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NSC

Southend creates Olympic gateway

March 2011
Vol 19 No. 3

Newhaven recovers energy

Regeneration centres on Rotherham

Dumbarton factory framed

Steel replaces timber for housing

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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.

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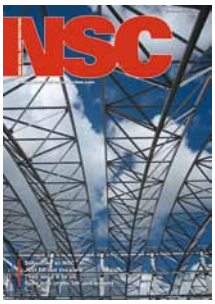




Cover Image
Newhaven Energy Recovery Facility, East Sussex
Main Client: Veolia Environmental Services
Architect: S'pace Architecture and Environment
Steelwork contractor: Graham Wood Structural
Steel tonnage: 800t

March 2011 Vol 19 No 3

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

SCI
Steel Knowledge

DESIGN OF STEEL BRIDGES

29 and 30 March 2011, Leeds

The design of steel bridges is a two-day course aimed at graduate engineers with a basic knowledge of bridge design who are employed in consulting practices and public/local authorities.

Speakers include many designers and steelwork fabricators actively involved in highway bridge design and thus the course provides access to the latest 'best practice' design guidance.

For structural design, reference is made to the Eurocodes. These standards have replaced BS 5400 and their use is required by client authorities for all new bridge design projects.

Fee and Registration

The course fee is:

£250 + VAT (BCSA & SCI members)
£300 + VAT (non-members)

This includes lunch and refreshments on both days, course notes and ten free Steel Bridges guidance publications, supplied as PDF's (two as hardcopies) as well as new Preliminary Steel Bridge design software to the Eurocodes.

Course objectives

- Give an overview of common forms of steel bridge used in the highway infrastructure
- Explain the design basis set out in the Structural Eurocodes and the evaluation of bridge loading
- Examine the modelling techniques for bridges, to determine internal forces and moments
- Explain the basis for determining the resistance of structural members, bracing systems and connections
- Examine requirements for fatigue design
- Give practical guidance on material selection, connection detailing, bridge articulation and support
- Give guidance on design for economical and durable construction

Please visit **WWW.STEEL-SCI.ORG/COURSES** or call: **+44 (0)1344 636 500** for more details and to register to attend.

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TATA STEEL

Steel development continues

Nick Barrett - Editor

Along with the rest of the construction industry, the steel sector is facing testing times. The tide of economic recovery looks increasingly unlikely to lift construction appreciably this year but, as BCSA President Jack Sanderson says in his address to the National Dinner (see News), recovery is at least in view.

Meanwhile the steel sector is focusing on its traditional values of delivering the quality product that customers expect whatever the economic background. Across the steel sector we can see the investments still being made that will ensure the most up to date technical advice and back up is available to designers when the upturn starts.

National Dinner speakers mentioned some of these investments. For example, Tata Steel has been investing heavily in continuously improving its steelworks and related facilities like the coatings line at Shotton. Mr Sanderson announced the opening of a new Northern office in Doncaster to house the staff associated with the new joint marketing initiative between BCSA and Tata Steel, which involves Tata Steel staff being seconded to BCSA.

Joint market development activities are being expanded with a number of initiatives such as growing a Regional Advisory team. There is an extensive long term research and development programme. The Target Zero initiative is progressing well and fully costed advice is now available for the sustainable design of a range of building types to help meet government carbon reduction targets. The commitment to providing high quality information for designers and all involved in the steel construction supply chain remains undiminished.

The steel sector is beginning to mobilise for CE marking with an increasing number of BCSA member companies already certified and others following regularly. It is testament to the quality of constructional steelwork and those who work with it that CE marking is achievable. That is not the case with other materials, which cannot be quality assured to the same level of confidence.

Recession is sometimes blamed for a rising toll of accidents on sites, but there is no evidence of this in the steel sector. The industry's safety record is highly creditable and for a second year the BCSA has been proud to report that there have been no falls from height reportable injury accidents.

The steel sector is committed also to maintaining the competitive edge that it has enjoyed for so many years against alternative materials. As guest speaker Tata Steel Europe Chief Executive Officer and Managing Director Dr Karl Köhler said at the National Dinner, while prices are increasing for steel the competitive situation with other materials is not significantly changed. Timber and concrete for example simply do not match steel for total cost, design in use capability, pace of technological innovation and sustainability.

