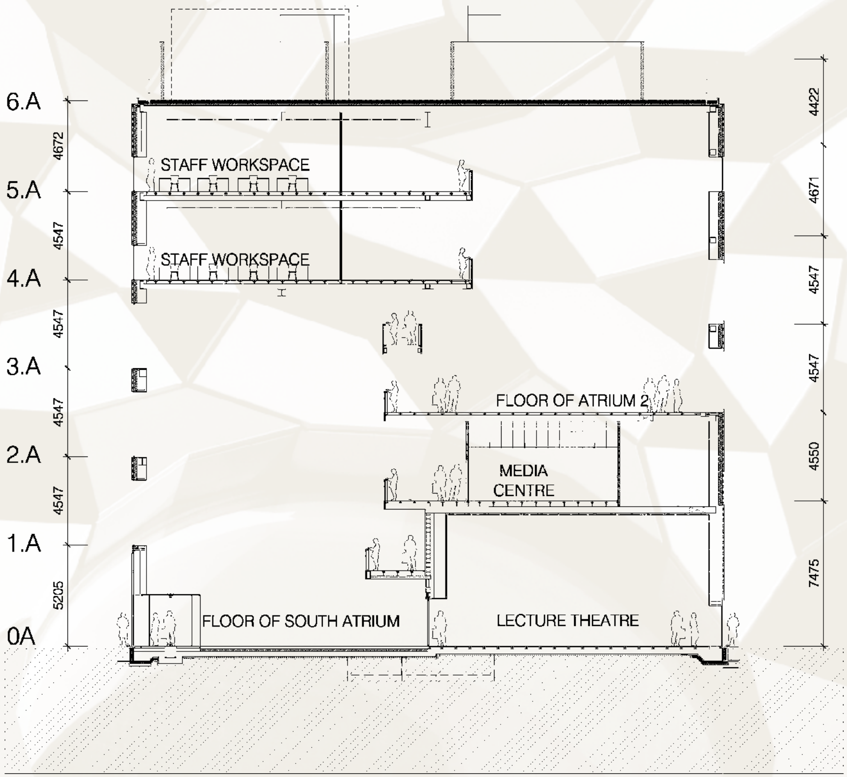
Steelwork gets to the core of the project

Each of the College's two wings has a central concrete core containing one lift shaft and an emergency staircase. Billington Structures installed the steel staircases to the inside of each core after they were cast.

The completed cores initially had a steel framing system drilled and then fixed to their inner walls to accept the steel staircases.

"We were able to get a scissor lift into the cores at first and this helped us install the framing for the initial 20m," explains Mr Williams. "The rest of the framing was then installed from the previous completed section of staircase."

Pre-assembled staircase units for each floor level were then lowered into the cores by tower crane.



The steelwork incorporates two atria which begin at different levels

and fifth floors (which are supported on two large columns founded at ground floor level). Once site assembled and erected it was followed by the vertical members and the roof beams.

Connecting both trusses back to the central hub's perimeter steelwork are a number of Fabsec beams, chosen for the aesthetic appearance as they have been left fully exposed. Fabsec cellular beams have also been used for the roof above the southern atrium, again for the same architectural reasons.

Interestingly, floor levels at either end of the building are offset in order to distinguish each wing from the other. A series of steel links and ramps span the atria, linking the wings and also realigning the differing floor levels.

"On this project the links spanning the atria had to be installed along with the main steelwork," says Mr Williams. "We had to coordinate with the concrete contractor as this part of the project has cast in-situ floors, as opposed to precast flooring, which has been used on the remainder of the project."

Situated at the apex of the structure's crank is the building's main entrance which leads directly into the central hub area. An arched doorway - 5.3m high and 12m at its widest - has been formed using bespoke hollow sections. Because of its location this was the first steelwork to be erected by Billington Structures, with the rest of the steelwork then springing off of this part.

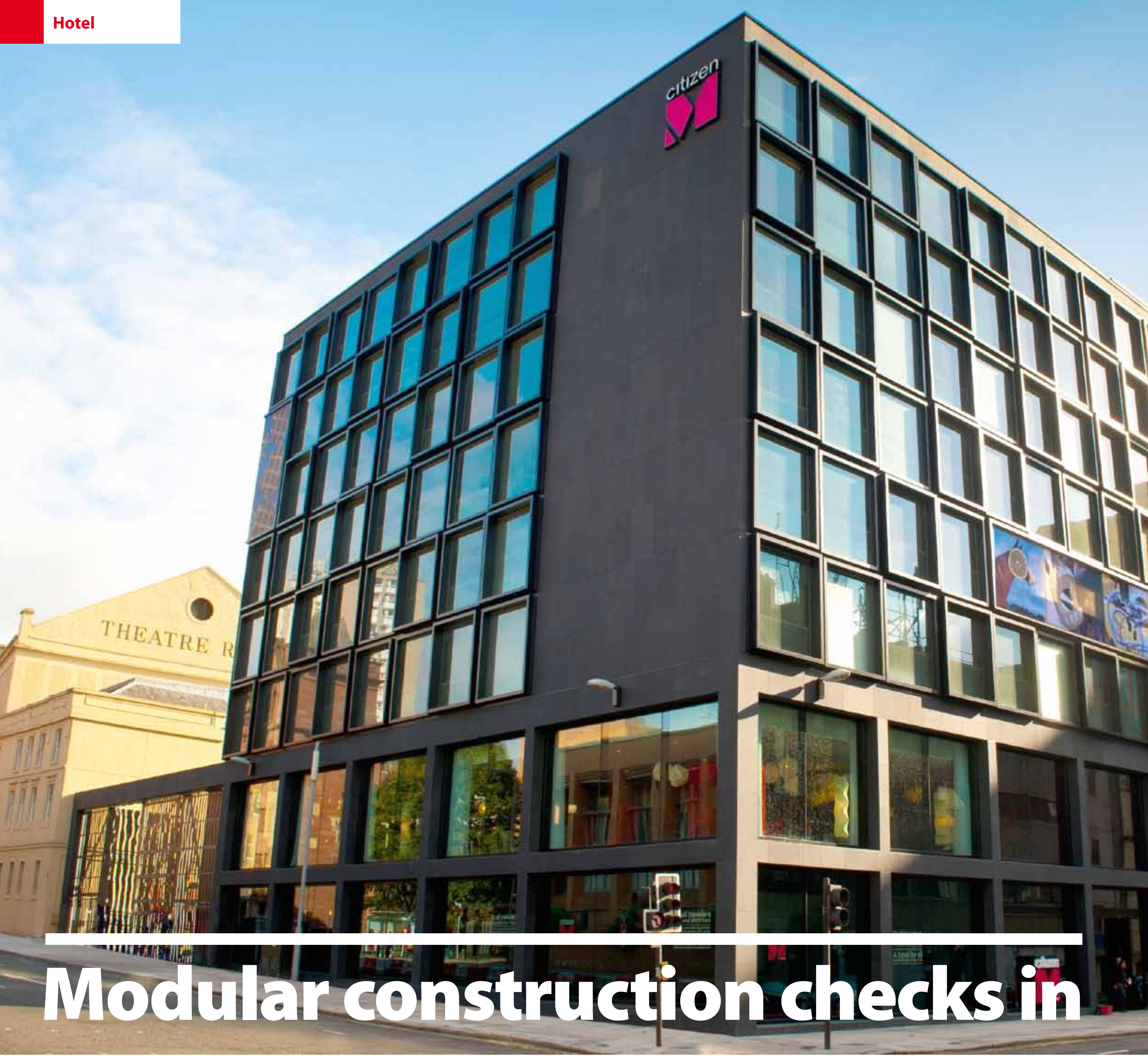
Two large columns, supporting the Vierendeel truss have been installed on top of the arch. Because of the excessive loads from these columns, and the fact that the arch has a crank on plan which makes it want to twist, large hollow sections were needed for their torsional resistance.

A series of steel links and ramps span the atria, linking the wings and also realigning the differing floor levels.

No off-the-shelf hollow sections, large enough for this job, were available so Billington fabricated its own 400 x 200 RHS. Using 35mm thick plate, the steel was either profiled to the curved form or pre-curved before being welded into the required sections.

Ravensbourne College opened during the autumn term 2010.

The college's façade features highly graphic Penrose tiling



Modular construction checks in

A new 198-bedroom hotel in central Glasgow has been constructed in quick time by using offsite steel modular construction technology.

Built on the site of the former STV television studios and next to the landmark Theatre Royal in central Glasgow, the UK's first citizenM hotel was completed in just 44 weeks due to the use of offsite steel construction for all of its 198 bedrooms.

The prefabricated modularised bedrooms were all produced offsite at the Tata Steel Living Solutions factory in North Wales, before being transported to Glasgow to be fitted into place. This form of modular construction can deliver many benefits over traditional building methods, including lower project costs, earlier completion time and improved quality and sustainability performance.

After the installation of piled foundations, the initial construction process involved the erection of the podium and transfer structure for the lower portion of the building. This consisted of steelwork contractor Henry Smith erecting a two-storey steel frame containing composite metal decking.

The ground floor of the hotel has been designed for retail outlets, while the first floor level houses the hotel's reception area, restaurant and bar.

A traditional beam and column steel frame was chosen for this part of the project for speed of construction. The entire frame was erected in approximately two weeks, giving the overall project a speedy start.

However one main challenge - which needed to be overcome - was encountered during the erection of the steel frame. This was connected with the site's underground services. One of the main corner columns was due to be erected directly above an incorrectly located fibre optic cable, which had to be re-routed around the site.

To prevent delay to the construction programme, a temporary raking column was installed, which allowed the rest of the

The UK's first modularised citizenM hotel is open for business

The prefabricated bedroom modules sit on a two storey steel frame

frame to be safely erected. Once the services had been moved, the temporary column was then removed and a permanent column was inserted in its place, a process which could not have been undertaken if the frame was concrete.

"The steel frame for the lowest two levels of the hotel structure was designed and erected to accommodate and accept the loads for the upper six levels of bedrooms," explains Dave Grove, Gifford Technical Director. "It acts as a transfer structure."