NSC

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Supplement to inspire zero carbon buildings

The BCSA and Tata Steel have commissioned a Target Zero supplement in order to raise awareness and further inspire readers to engage with the Target Zero study.

The supplement, entitled 'Cost effective routes to carbon reduction' gives readers an abridged version of the Target Zero study and encourages them to visit the website, *www.targetzero.info* , to get more in-depth information.

Launched last year, Target Zero provides guidance on the design and construction of sustainable, low and zero carbon buildings in the UK.

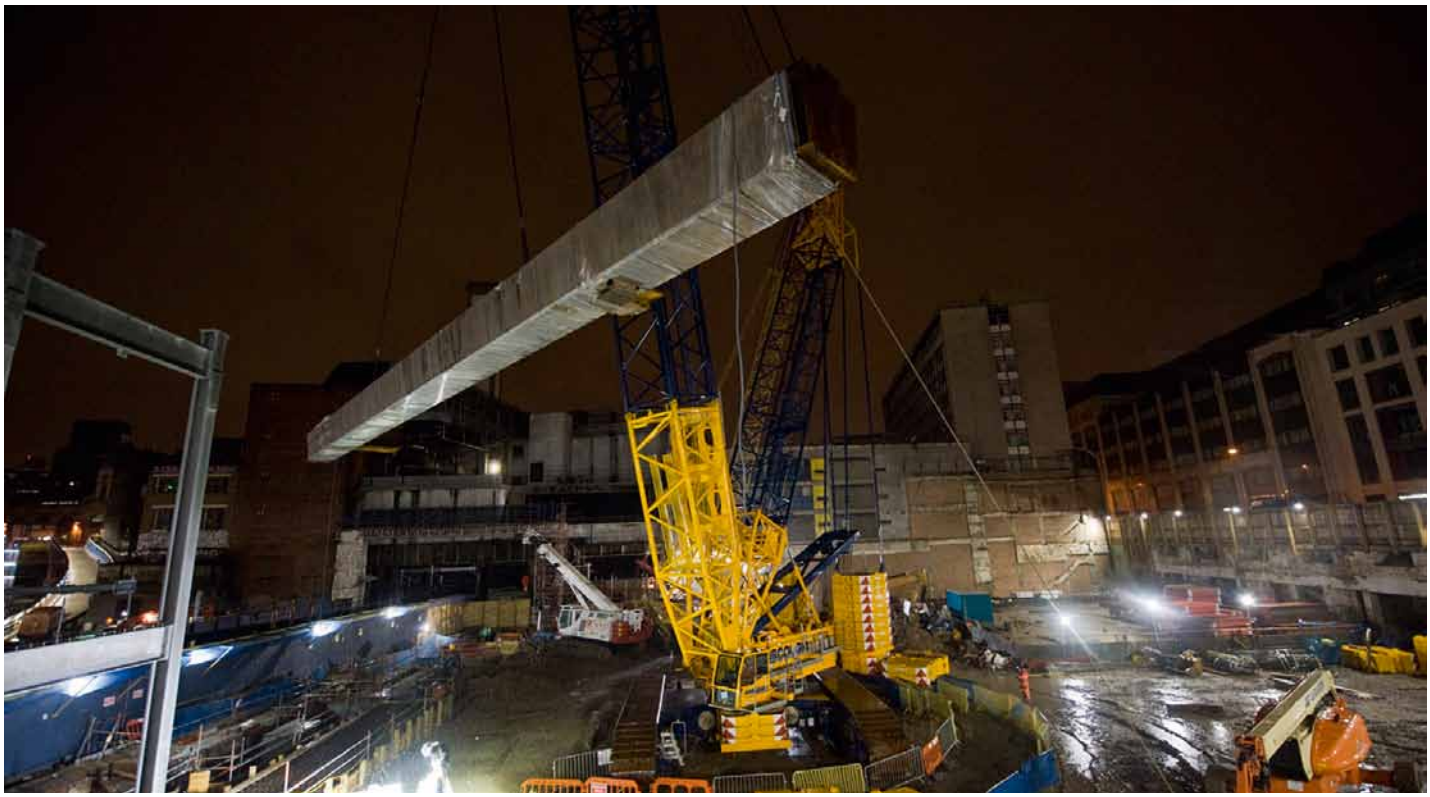
It is a free resource that will provide designers, architects and engineers with the guidance they need to meet the zero carbon emissions target set by government for 2019.

AECOM was commissioned to produce the Target Zero study and its findings considered operational carbon, BREEAM and embodied carbon.

Five non-domestic building types are covered in the study: schools; distribution warehouses; supermarkets; offices and mixed use developments.

The first three reports are available now on the target zero website, with the final two due out soon. The supplement will be distributed with April's NSC.

New London rail interchange takes shape



Work is progressing on the redevelopment of Farringdon Station in London, part of the Thameslink Programme, which will deliver more trains and better journeys for passengers traveling north-south through the capital.

Once complete, Farringdon Station will be the only central London rail hub from which passengers will be able to access Thameslink services, Crossrail trains and London Underground.

The scheme, to develop the Integrated Ticket Hall and Associated Administration Block for the proposed Thameslink/ Crossrail upgrades, includes the supply and installation of structural steelwork by Bourne Steel, for the Costain/Laing O'Rourke (CoLOR) joint venture.

Two 27m-long prismatic girders have been lifted into position at the Station. The girders, weighing approximately 60t, were pre-enclosed in high-quality concrete for corrosion and fire protection purposes. Both were lifted into position during two night possessions of the Underground and Network Rail lines beneath, ensuring the busy commuter routes remained available during key working hours.

Bourne Steel's sister company Bourne Special Projects is also carrying out construction of a new entrance building on Turnmill Street, refurbishment of the existing Grade 2 listed station building and construction of a new North Train Shed Roof.

Fastener supplier gains sector approvals

Leeds based fastener manufacturer and supplier Andrews Fasteners was recently audited by Lloyds and accredited to BS EN ISO 9001:2008, CE Approval to BS EN 14399 (preload) and BS EN 15048 (non preload), as well as gaining National Highways Sector Scheme 3 for stocking and distribution activities for mechanical fasteners.

"This is an important step for the company as CE Approval and Sector Scheme 3 accreditation will soon be a major requirement of buyers of structural fasteners," said Michael Carey, Andrews Fasteners' Managing Director. "Without the extensive investment, neither of these approvals would have been achieved."

The use of CE approved fasteners is not yet a legal requirement in the UK, although it is in many EU countries. In 2013 the Construction Product Directive will become a regulation and then CE Approved products must be used in the construction industry.

Andrews have been buying CE Approved products since 2006, but it has not been able to offer a full service to its customers due to the requirements of the Construction Product Directive.

"Now as Andrews has the approval we will be able to change the plating finish of items and supply them as CE Approved, and using our extensive range of blanks we can change them into Bolts and supply them as CE Approved as well," said Mr Carey.

Light at the end of the tunnel

British Constructional Steelwork Association members are looking forward to a recovery starting in 2012 after the capacity reductions of the past two years, President Jack Sanderson said at the association's Annual Dinner.

Mr Sanderson said: "We expect that 2011 will be another very difficult year, but hopefully we can see some light at the end of the tunnel and recovery will get under way in 2012."

Mr Sanderson said it was disappointing that amendments to the Construction Act that will improve payment practices in construction have been postponed until October, but this would at least give more time to the BCSA to give detailed training to members' staff in how to get full value from the changes.

The sector's health and safety performance continues to improve, ahead of government targets for a 60% reduction in reportable injuries over ten years. There were no reportable injuries involving BCSA members resulting from falls from height for the second year running. "We place great emphasis on eliminating accidents and injuries and health and safety of our people is always at the top of our agenda," said Mr Sanderson. "Our recent performance is particularly creditable against a background of difficult contractual conditions and the current economic climate."

The joint BCSA/Tata SteelTarget Zero initiative led by AECOM to provide designers with fully costed solutions to make sustainable zero carbon building aspirations a reality, had successfully produced guidance for five non domestic building types – schools, warehouses, supermarkets, offices and mixed use developments. Three of these are available now on the Target Zero website and the others are due soon.

CE marking of structural steelwork arrived in January and becomes a legal requirement in summer 2013. Mr Sanderson said the clock is ticking and the industry only has only 28 months to complete preparations.

BCSA and the Steel Construction Certification Scheme have developed guidance for member companies on what they need to do in terms of changes to their factory production control procedures and welding quality management plans. Regular courses are now being held for BCSA members and BCSA has published a CE Marking version of the National Structural Steelwork Specification. Some member companies have already gone through the necessary audit and accreditation procedures and are now able to CE mark.