Once the frame was erected a steel grillage was placed over the top of the first floor and then a 125mm thick transfer slab was cast. The podium was then ready for the prefabricated bedroom modules to be lifted into place.

As well as acting as a transition zone between a steel frame erected onsite and the modular offsite construction, the slab on top of the first floor level is also where the project's two cores change.

Erected along with the steel frame, the lower two floors have steel braced cores. However for the upper levels subcontractor Bourne Off-Site Solutions supplied prefabricated hot rolled modular steel cores which were brought to site fully complete. With the aid of a mobile crane they were landed on top of the podium directly above two openings in the transfer slab.

While the preliminary groundworks were being undertaken and the steel frame was being completed, the 198 bedroom modules were being fabricated in North Wales. Once the transfer structure podium was completed, the modules were delivered to site - two to a truck - ready for installation.

The initial part of the modular construction process saw the two stair and lift cores installed.

"Two floor levels of prefabricated core were installed at first," says John Boylan, Tata Steel Living Solutions Project Manager. "In this way the cores were always one floor ahead in the process, which helped with the safe landing of the bedroom modules."

In each of the six upper levels of the hotel, two rows of bedroom modules were installed, along the inside and outside façades. The initial floor of units were tied into the transfer podium as well as the two cores. Each subsequent floor level of modules was then installed and tied into the modules below as well as the separating corridor cassettes.

These corridor cassettes were also brought to site as prefabricated units and installed to separate the two rows of bedrooms to form a corridor, 1.6m wide.

All of the 198 bedroom modules are approximately 2.5m wide × 6.5m long and 2.8m tall. Each one was fully fitted out in the factory and contained a shower enclosure, toilet, vanity unit and sink, fitted wardrobe and a large super-sized double bed. A service riser was also included in the module, which meant after the installation process was completed, each module was easily and quickly linked into the main mechanical and electrical services in the corridors.

"Between ten and twelve modules were installed each day using a 300t capacity mobile crane," explains Mr Boylan. Once installation was completed and the modules were all in place the façade of the structure was then clad and this very nearly completed project.

Robin Herron, Pre-Construction Director, John Sisk & Son said: "citizenM is an innovator in the hotel industry and has come to the market with a refreshing product responding to the needs of its target market, delivering affordable luxury. For this project the benefits of optimised modular construction were clear from the initial design stage down to the final delivery, bringing the lowest project cost, earlier completion, improved quality and building performance."

Summing up, Carel van Houte, Chief Development Officer, citizenM hotels said: "The current economic climate has increased the demand for affordable luxury accommodation. The offsite modular solution worked in perfect harmony with ours, providing the best consistent quality possible within strict time boundaries and at an affordable price."

The prefabricated modularised bedrooms were all produced offsite in North Wales, before being transported to Glasgow to be fitted into place.

Approximately one dozen modules were craned into place every day

FACT FILE

citizenM hotel, Glasgow

Main client: citizenM
Architect: Concrete Architectural Associates
Main contractor: John Sisk & Son
Structural engineer: Gifford
Bedroom module producer and supplier: Tata Steel Living Solutions
Modular structural core supplier: Bourne Off-Site Solutions
Steelwork contractor for podium: Henry Smith

Record breaker reaches skyward

Completed in time for the London 2012 Olympics, the Shard will present a stunning backdrop to the Games

The construction of the Shard, Europe's tallest, and first major mixed-use building has been dominating the London skyline for some months. Martin Cooper reports from a record breaking structure in the making.

When it reaches its final height of 310m the Shard will not only be the European Union's tallest building it will have become London's most highly visible structure.

Rising up on a plot adjacent to London Bridge Station, the building has quickly become a landmark and one finds it difficult to remember a time when it was not there. How fast the Shard has ingrained itself on the capital's consciousness is testament to the size, shape and design as well as the speed of its construction programme.

This programme, which began in 2007, has seen a number of records tumble including the UK's largest ever continuous concrete pour for the basement slab and most recently (December 2010) becoming the country's tallest structure, ahead of schedule, when the 72-storey core was completed.

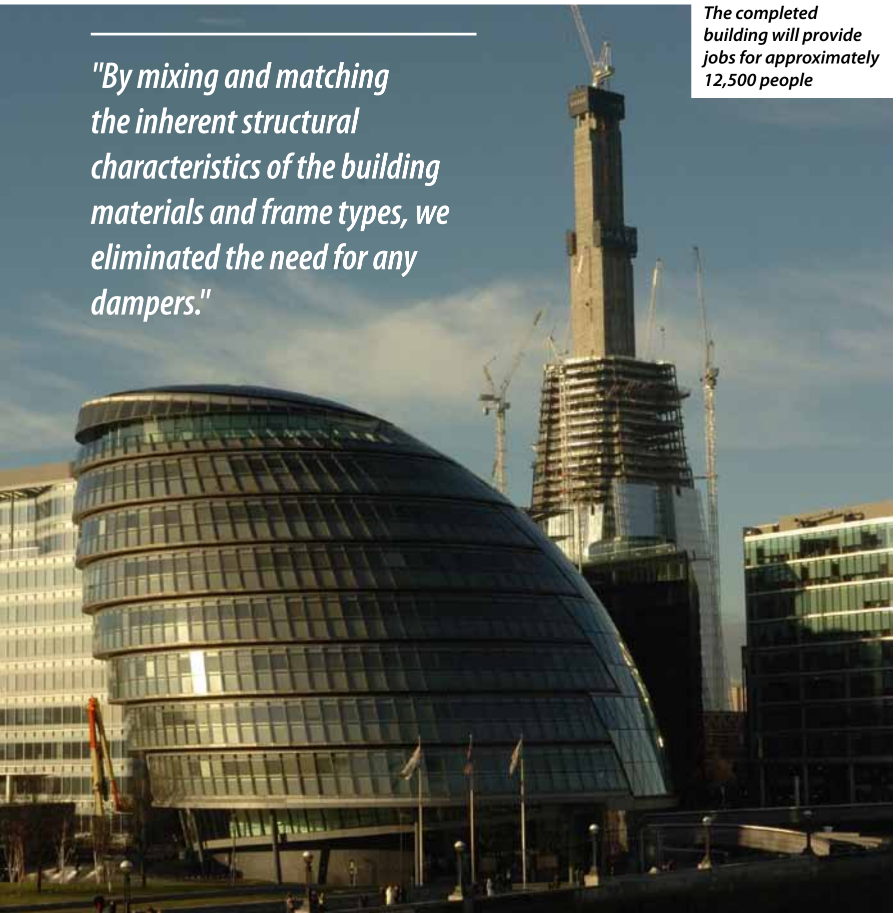
Said to be Europe's largest mixed-use building, it has been designed by architect Renzo Piano as a 'vertical city'. Sitting above three concrete formed basement levels, from ground level upwards the Shard consists of public areas, retail outlets and a lobby up to third floor, office accommodation up to level 28, and then above this restaurants and a mid-level public viewing gallery from levels 31 to 33. Levels 34 to 50 have been pre-let to the Shangri-La Hotel and within this zone the structure's framing material changes from steel to concrete.

Ground floor to level 40 the building has been constructed with structural steelwork. However, from the first level of hotel bedrooms a concrete frame kicks off. The post tensioned concrete frame then extends upwards to level 69 and not only encompasses the hotel, but also 12 floors of prime residential apartments. Serviced by the five-star Shangri-La Hotel, the apartments will be the highest in the UK.

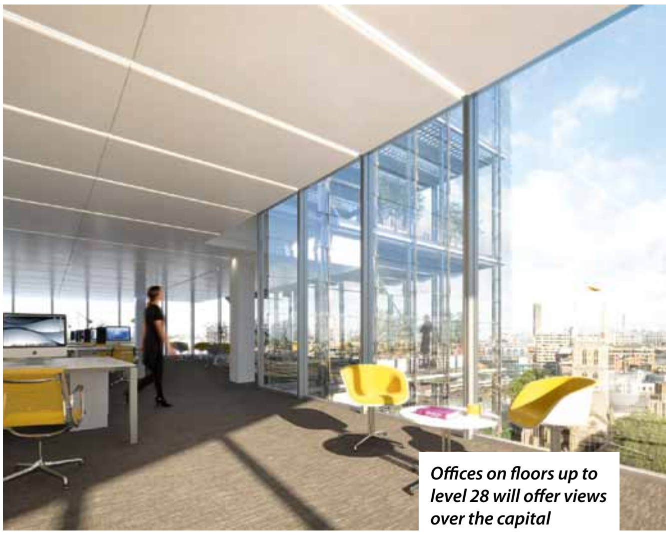
"By mixing and using the inherent structural characteristics of the building materials and frame types, we eliminated the

Dominating the locality the Shard forms the largest part of the London Bridge Quarter development

The completed building will provide jobs for approximately 12,500 people



"By mixing and matching the inherent structural characteristics of the building materials and frame types, we eliminated the need for any dampers."



Offices on floors up to level 28 will offer views over the capital

need for any dampers," says WSP Director Kamran Moazani. "From the beginning our design philosophy was to fully optimise the structure and a hybrid system best suited this."

The lateral stability for the structure is based on a vertical spine consisting of a cantilevered concrete core stiffened by a steel outrigger hat truss at high level (floors 66-69) engaging the perimeter columns of the building.

Optimised perimeter column locations transfer with height - as the building tapers - from 6m spacing at the base, to 3m, and then 1.5m at the very top. All vertical column transfers were optimised and achieved with no loss of space, while the perimeter columns are transferred using either a load sharing steel girder system or A-frames.

The Shard's central core has topped out at level 72, which is the top floor of an upper viewing gallery. This gallery, which extends from level 69 to 72, will be erected as part of Severfield-Reeve's steelwork erection programme phase two. Due to begin later this April, the second steel frame element crowns the building with a triple storey frame for the upper viewing area, followed by a steel lattice frame for the spire which will extend the structure upwards to level 87.

Above this, further steelwork - forming a cantilevered frame for the glass cladding at the structure's pinnacle - will be added, taking the building to the lofty heights of level 92. This topmost steel part of the structure has been dubbed the 'Radiator' as it will also house the heat rejection plant.

From the foot of the structure, ground floor to level 40 represents the biggest part of the overall steel package, and as of early December this initial phase, involving some 15,000 pieces of steelwork weighing 12,000t, had been completed by Severfield-Reeve Structures.

Springing off of the ground floor concrete slab, the lower level steelwork erection started during the Spring of 2010. This important milestone in the overall ➔

FACT FILE

The Shard, London

Client: Sellar Property Group

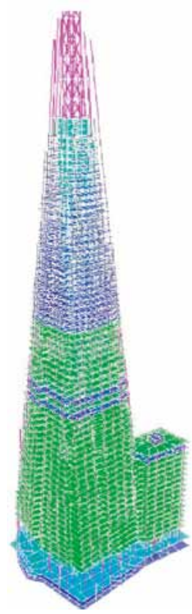
Architect: Renzo Piano

Main contractor: Mace

Structural engineer: WSP

Steelwork contractor: Severfield-Reeve Structures

Steel tonnage: 13,000t



Model showing the structure's slender tapering design

The Shard tapers inwards as it gets higher with column spacings decreasing from 6m centres to 1.5m

construction programme followed on from an extensive demolition phase and the installation of foundations and the slab.

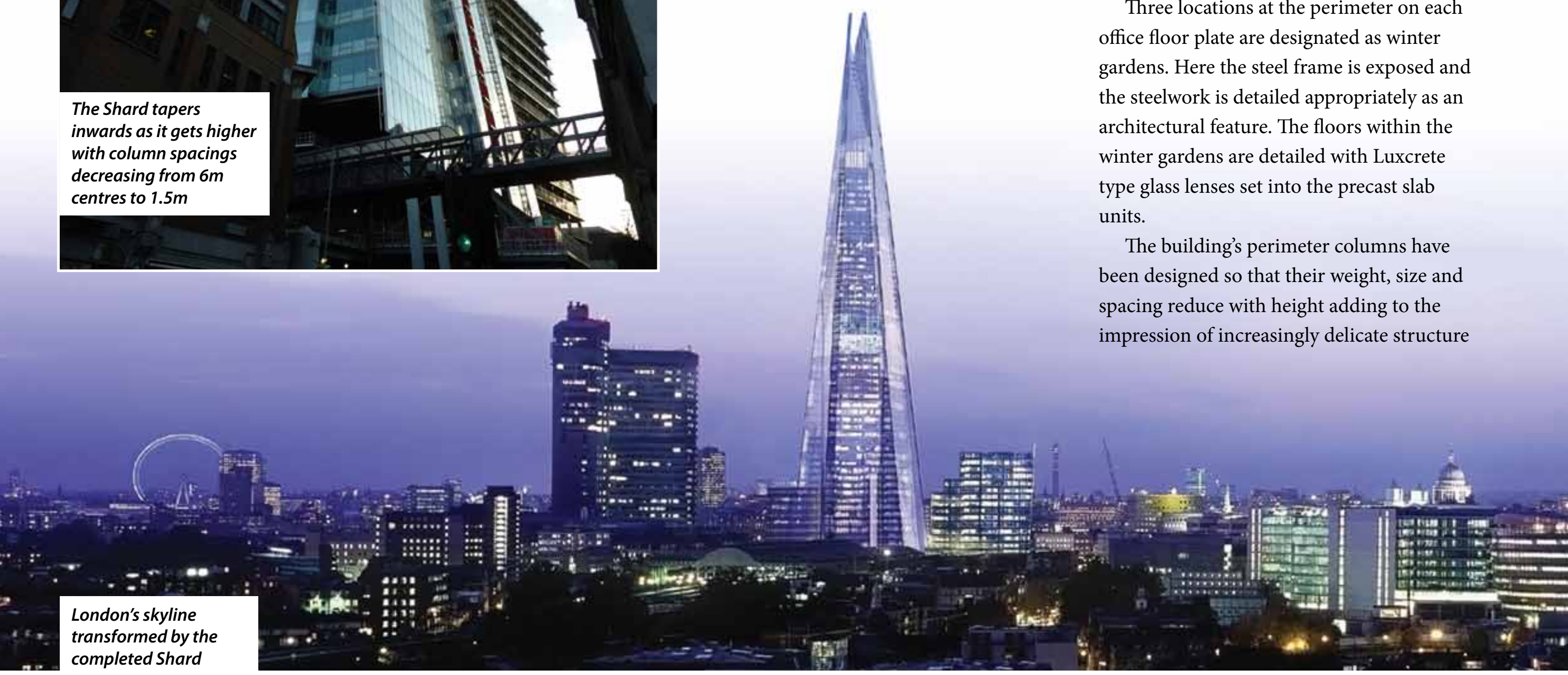
"Completing the initial and the largest part of the steelwork by November was a huge achievement for all those involved," says Gareth Lewis, Mace Chief Operating Officer for Construction. "One of the main reasons for choosing steel was for its speed of construction."

Another important factor in favour of steelwork, for this first sector of the building, is its flexibility. The offices, once complete, can be configured to client's needs by removing partition walls and enlarging adjoining spaces, something which would be extremely difficult and time-consuming with a concrete frame. Steel has also allowed the office zone, as well as the overall building height, to be maximised with an office floor to ceiling height of only 3.65m.

"Fabsec cellular beams, mostly with 15m spans, with services passing through them were deemed the most appropriate form of construction for the office, retail and the majority of the public spaces," explains Mr Moazani. "Steel framing is also used in the lowest levels of the hotel from levels 37 to 40 where edge transfer beams are used to transfer loads from columns at 3m centres to office floor columns at 6m centres."

Three locations at the perimeter on each office floor plate are designated as winter gardens. Here the steel frame is exposed and the steelwork is detailed appropriately as an architectural feature. The floors within the winter gardens are detailed with Luxcrete type glass lenses set into the precast slab units.

The building's perimeter columns have been designed so that their weight, size and spacing reduce with height adding to the impression of increasingly delicate structure



London's skyline transformed by the completed Shard tapering into the sky. The columns system, with its decreasing column spacing, requires the use of sets of load sharing beams at various locations in the elevation. Acting as a load sharing system, a Vierendeel truss system has been erected around the top of the steel framed sector (levels 37-40), transfering loads back to the core. This zone not only features a grid change, but it is also where the post tensioned frame kicks off.

The structural steelwork programme has also played an important role in the swiftness of the overall scheme. Many of the other trades follow-on immediately behind the steel erection, and the quicker the steel is up the quicker the cladding, for instance, can start.

"There is 56,000m^2 of glass to be installed on the Shard, that's 11,000 panels," explains Mr Lewis. "By the end of November we were ahead of schedule with more than 3,000 panels installed."

To complete the first 40 stories of steelwork by November is testament to the close cooperation between the entire construction team, something which has been borne out by the logistical schedules.

"We have a dedicated team on site, working closely with all other team members," says Peter Emerson, Chief Operating Officer of Severfield Rowen. "We've prefabricated as much steelwork as possible offsite which has contributed to a quick programme.

"Working offsite has included welding all perimeter cladding supports to the perimeter steelwork, which has helped with the speedier installation of the glazing."

A coordinated approach has been vital, especially with the logistics of working on a tight site adjacent to one of London's busiest rail stations.

"When it comes to the final steel elements which crown the building, we will be delivering as much of the steel in pre-assembled 'intelligent' units to speed up the erection and again limit the number of crane lifts," sums up Mr Emerson.

The shell and core of the Shard is due to be completed in Summer 2012, ready to form a fitting backdrop to the London Olympics.

London Bridge Quarter

The Shard, which is being developed by Sellar Property Group in conjunction with the State of Qatar, is the first phase of one of London's most important urban regeneration projects. Forming what has been dubbed London Bridge Quarter (LBQ), the overall development also has three other elements: London Bridge Place, an 18-storey commercial block; a new concourse for London Bridge Station; and a new bus station.

The estimated value of the LBQ is about £2,000M, and it will make a major contribution to the continuing regeneration of this already vibrant part of London's South Bank as well as helping to make Southwark a destination for both international businesses and tourists alike. It is estimated LBQ will provide employment for up to 12,500 people.

Built on a prominent hillside, the Alloa campus will overlook the town and the surrounding countryside

Campus construction boosts local economy

A new campus at Alloa represents the initial phase of Forth Valley College's ambitious plans to upgrade its three main centres. Martin Cooper reports.

FACT FILE
Forth Valley College, Alloa campus
Main client: Forth Valley College
Architect: Reiach and Hall Architects
Main contractor: Miller Construction
Structural engineer: Halcrow Yolles
Steelwork contractor: Hescott Engineeering
Steel tonnage: 350t
Project Value: £21M

Forth Valley College is the fifth largest college in Scotland and currently undergoing a large scale modernisation programme consisting of the construction of two new campuses at Alloa and Stirling.

At both locations, the work involves the building of new premises to replace ageing town centre campuses. The new structures will provide students and local business communities with state-of-the-art facilities, while also giving a boost to the region's economy.

The first of the two projects to get underway was Alloa and here the job is helping students gain vital work experience as well as creating more than 130 jobs in a sector under pressure in the current economic climate.

Keith Brown, Minister Scottish Parliament (MSP) for Skills and Lifelong Learning said: "We must continue to stimulate the economy when and where we can in order to support a strong recovery."

The new Alloa campus is a 6,000m^2 structure being built on the site of a former council office. Once complete this summer the college will relocate from its existing Alloa premises into its new modern and eye-catching campus.

The most noticeable feature of the site is its topography and this has presented main contractor Miller Construction with its biggest challenge. In order for the new structure to overlook the adjacent main road and town centre and maximise the site's footprint, the structure has been built into a slope that dominates the site.

Featuring a workshop block at the front, the building rises up the slope via concrete retaining walls. A two-storey link block straddles the walls and allows access into the main teaching block which sits at the top of the slope and overlooks the main road as well as the workshop area.

"We initially had to remove an existing retaining wall and then construct new retaining walls for the college's stepped levels," explains John Downey, Miller Construction Senior Project Manager for both the Alloa and Stirling sites.