BCSA President Jack Sanderson

Steel stays competitive

Tata Steel Europe Chief Executive Officer and Managing Director Dr Karl Köhler

The UK construction sector is being served by a healthy steel manufacturer, best in class steelwork contractors and brilliant architects and structural engineers, said Tata Steel Europe Chief Executive Officer and Managing Director Dr Karl Köhler.

Speaking at the BCSA's National Dinner Dr Köhler said there were also the three things necessary for the continued success of steel in the UK. He said Tata Steel is mindful of the rising cost of construction inputs generally and had been making cost reducing efficiency investments, such as rationalising the UK panels and profiles business onto one site next to the coatings lines at Shotton. The supply chain was being made as lean as possible.

Despite this, raw materials price rises had to be passed on. Dr Köhler said: "I know this volatility makes it difficult for all of our key sectors – whether it be packaging that lives on an annual cycle of seasons, whether it be automotive that must plan vehicle design and delivery over multiple years or whether it be the construction industry that is project driven and where cost stability is essential to ensure budget delivery, and also to allow design innovation within boundaries placed by our end customers."

Dr Köhler said Tata Steel was working with customers on pricing innovations that can help customers get through these testing times. He said: "A key message is that while prices are increasing for steel the competitive situation with other materials is not significantly changed. Timber, concrete – they simply do not match steel for total cost, design in use capability, pace of technological innovation and sustainability.

"We must provide the construction market with the right information of the cost of structural steelwork to ensure that steel is never ruled out of a project simply because of people's mistaken perceptions."

First Eurocode designed bridge erected in Devon

The first bridge on the UK road network to be designed and constructed to the new Eurocode design standards, which are currently being introduced across the EU, has been lifted into place across the M5 in Devon.

The fully assembled 90m-long main span of the bridge required the UK's largest mobile crane to lift it into place during a night time motorway possession.

Working on behalf of main contractor Carillion, Rowecord Engineering fabricated the bridge and brought it to site in large sub-assemblies, the largest of which was 35m long × 6m wide.

The main span was then fully assembled on temporary trestles positioned adjacent to the bridge's final position. Weighing approximately 230t, the structure was fully welded, painted and had cables and its anti-skid deck installed prior to being lifted into place.

The lift took approximately 1.5hrs to complete, and the following weekend Rowecord repeated the procedure and installed the smaller and fully assembled end spans of the bridge.

Known as the Redhayes bridge, it will provide both pedestrian and cycle routes across the M5, near Exeter.

Dr Steve Denton, Director of Engineering at Parsons Brinkerhoff said: "The lifts have gone very smoothly and we are absolutely delighted with the result. It will be an iconic landmark for Exeter, marking the gateway to the city as well as being an important step forward for infrastructure as Eurocode design standards were employed."

Photo © Matthew Davison

AROUND THE PRESS

Construction News
27 January 2011
Steel threat to commercial projects
"It's isn't likely to have any effect on steel in terms of competitiveness. This isn't just structural steel - it's all steel - so this is just as much as a problem for concrete contractors who use a lot of steel rebar," said British Constructional Steelwork Association director general Derek Tordoff.

New Civil Engineer
3 February 2011
Newark's road to recovery
(A46 Improvements) In all there are 22 new structures on the route, including eight grade-separated junctions, 11 overbridges, two underbridges and a major rail bridge. "One of the benefits of the project is that we've been able to rationalise the bridge design, and a lot of them now look very similar," says Balfour Beatty project director Tony Dixon. The same design has been used for 12 of the overbridges, which are being built as integral structures with steel beams and composite decks, typically spanning 30m.

New Civil Engineer
10 February 2011
Managed packages at London 2012 Olympics
Head of temporary venues David Coulson set up a series of packages for civil engineering, building services, lightweight structures, event fit-out, modular buildings, temporary seating and general building. There are also specific packages for the 2m deep stainless steel, sectional swimming pools that will be erected two weeks before the Games start for training purposes.

Building Magazine
4 February 2011
Battersea: the last chance
(On Battersea Power Station redevelopment) A spokesman for the developer said: "Some of the steel will need repairing, but the steel frame will not be replaced."

Building Magazine
11 February 2011
A touch of class
(Restoration of Midland Grand hotel) Much of the work was concentrated on the ceilings. These sag over time so stainless steel hangers are used as supports.

BCSA Director General to retire

Dr Derek Tordoff is to retire as Director General of the BCSA at the end of the year after 27 years in the post, President Jack Sanderson announced at the National Dinner.

Dr Tordoff (right) has been with the BCSA for 35 years and has led the Association during a dramatically successful period for the £3,000M a year UK steel construction sector, as it came to dominate the market for single and multi storey building frames, become the default option for railway bridges and capture a still growing share of the road bridges market.

Dr Tordoff said: "It is time for BCSA to have a new chief executive to lead the drive for further growth and commercial success for the steel construction sector. I will not be leaving until the end of the year and during that time there is much to be done. I therefore expect to be as busy as ever on behalf of BCSA to ensure that the Association continues in good shape and to effect a smooth transition to my successor."

Mr Sanderson paid tribute to Dr

Tordoff's contribution to the success of the BCSA. "Derek will be a hard act to follow. He has been a steady and calming influence over the years, during often challenging times. It has been a difficult task to pull so many things together to allow us to make the progress that we have. He will be sorely missed."

During Dr Tordoff's tenure there have been a host of developments leading to an improved service for clients of the sector. Health and safety, for example, has been dramatically improved by the introduction of several innovative measures, leading to a 60% reduction in accidents in the last ten years.

The period saw the enthusiastic promotion by the BCSA of new productivity and quality enhancing technology like 3D modelling, and the use of cad/cam. Long span beams, curving and bending of sections, and developments in protective coatings and fire engineering have also helped make the UK's steel construction sector the most successful in the world.

In recent years, sustainability initiatives like the BCSA's Sustainability Charter and the current Target Zero project in support of the government's carbon reduction strategy have increasingly come to the fore.

Dr Tordoff said: "Perhaps the greatest achievements of the sector during these years have been the improvement in safety and the increase in our market share in multi storey buildings from 30% to 70%. It has been an exciting and sometimes challenging time and I have been proud to have played a part in steel construction's amazing success story."

Official opening for BCSA office

BCSA President, Jack Sanderson has officially opened the new BCSA Yorkshire office in Doncaster.

Following the signing of the Steel Construction Market Development Agreement between the BCSA and Tata Steel, all BCSA staff previously based in Leeds have relocated to the new office, where they have been joined by approximately ten of the Tata Steel advisory team on long-term secondment.

The new office in Doncaster is a more central point for BCSA staff relocating from Leeds and Tata Steel employees moving from their previous work places in Scunthorpe and Rotherham.

Working together, the BCSA and Tata Steel are committed to the long term funding of research and market development, under the direction of a new

The combined BCSA and Tata Steel team outside their new office

joint market development board.

On opening the new office, Mr Sanderson said: "These are exciting times and we look forward to working as a team offering first class advice to the steel construction industry."

Steelwork contractor updates production facility

Leach Structural Steelwork has replaced its production systems with a brand new, fully automatic CNC sawing and drilling system from the Dutch manufacturer Voortman.

To achieve the best efficiency, Voortman recommended what it claims are the world's fastest band sawing machine - the VB1250 - and the world's fastest drilling system - the V630 - in a split configuration. Due to the sophisticated operating software, the machines will be interconnected and controlled by just one operator.

Eric Leach, Managing Director of Leach Structural Steelwork said: "We did extensive market research to find the right machines with the most advantages. After many visits, we eventually discovered the expertise and professionalism of Voortman. With over 50 Voortman installations in the UK and Ireland, we felt comfortable to place this order and we are now well placed for the future!"

SCCS issues CE Marking certificates

The Steel Construction Certification Scheme (SCCS) is in the process of issuing its first CE Marking certificates, having recently become a Notified Body and entitled to audit companies production facilities.

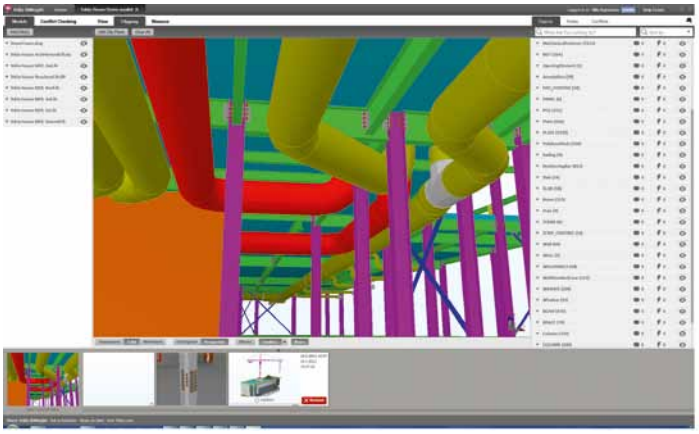
Once an audit is complete and the process is satisfactory, the SCCS can issue a Factory Production Control Certificate which entitles a company to apply a CE Mark to products produced at the audited factory.