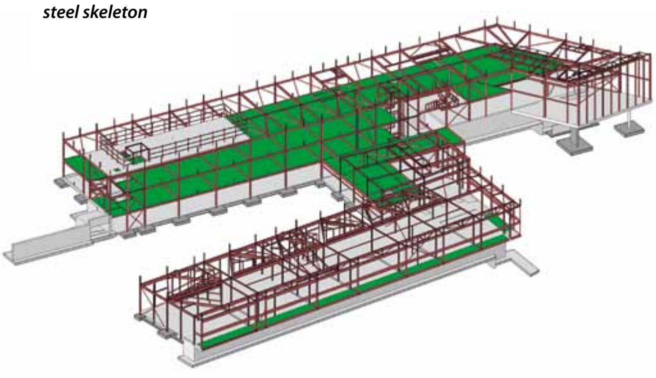
Building new retaining walls, earthmoving and then backfilling took approximately 12 weeks to complete. The lower level of the project was then vibro compacted prior to pad foundations being installed, while on the upper level - which consists mostly of stiff clay - the pad foundations were able to be immediately installed.

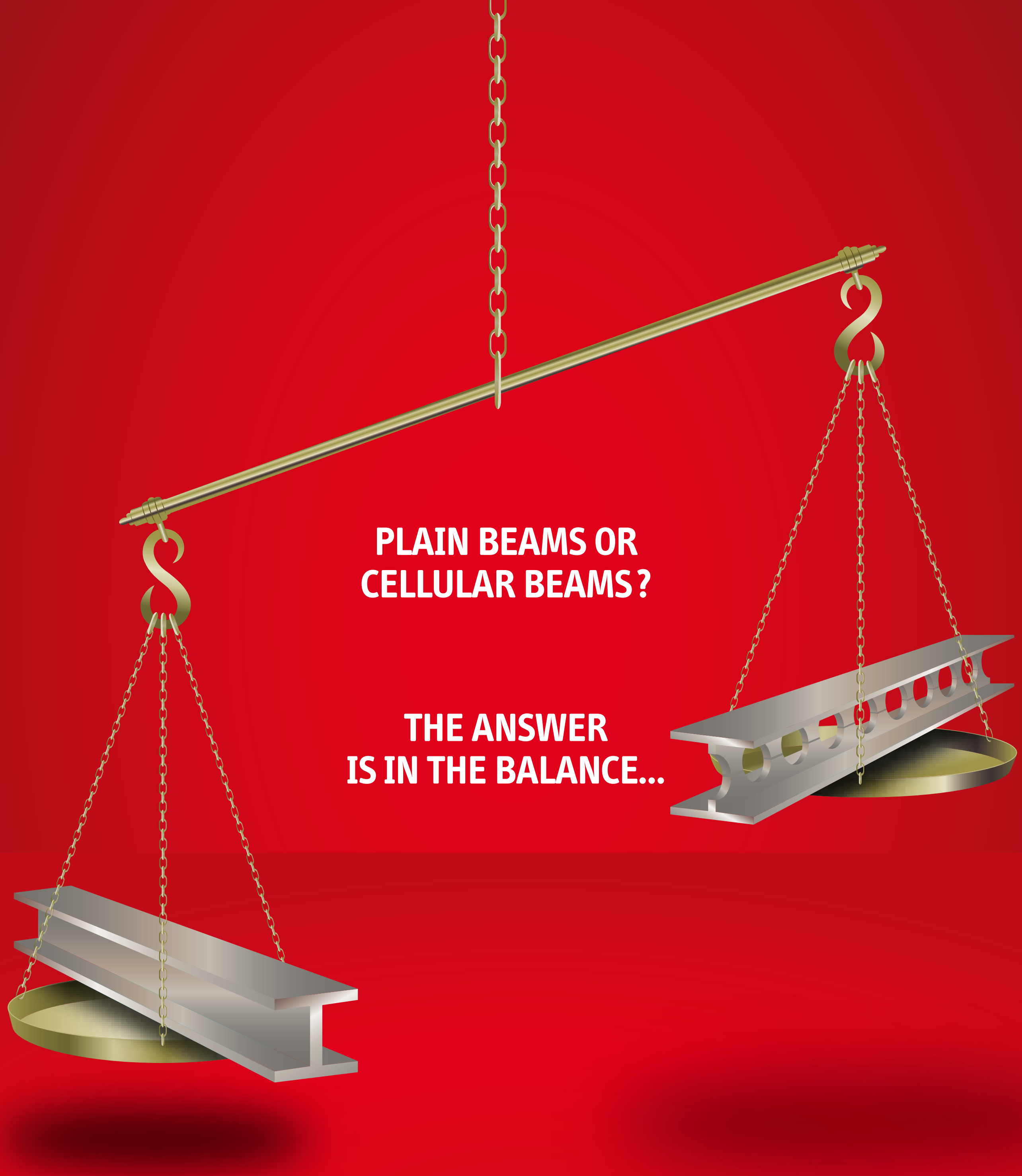
Locally based Hescott Engineering was then able to begin its 10 week steel erection programme for the main frame.

Speed of construction as well as cost drove the decision to go with a steel frame. On this project time is of the essence as the campus is due to be open in the autumn.

"Steel was selected as the primary construction material for two main reasons. The cost was a key factor, however with a challenging programme it was clear that the flexibility to incorporate design changes as the scheme developed would be essential," explains Gary Farquhar, Halcrow Yolles Senior Engineer. "With the steel procurement process changes can be incorporated right up to fabrication."

Model showing the steel skeleton





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The library overlooks the rest of the college

A glazed façade will allow plenty of natural light to penetrate the library

"With the steel procurement process changes can be incorporated right up to fabrication."

The steelwork configuration for the main teaching block is based around an irregular grid pattern, as the block consists of various sized rooms. The longest spans are however in the 10m region supporting hollow core floors spanning up to 9m. Stability for the frame is provided by conventional cross bracing placed in corridor partitions and external walls.

Because of the sloping site, the teaching block has a partial basement, making the structure a three-storey building in places. This basement area can only be accessed from the rear and will be used for storage. The main entrance to the block is located on the first floor along with some teaching rooms, while the uppermost second floor is completely taken up with classrooms.

The floors of the teaching block have all been constructed with conventional rolled sections in conjunction with Deltabeams.

Deltabeams are one of a number of steel shallow floor solutions.

"For the teaching block a relatively clean soffit was considered attractive by the design team. Minimising storey heights also provided a beneficial cost balance by reducing the height of the feature and very high specification masonry cladding," says Mr Farquhar.

In order to speed up the erection of the Deltabeams, Hescott installed the beams in regular 9m long continuous lengths, erecting the teaching block's columns on top of the beams and in storey high sections.

The western end of the teaching block culminates in a feature library which overlooks the town and has an 8m-high glazed elevation. This block is supported on a large flat slab with only two minimal RC columns supporting it. The designers also had to be mindful of horizontal deflection because of the full height curtain walling.

For the single-storey workshop a more open plan arrangement was required and a rectangular grid of up to 12m x 10m was used throughout. A more traditional beam and column steelwork frame was erected for this part of the project.

One of the main design challenges centres around the workshop which overlooks and cantilevers out over the adjacent main road. Although the cantilevers are only 2.5m, each is heavily loaded, supporting up to 12m lengths of brickwork façade and long span concrete floors.

"While the tall cantilever façade was heavy, the workshop roofs were relatively light, which gave us an interesting dilemma," adds Mr Farquhar.

To overcome this, Halcrow Yolles designed long span compound sections. The projecting cantilevers continued as ground level concrete encased compound sections running 10m back to the internal column base. The composite action helped limit deflections in the cantilever tip, while the 10m lever ensured the self weight of the lightweight roof and related pad foundations was sufficient to resist the uplift force generated by the cantilever.

"One of those hidden details which are rarely appreciated by the end users, but give the structural engineers enormous satisfaction", said Mr Farquhar.

The new campus development will have space for up to 2,900 students per academic year, across all modes of attendance, and will include high tech-specification teaching rooms, workshops, gym and cafeteria. The campus will offer provision in subject areas such as construction, engineering, motor vehicle maintenance, science, business, computing, childcare and education, creative industries, hairdressing and beauty therapy.

Forth Valley College's Alloa campus is scheduled for completion during the summer of 2011.

The main teaching block features an irregular grid pattern as each floor accommodates different sized classrooms

Thermal mass and lightweight sustainable construction

BCSA Technical Development Manager Chris Dolling explains the parameters for achieving optimum thermal mass in steel-framed buildings.

A combination of natural ventilation and thermal mass was chosen as the best way of controlling building temperatures within Barnsley College

As the importance of sustainability has increased in recent years, attention has turned to finding ways in which good design can positively affect the drive to reduce embodied and operational carbon emissions in buildings. As far as framing and flooring systems are concerned, the choice between steel and concrete has provided limited opportunities to influence operational carbon. However, there is one commonly used exception to this, which is thermal mass

Thermal mass (more correctly called fabric energy storage) is the ability of the structural mass of a building to absorb excess heat. Most of a building's mass is in the floors and this is the part of the structure which is usually exposed, by removing the suspended ceiling, to take advantage of this heat storage capability. Used effectively, it can help to create a situation where some buildings can be cooled and ventilated without the use of air conditioning. As air conditioning is a major energy user in many buildings, this can lead to significant reductions in carbon emissions.

If thermal mass is to work effectively, the exposed floor must absorb the excess heat during the occupied hours and the floor is then cooled in the unoccupied hours. This usually happens over a 24 hour cycle. There is a limit to how much heat can be absorbed into the structure in the occupied hours and a further brake on the process is created by the resistance in a concrete floor to the passage of heat, (this can be understood better by remembering that concrete is also promoted as an insulator). Analysis has shown that no more than 100mm of concrete can be mobilised to absorb excess heat and this is available in steel and concrete framed buildings (see box).

A 100mm depth of concrete is available in the floor slab of all common forms of steel construction. Composite floors are generally 130-150mm thick with 70-90mm above the ribs. Precast units are generally 200-250mm thick. This provides optimum thermal mass from lightweight construction. The extra mass from heavy concrete construction is waste with an environmental burden, which is compounded by the heavier foundations required.

The misconception that extra weight is beneficial arises because structurally massive buildings, such as churches, remain cool in hot weather. The mass of the building is only part of the story. Churches do not have many windows, so there is very little solar gain. Also, they are not filled with computers and other electrical heat sources. Churches stay uncomfortably cold in winter as their excess mass prevents effective heating. Designers who wish to utilise thermal mass in a modern building should provide the optimum amount and not a wasteful excess - which may reduce efficiency.

Exposed soffits

One practical issue facing designers when utilising thermal mass is whether the exposed soffit is aesthetically acceptable. The problem is common to both concrete and steel construction. Perforated ceiling panels can be used to conceal the problem and still allow the air to flow. This may affect performance slightly. Metal deck soffits can be painted or prepainted to hide the galvanised finish, which some people may feel is unsightly

A suspended ceiling with painted metal decking on cellular beams

Metal decking is available with a prepainted soffit to hide the galvanised finish

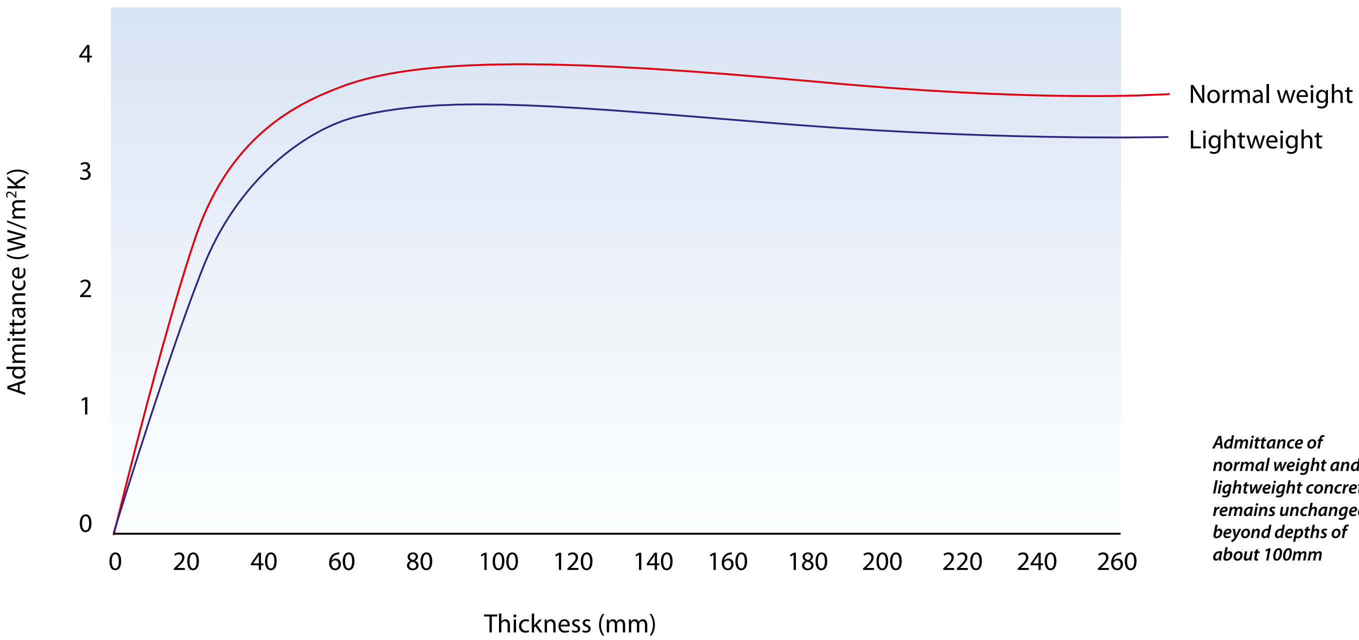
A permeable ceiling will hide a soffit while allowing air to flow

Why 100mm thickness is all you need

The most important characteristic of any material used to provide fabric energy storage is the admittance. BRE Digest 454, Part 1[1] defines this as "the rate at which a square metre of surface area can absorb heat from the air at a temperature difference of 1°C, expressed as units of W/m²K." In theory, some exposed surfaces, such as concrete soffits, can have admittance factors of over 20 W/m²K. In practice, the resistance to heat flow at the surface limits this to a maximum of about 8.3 W/m²K[2]. Reference 2 states that *"Admittance is dependent upon a number of material variables – notably density, thermal capacity, and the thermal conductivity of the first 100 mm or so (for a 24-hour cycle) below the surface."*

Admittance is a function of the depth of the material absorbing the excess heat. BRE Digest 454 Part 1 states that: *"Based on a 24 hour period… temperature variations penetrate up to about 100mm… depending on the material type and the rate of heat transfer. Increasing the amount of thermal mass available beyond the 100mm depth on a specific surface offers little benefit for a diurnal cycle."* In more straightforward terms, this means that, on a 24 hour cycle of heating and cooling, it is possible to utilise only 100mm of mass to absorb excess heat. This is something which has been recognised for some time, has been widely reported in published papers and accepted by the concrete industry.

1. *Braham, D. et al. Building Research Establishment Digest 454, Part 1: Thermal mass in office buildings, an introduction.*
2. *Avoiding or minimising the use of air conditioning. www.cibse.org/pds/GIR031.pdf.*



Admittance of normal weight and lightweight concrete remains unchanged beyond depths of about 100mm

David Mellor Factory, Hathersage, Derbyshire

For: David Mellor Design Limited

The David Mellor Factory is a circular building with a domed steel roof structure spanning 28 metres from a natural sandstone wall. It houses a cutlery factory and is built in an area of outstanding natural beauty in the Peak District.

The steel roof structure consists of 24 trusses radiating around a glazed centre and supported on the perimeter wall, where a solid bar provides the circumferential tie. Viewed from inside, the structure resembles a floating bicycle wheel with the hub around the glazed centre. This circular hub truss carries torsional loads from the radial trusses.

The roof structure is supported off the wall and over the clerestory glazing by a series of radial on-edge vertical steel plates. These ensure compatibility between the brittle solid masonry elements and the flexible steel roof by acting as a spring. These discreet steel elements give the roof the impression that it 'floats' above the wall, and allow for horizontal and vertical deflection whilst restraining the roof circumferentially and vertically.

The simple external appearance is achieved in harmony with the lightweight internal steel structure.

SSDA COMMENDATION 1990

Architects
Michael Hopkins and Partners

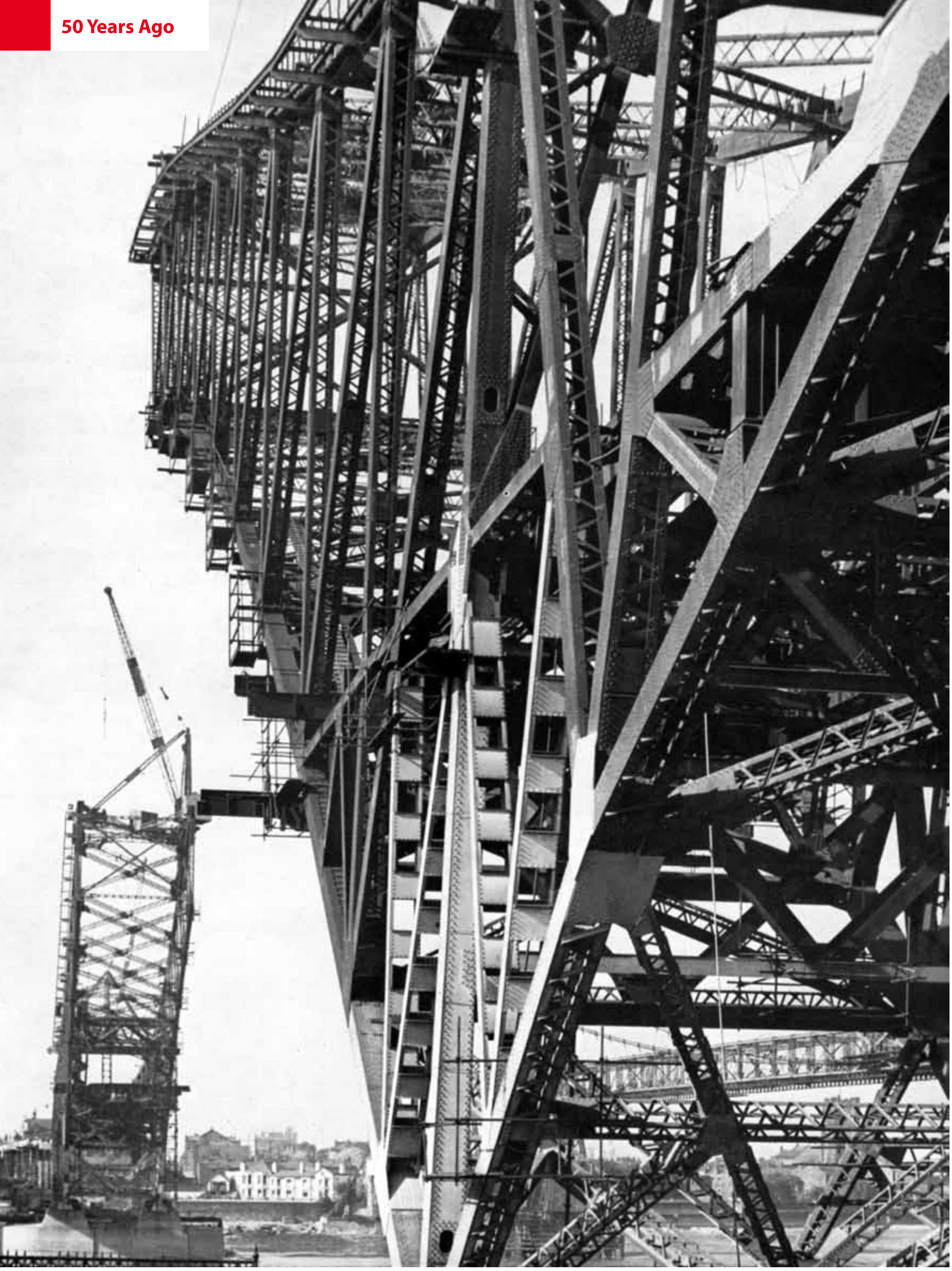
Structural Engineers
Whitby and Bird

Steelwork Contractor
Tubeworkers Limited

Main Contractor
David Mellor Design Limited

Judges Comments:

Those who work within this delightful small factory and who also had the satisfaction of helping to build it, thoroughly enjoy the environment created by the high quality of its design, detail and worksmanship.



Runcorn–Widnes Bridge

The New Runcorn-Widnes Bridge is of the arched design and has a central span of 1,082 ft with side spans of 250 ft. The bridge is approached by reinforced concrete viaducts on each side of the river. The bridge provides for a 33-ft carriageway and two 6-ft footpaths.

The foundation work consists of a large skew pier in the river on the Widnes side, a skew pier on the Runcorn side, two approach piers in Widnes and foundation work for the side spans of the arch bridge.

A large amount of property had to be acquired in connection with these approaches and the total estimated cost of the works and property is of the order of £2,900,000.

The total weight of steel in the main bridge is approximately 5,600 tons, and includes mild steel to B.S. 15, high tensile steel to B.S. 548, and weldable high tensile steel to B.S. 968.

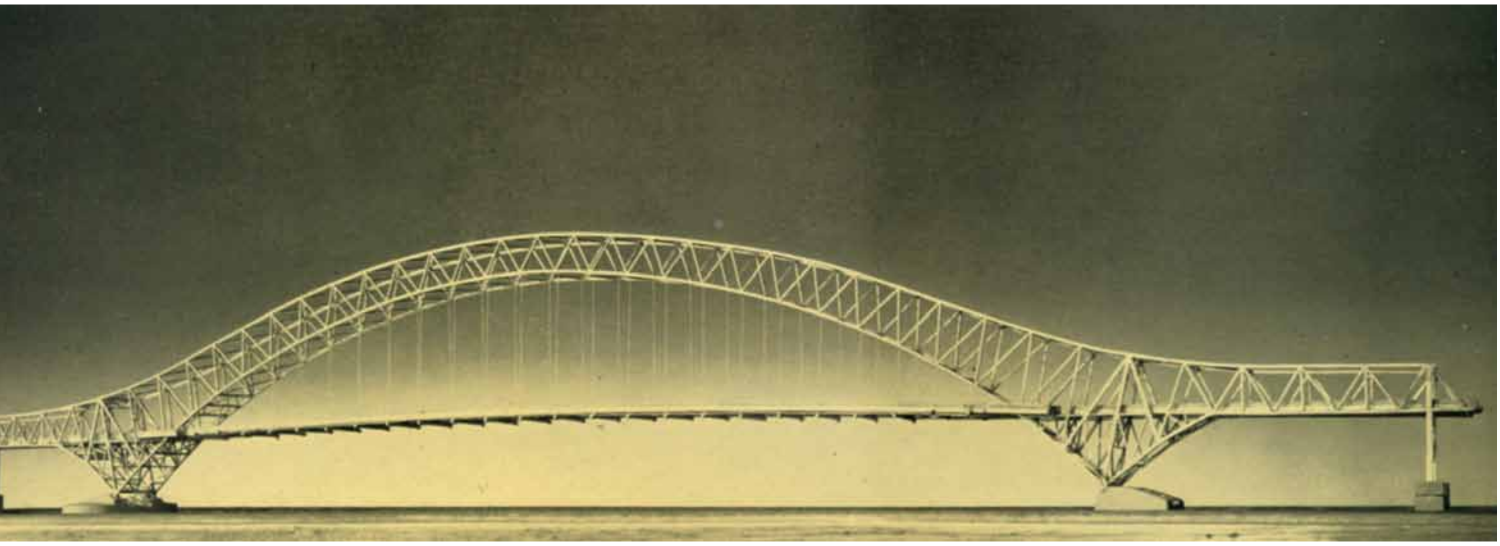
The rise of the arch is 252 ft 6 in above the bearings, the main arch ribs are placed at 54 ft centres at varying depths from 35 ft to 95 ft approximately, the truss cords being generally 33 in x 27 in enclosed box section. Hangers of locked coil steel wire rope will be suspended from the arch rib to support the deck of the bridge. The deck is constructed of welded steel cross girders and stringers with reinforced concrete deck.

A feature of the design of the bridge viaducts are the 'T' shaped piers that support the reinforced concrete deck.

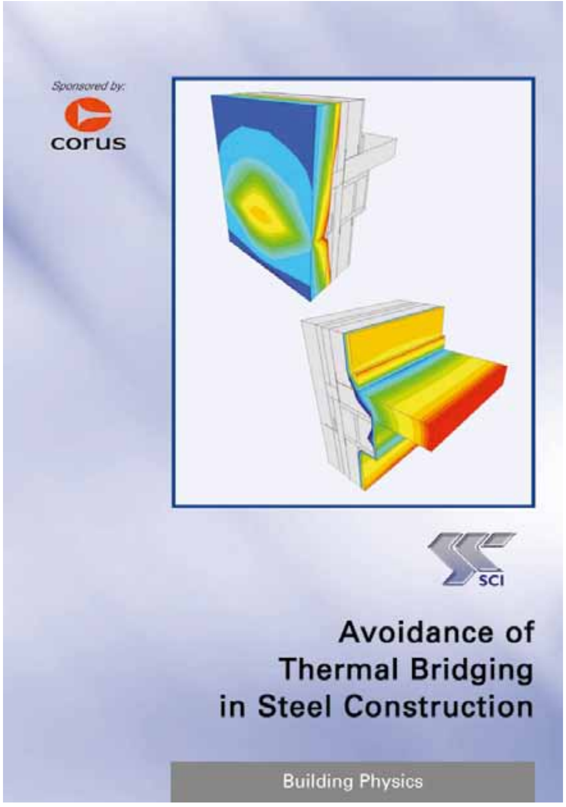
It is anticipated that the work will be completed in the spring of 1961.

Above: The Runcorn-Widnes Bridge under construction.

Below: Model of the Runcorn-Widnes Bridge, which, when finished, will be one of the most beautiful bridges in the world.



Avoidance of Thermal Bridging in Steel Construction



Catalogue number	**P380**
ISBN number	978 1 85942 182 6
Authors	A G J Way MEng CEng MICE, C Kendrick MSc
Pagination	25 pp
Pages	A4 Paperback
Publication date	2088

Energy efficiency is becoming an increasingly important parameter in the design of buildings. The thermal insulation provided by the building envelope is key to energy efficiency but thermal bridges, weak spots in the insulation, lead to local heat losses that reduce the efficiency of a building.

This technical guidance illustrates how thermal bridging occurs in a number of design situations. It describes the methodologies for calculating energy performance in accordance with regulatory requirements and the control of condensation. It describes the results of thermal modelling analyses of typical interface details such as beams penetrating the building envelope, balcony attachments and brickwork supports all used in steel construction. It also provides whole building modelling results with SAP ratings and target emissions rates.

The details described in the publication have not been designed to optimise thermal performance and in practice further thermal modelling analyses could be carried out to quantify the improvement in thermal performance that modifications to the details could deliver. However, the information can be used as general guidance on how to minimise thermal bridging in steel construction.

Until 4th February 2011 this publication is available at £5 + P&P to SCI Members (normally £10) and £10 + P & P to Non SCI Members (normally £20) Call SCI Publications Sales on +44 01344 636505 to purchase your copy.

New and revised codes & standards

From BSI Updates November and December 2010

BS EN PUBLICATIONS

BS EN ISO 14171:2010

Welding consumables. Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels. Classification

Supersedes BS EN 756:2004

BS EN 15643-1:2010

Sustainability of construction works. Sustainability assessment of buildings. General framework

No current standard is superseded

CORRIGENDA TO BRITISH STANDARDS

BS EN 1997-2:2007

Eurocode 7. Geotechnical design. Ground investigation and testing

CORRIGENDUM 1

BS EN 14399-7:2007

High-strength structural bolting assemblies for preloading. System HR. Countersunk head bolt and nut assemblies

CORRIGENDUM 1

BS EN 14399-8:2007

High-strength structural bolting assemblies for preloading. System HV. Hexagon fit bolt and nut assemblies

CORRIGENDUM 1

BRITISH STANDARDS WITHDRAWN

BS EN 756:2004

Welding consumables. Solid wires, solid wire-flux and tubular cored electrode-flux combinations for submerged arc welding of non alloy and fine grain steels. Classification

Superseded by BS EN ISO 14171:2010

NEW WORK STARTED

ISO 16346

Energy performance of buildings. Assessment of overall energy performance

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – NATIONAL BRITISH STANDARDS

10/30228091 DC

BS 7371-8 Coatings on metal fasteners. Specification for sherardized coatings

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – ADOPTIONS

10/30233286 DC

BS EN 1998-2 A2 Eurocode 8. Design of structures for earthquake resistance. Bridges

ISO PUBLICATIONS

ISO 225:2010

(Edition 3)

Fasteners. Bolts, screws, studs and nuts. Symbols and descriptions of dimensions

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ISO 14171:2010

(Edition 2)

Welding consumables. Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels. Classification

Will be implemented as an identical British Standard

ISO 15630-1:2010

(Edition 2)

Steel for the reinforcement and prestressing of concrete. Test methods. Reinforcing bars, wire rod and wire

Will be implemented as an identical British Standard

ISO 15630-2:2010

(Edition 2)

Steel for the reinforcement and prestressing of concrete. Test methods. Welded fabrics

Will be implemented as an identical British Standard

ISO 15630-3:2010

(Edition 2)

Steel for the reinforcement and prestressing of concrete. Test methods. Prestressing steel

Will be implemented as an identical British Standard

AD 352
Fatigue assessment of crane supporting structures to Eurocode 3

This Advisory Desk note offers advice on fatigue assessment of crane girders (described in the *Eurocodes* as "runway beams") and other crane supporting structures, in particular on the purpose of paragraph (2) of clause 9.1 of BS EN 1993-6 (*Eurocode 3 – Design of steel structures – Crane supporting structures*) and how it should be interpreted.

Clause 9.1(2) states: "Fatigue assessment need not be carried out for crane supporting structures if the number of cycles at more than 50% of full payload does not exceed C_0." The UK National Annex confirms that C_0 should be taken as 10^4.

The purpose of 9.1(2) of BS EN 1993-6 is to provide a simple preliminary check to see whether a detailed fatigue assessment is necessary. It was intended to avoid detailed calculations when the total number of operating cycles over the design life is modest. To achieve a simple rule it is necessary to make assumptions about the load spectrum, the design for strength at ULS (STR limit state) and the class of fatigue detail.

The first problem arises because of the use of the term "full payload" in clause 9.1(2). What is meant is the maximum value of the lifted load; it does not mean the crane capacity. It has mistakenly been suggested that if the crane capacity ("Safe Working Load") were double the maximum lifted load, this would avoid the necessity for a fatigue assessment of the crane supporting structure. This is a misinterpretation, leading to an unsafe conclusion.

It has also mistakenly been suggested that if a crane supporting structure were designed for double the actual loads applied by the crane, it need not be checked for fatigue. This is also a misinterpretation, leading to an unsafe conclusion.

The second problem is that there is no statement about the number of cycles at less than "50% of the payload". Although there was an assumption (in drafting the rule) that the total spectrum, of which the 10^4 cycles is part, has a normal (Gaussian) distribution, this is not explicitly mentioned. From the wording of the clause, it might be inferred that the number of cycles at less than 50% could be unlimited, but that would be an incorrect interpretation.

It also appears to have been assumed that the steel grade would not be higher than S275, that the span of the crane girder would be sufficient to avoid two load cycles for each pass of the crane and that the resistance of the supporting structure would be fully utilized under the ULS combination of actions. Taken with a further assumption about the relative magnitudes of crane self weight and lifted load, these assumptions imply a particular stress level under fatigue loading. Finally it appears to have been assumed that constructional details requiring the use of stress concentration factors will be avoided. None of these assumptions is stated.

It is therefore concluded that the rule, as expressed in clause 9.1(2) of EN 1993-6, is open to misinterpretation and potentially to an unsafe conclusion that a detailed fatigue assessment is not needed. This situation will be taken up with the relevant committees but in the meantime, the following modified version of the rule may be used.

"Fatigue assessment need not be carried out for crane supporting structures if the following criteria are all met:

1. the required steel grade for the structure is not greater than S275;
2. constructional details requiring the use of stress concentration factors are avoided;
3. the load on the structure due to the self weight of the crane does not exceed 70% of that due to the maximum lifted load ;
4. the span of the runway beams (crane girders) is at least 70% more than the crane wheel spacing (centre-to-centre of the first and last wheels in each end carriage);
5. either:
   a) the crane loading spectrum has a 'normal' (Gaussian) distribution, in which not more than 10,000 cycles impose a load exceeding 50% of the maximum load in the spectrum;
   b) the total number of cycles of loading on the structure, each cycle comprising of one traverse of the loaded crane and one traverse of the unloaded crane, does not exceed 10,000."

This modified rule is conservative; failure to comply with all five criteria does not necessarily indicate that a particular structure will fail a fatigue assessment, only that a full fatigue assessment should then be made.

Contact: **David Iles**
Tel: **01344 636525**
Email: **advisory@steel-sci.com**

Note: Thanks are expressed to Colin Taylor for his advice in the preparation of this AD.

AD 353
Execution class for bridge steelwork

With the switch to Eurocodes for the design of bridges, project specifications are now being drawn up based on the use of the execution standard BS EN 1090-2 and the Steel Bridge Group's Model Project Specification (MPS) document (SCI publication P382). The Advisory Desk has become aware that, in adopting the MPS, specifiers have in some cases chosen to select Execution Class 4 (EXC4) as the 'default' for the project, rather than EXC3, as recommended in the MPS. The purpose of this AD Note is to explain the consequence of making that more onerous choice.

BS EN 1090-2 sets out four execution classes, EXC1 to EXC4, EXC4 being the highest class. For the reliability level appropriate to most bridges, EXC3 will ensure the necessary quality of workmanship throughout the structure - in practice EXC2 might be sufficient for many parts of a bridge but it is easier and safer to adopt the same level of requirements generally, rather than try to differentiate between one part of the structure and another.

The differences in requirements between EXC3 and EXC4 arise in only a few clauses of BS EN 1090-2 but have a significant effect upon certain acceptance criteria and levels of inspection. The most notable changes are: thickness tolerance (5.3.2); quality of cut surfaces (6.4.3); acceptance criteria (7.6); extent of supplementary NDT (Table 24).

In detail the increased requirements are:

Thickness tolerance (5.3.2): The default thickness tolerance for EXC4 is Class B, which is more onerous than the Class A normally used at present for both highway and railway bridges. Specifying Class B will result in an increase of 0.5 to 0.7 mm in the thickness of most plates and material cost is directly related to the weight of the plates. The increase in self-weight due to positive tolerance should be allowed for, where appropriate (in lightweight structures of thin plated elements).

Quality of cut surfaces (6.4.3) – The cutting processes used in normal production are not capable of producing the 'Range 3' quality of surface required by EXC4. To achieve this quality the cut surface would need to be ground, which would frustrate the efforts that fabricators are making to avoid all manual grinding because of health and safety concerns over tool vibration and eye injury. The additional operation would add to cost. Range 3 quality is not usually assumed when carrying out fatigue assessment of free edges

Acceptance criteria (7.6) – Fabrication shops using mainly manual welding methods will struggle to achieve some of the additional acceptance criteria for level B+, particularly if the design calls for complex joints where access is poor and the welder may be working in an uncomfortable position. The additional requirements of EXC4 are only really achievable if there are simple, relatively straight joints where mechanized processes can be applied or the welder has good access and visibility.

Extent of NDT (12.4.2) - a greater extent of inspection clearly invokes greater time and cost.

The requirements for EXC3 in these clauses correspond to current practice in bridge fabrication, which has offered a quality that has generally been acceptable. Class EXC3 is adequate to ensure that the fatigue reference stress level is for the detail category in the Tables in BS EN 1993-1-9 or, where listed in Table NA.1 in the UK National Annex, the minimum strength level in that Table. Specifying EXC4 would meet the requirements for "special inspection and testing requirements" noted in NA.2.1.2 – for example allowing the detail category to increase from 125 to 140 for free edges – but the increase will rarely have any practical effect for fatigue, as lower category details at or near the specific location will usually govern.

In summary, if the more stringent requirements of EXC4 are specified, the requirements can be met but they are more onerous, will result in increased fabrication cost but will achieve very little benefit.

Contact: **David Iles**
Tel: **01344 636525**
Email: **advisory@steel-sci.com**

Steelwork contractors for buildings

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

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

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

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

Notes

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●		●										Up to £2,000,000
ACL Structures Ltd	01258 456051			●	●	●	●				●				●		Up to £2,000,000
Adey Steel Ltd	01509 556677				●	●	●	●		●	●			●	●		Up to £3,000,000
Adstone Construction Ltd	01905 794561			●	●	●											Up to £4,000,000
Advanced Fabrications Poyle Ltd	01753 531116				●		●	●	●	●	●				●	✓	Up to £400,000
Angle Ring Company Ltd	0121 557 7241												●				Up to £1,400,000
Apex Steel Structures Ltd	01268 660828				●		●			●	●						Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●		●	●					Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●		Up to £800,000*
ASD Westok Ltd	01924 264121												●				Up to £6,000,000
ASME Engineering Ltd	020 8966 7150				●					●	●			●	●	✓	Up to £1,400,000*
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✓	Above £6,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●		●							●			Up to £2,000,000
B D Structures Ltd	01942 817770			●	●	●	●				●			●			Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✓	Up to £1,400,000
Barnshaw Section Benders Ltd	01902 880848												●			✓	Up to £800,000
Barrett Steel Buildings Ltd	01274 266800			●	●	●	●									✓	Up to £6,000,000
Barretts of Aspley Ltd	01525 280136			●	●	●				●	●			●	●		Up to £3,000,000
BHC Ltd	01555 840006	●	●	●	●	●	●							●			Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●			●	●	✓	Up to £3,000,000
Browne Structures Ltd	01283 212720				●			●							●		Up to £400,000
Cairnhill Structures Ltd	01236 449393				●	●	●	●		●	●			●	●	✓	Up to £2,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●	●	●	●	●		●	●	✓	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 502277	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●		Up to £6,000,000
Cordell Group Ltd	01642 452406	●			●	●	●	●	●	●	●					✓	Up to £3,000,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●		Up to £1,400,000
Crown Structural Engineering Ltd	01623 490555			●	●	●	●		●		●			●		✓	Up to £800,000
D H Structures Ltd	01785 246269				●						●						Up to £40,000
Discain Project Services Ltd	01604 787276				●					●	●				●	✓	Up to £1,400,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●			●					✓	Up to £6,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✓	Up to £6,000,000
Emmett Fabrications Ltd	01274 597484			●	●	●	●							●			Up to £1,400,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✓	Up to £3,000,000
Fisher Engineering Ltd	028 6638 8521		●	●	●	●	●	●	●	●	●	●				✓	Above £6,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●			●						Up to £3,000,000
GME Structures Ltd	01939 233023			●	●		●	●		●	●			●	●		Up to £400,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●			Up to £800,000
Graham Wood Structural Ltd	01903 755991		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000
Grays Engineering (Contracts) Ltd	01375 372411				●			●		●	●				●		Up to £100,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●				✓	Up to £4,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●			●						Up to £2,000,000
Had Fab Ltd	01875 611711								●		●				●	✓	Up to £2,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✓	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●					Up to £2,000,000
Henry Smith (Constructional Engineers) Ltd	01606 592121			●	●	●	●	●									Up to £4,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●		Up to £4,000,000
Hills of Shoeburyness Ltd	01702 296321									●	●				●		Up to £1,400,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
J Robertson & Co Ltd	01255 672855									●	●				●		Up to £200,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●			Up to £6,000,000*
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●						Up to £1,400,000
Lowe Engineering (Midland) Ltd	01889 563244									●	●			●	●	✓	Up to £400,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✓	Up to £3,000,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		Up to £1,400,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Maldon Marine Ltd	01621 859000				●			●	●	●					●		Up to £1,400,000
Mifflin Construction Ltd	01568 613311		●	●	●	●	●				●						Up to £3,000,000
Milltown Engineering Ltd	00 353 59 972 7119			●	●	●	●	●									Up to £6,000,000
Newbridge Engineering Ltd	01429 866722			●	●	●	●								●	✓	Up to £1,400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●						✓	Up to £4,000,000
On Site Services (Gravesend) Ltd	01474 321552				●		●	●		●	●				●		Up to £200,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		Up to £1,400,000
Paddy Wall & Sons	00 353 51 420 515			●	●	●	●	●	●	●	●					✓	Up to £6,000,000
Painter Brothers Ltd	01432 374400								●		●				●	✓	Up to £6,000,000
Pencro Structural Engineering Ltd	028 9335 2886			●	●		●	●			●				●	✓	Up to £2,000,000
Peter Marshall (Fire Escapes) Ltd	0113 307 6730									●					●		Up to £1,400,000
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		Up to £1,400,000
REIDsteel	01202 483333		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000*
Remnant Engineering Ltd	01564 841160				●		●	●	●	●	●			●	●	✓	Up to £400,000*
Rippin Ltd	01383 518610			●	●	●	●	●									Up to £1,400,000
Robinson Steel Structures	01332 574711		●	●	●	●	●		●	●	●	●		●	●	✓	Above £6,000,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Rowen Structures Ltd	01773 860086		●	●	●	●	●	●	●	●	●	●		●			Above £6,000,000*
RSL (South West) Ltd	01460 67373			●	●		●				●						Up to £1,400,000
S H Structures Ltd	01977 681931						●	●	●	●							Up to £2,000,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Shipley Fabrications Ltd	01400 231115			●	●	●	●		●	●	●				●		Up to £200,000
SIAC Butlers Steel Ltd	00 353 57 862 3305		●	●	●	●	●	●	●		●	●				✓	Above £6,000,000
SIAC Tetbury Steel Ltd	01666 502792			●	●	●	●				●	●				✓	Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●		●								●		Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		Up to £1,400,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●	●			●		Up to £200,000
The AA Group Ltd	01695 50123			●	●	●	●			●	●				●		Up to £4,000,000
Traditional Structures Ltd	01922 414172		●	●	●	●	●	●	●		●	●		●		✓	Up to £4,000,000*
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●		Up to £4,000,000
W I G Engineering Ltd	01869 320515				●					●					●		Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✓	Up to £6,000,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●	●	✓	Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●			●			●	●	●	●				●	✓	Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●					✓	Up to £2,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)

Corporate Members

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

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

Associate Members

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9
AceCad Software Ltd	01332 545800		●							
Albion Sections Ltd	0121 553 1877	●								
Andrews Fasteners Ltd	0113 246 9992									●
ArcelorMittal Distribution – Birkenhead	0151 647 4221								●	
ArcelorMittal Distribution – Birmingham	0121 561 6800								●	
ArcelorMittal Distribution – Bristol	01454 311442								●	
ArcelorMittal Distribution – Manchester	0161 703 9073								●	
ArcelorMittal Distribution – Mid Glamorgan	01443 812181								●	
ArcelorMittal Distribution – Scunthorpe	01724 810810								●	
ArcelorMittal Distribution – Wolverhampton	01902 365200								●	
Arro-Cad Ltd	01283 558206			●						
ASD Interpipe UK Ltd	0845 226 7007								●	
ASD metal services - Biddulph	01782 515152								●	
ASD metal services - Bodmin	01208 77066								●	
ASD metal services - Cardiff	029 2046 0622								●	
ASD metal services - Carlisle	01228 674766								●	
ASD metal services - Daventry	01327 876021								●	
ASD metal services - Durham	0191 492 2322								●	
ASD metal services - Edinburgh	0131 459 3200								●	
ASD metal services - Exeter	01395 233366								●	
ASD metal services - Grimsby	01472 353851								●	
ASD metal services - Hull	01482 633360								●	
ASD metal services - London	020 7476 0444								●	
ASD metal services - Norfolk	01553 761431								●	
ASD metal services - Stalbridge	01963 362646								●	
ASD metal services - Tividale	0121 520 1231								●	
Austin Trumanns Steel Ltd	0161 866 0266								●	
Ayrshire Metal Products (Daventry) Ltd	01327 300990	●								
BAPP Group Ltd	01226 383824									●
Barnshaw Plate Bending Centre Ltd	0161 320 9696	●								
Barrett General Steels	01274 682281								●	
Barrett Tubes Division	0121 601 5050								●	
Cellbeam Ltd	01937 840600	●								
Cellshield Ltd	01937 840600							●		
CMC (UK) Ltd	029 2089 5260							●		
Composite Metal Flooring Ltd	01495 761080	●								

Steelwork contractors for bridgework

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

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

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

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

Company name	Tel	FG	PG	TW	BA	CM	MB	RF	AS	QM	Contract Value (1)
'N' Class Fabrication & Installation	01733 558989	●	●	●	●			●		✓	Up to £800,000
ABC Bridges Ltd	0845 0603222	●								✓	Up to £100,000
A G Brown Ltd	01592 630003	●						●	●	✓	Up to £800,000
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	✓	Up to £1,400,000
B&B Bridges Ltd	01942 676770	●	●	●	●	●	●	●	●	✓	Up to £1,400,000
Briton Fabricators Ltd ◆	0115 963 2901	●	●	●	●	●	●	●	●	✓	Up to £3,000,000
Cairnhill Structures Ltd ◆	01236 449393	●	●		●			●	●	✓	Up to £2,000,000
Carver Engineering Services Ltd	01302 751900	●	●	●	●		●	●	●	✓	Up to £2,000,000
Cimolai Spa	01223 350876	●	●	●	●	●	●			✓	Above £6,000,000
Cleveland Bridge UK Ltd ◆	01325 502277	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Concrete & Timber Services Ltd	01484 606416	●	●	●		●	●		●	✓	Up to £800,000
Donyal Engineering Ltd	01207 270909	●						●	●	✓	Up to £800,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●		●	●	●	✓	Up to £2,000,000
Francis & Lewis International Ltd	01452 722200							●	●	✓	Up to £2,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●		●	●	✓	Up to £6,000,000
Hollandia BV	00 31 180 540540	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Interserve Project Services Ltd	0121 344 4888							●	●	✓	Above £6,000,000
Interserve Project Services Ltd	020 8311 5500	●	●	●	●		●	●	●	✓	Up to £400,000*
Mabey Bridge Ltd ◆	01291 623801	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●						●		✓	Up to £800,000
Nusteel Structures Ltd ◆	01303 268112	●	●	●	●	●		●	●	✓	Up to £4,000,000
Painter Brothers Ltd ◆	01432 374400	●		●					●	✓	Up to £6.000,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓	Up to £3,000,000*
Remnant Engineering Ltd ◆	01564 841160	●							●	✓	Up to £400,000*
Rowecord Engineering Ltd ◆	01633 250511	●	●	●	●	●	●	●	●	✓	Above £6,000,000
SIAC Butlers Steel Ltd ◆	00 353 57 862 3305	●	●	●	●	●		●	●	✓	Above £6,000,000
TEMA Engineering Ltd ◆	029 2034 4556	●	●	●	●	●	●	●	●	✓	Up to £1,400,000*
Varley & Gulliver Ltd ◆	0121 773 2441	●						●	●	✓	Up to £4,000,000
Watson Steel Structures Ltd ◆	01204 699999	●	●	●	●	●	●	●	●	✓	Above £6,000,000

◆ Denotes Steelwork Contractor Membership of the BCSA

Company name	Tel	1	2	3	4	5	6	7	8	9
Composite Profiles UK Ltd	01202 659237	●								
Computer Services Consultants (UK) Ltd	0113 239 3000		●							
Cooper & Turner Ltd	0114 256 0057									●
Cutmaster Machines UK Ltd	01226 707865					●				
Daver Steels Ltd	0114 261 1999	●								
Development Design Detailing Services Ltd	01204 396606			●						
Easi-edge Ltd	01777 870901							●		
Fabsec Ltd	0845 094 2530	●								
FabTrol Systems UK Ltd	01274 590865		●							
Ficep (UK) Ltd	01924 223530					●				
FLI Structures	01452 722200	●								
Forward Protective Coatings Ltd	01623 748323						●			
Hadley Rolled Products Ltd	0121 555 1342	●								
Hempel UK Ltd	01633 874024						●			
Hi-Span Ltd	01953 603081	●								
Highland Metals Ltd	01343 548855						●			
Hilti (GB) Ltd	0800 886100									●
International Paint Ltd	0191 469 6111						●			
Jack Tighe Ltd	01302 880360						●			
Kaltenbach Ltd	01234 213201					●				
Kingspan Structural Products	01944 712000	●								
Leighs Paints	01204 521771						●			
Lindapter International	01274 521444									●
Metsec plc	0121 601 6000	●								

Company name	Tel	1	2	3	4	5	6	7	8	9
MSW Structural Floor Systems	0115 946 2316	●								
National Tube Stockholders Ltd	01845 577440								●	
Northern Steel Decking Ltd	01909 550054	●								
Panels & Profiles	0845 308 8330	●								
John Parker & Sons Ltd	01227 783200								●	●
Peddinghaus Corporation UK Ltd	01952 200377					●				
Peddinghaus Corporation UK Ltd	00 353 87 2577 884					●				
PMR Fixers	01335 347629	●								
PP Protube Ltd	01744 818992	●								
PPG Performance Coatings UK Ltd	01773 837300						●			
Prodeck-Fixing Ltd	01278 780586	●								
Rainham Steel Co Ltd	01708 522311								●	
Richard Lees Steel Decking Ltd	01335 300999	●								
Schöck Ltd	0845 241 3390	●								
Site Coat Services Ltd	01476 577473						●			
Structural Metal Decks Ltd	01202 718898	●								
Tata Steel	01724 404040				●					
Tata Steel Distribution (UK & Ireland)	01902 484100								●	
Tata Steel Service Centres Ireland	028 9266 0747								●	
Tata Steel Service Centre Dublin	00 353 1 405 0300								●	
Tata Steel Tubes	01536 402121				●					
Tekla (UK) Ltd	0113 307 1200		●							
Tension Control Bolts Ltd	01948 667700									●
Wedge Group Galvanizing Ltd	01909 486384						●			