SCCS is also accredited for National Highways Sector Schemes 19A (For corrosion protection of ferrous materials by industrial coatings) and 20 (For execution of steelwork in transportation infrastructure assets).

The SCCS was established in 1986 to meet the demand for a technically capable certification body specifically for companies engaged in design, manufacture and erection of structural steelwork and its associated products and services.

The scheme's objective is to secure high standards of excellence and quality of design, manufacturing and erection processes and associated construction procedures and practices in the steelwork construction industry through independent certification to specific standards.

Tekla launches all encompassing design software



Recently launched Tekla BIMsight is a new collaboration tool that allows construction industry design professionals to view and understand 3D models created by different disciplines and software.

"Tekla's mission is to drive the evolution to digital information modeling, multiplying our customers' potential to think and achieve big in their projects and businesses," explained Tekla Executive Vice President Risto Räty." Understanding BIM as a centralized process rather than 'just a model' requires cooperation and goodwill between the construction disciplines. This is exactly what we want to achieve with the new Tekla BIMsight software, and our part of the goodwill is to distribute it for free for the whole industry to easily take into use."

Tekla BIMsight has been described as the 'missing link' software application because it enables accurate and effective 3D model-based project collaboration for everyone in the industry.

The Tekla BIMsight software is free to download from *http://www.teklabimsight.com.*

Bigger North Terminal for Gatwick Airport

Steelwork is playing a central role in the ongoing Gatwick Airport North Terminal Extension project which should be completed by the end of this year.

The current terminal building is being extended along its southern and eastern elevations to create additional check-in capacity and baggage areas. This will allow the terminal to increase its annual capacity from 14m to approximately 24m passengers per annum.

Structural steelwork for the extension is being supplied and erected by Watson Steel Structures.

Other related projects which have been undertaken at the Terminal include the construction of a new forecourt, a new passenger interchange for the inter terminal transit system, and a new short stay multi-storey car park.

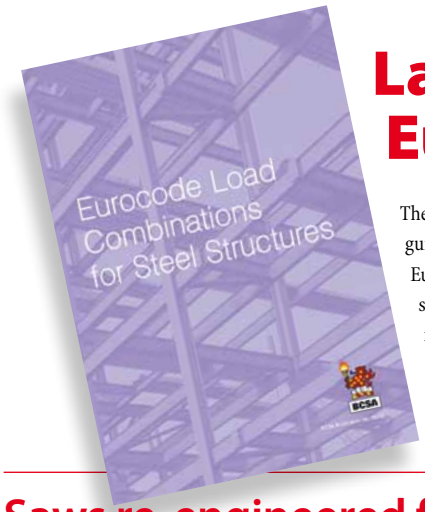
NEWS IN BRIEF

The **BSCA**'s model specification for structural bolts and fasteners has been updated to comply with the European Standards for structure bolts and the requirements for CE Marking. The revised specification was launched at the National meeting on 24th February 2011. Furthermore a copy of the specification will be issued to all BCSA members and the specification will be put on BCSA's web site (*www.steelconstruction.org*) for free download.

The **Steel in Fire Forum**, a discussion group for researchers and designers interested in the behaviour of steel and composite framed structures under the influence of fire, will hold its next meeting at the Institution of Structural Engineers, 11 Upper Belgrave St, London SWIX 8BH on 12 April, starting at 11am. The meeting is open all, and those wishing to attend or needing a copy of the agenda, contact *john.dowling@steelconstruction.org.*

Barrett Steel (Woodberry Chillcott) Bristol facility has installed a new flat bed laser machine for the cutting of sheets and plates. The machine can cut mild steel, stainless steel and aluminium with thicknesses from 0.9mm up to 25mm, 20mm and 12mm respectively. Large components, up 4m x 2.5m can also be cut on the laser machine.

Tekla Structures 17 is now available for download from the Tekla Structures website. This latest version is said to incorporate a number of improvements for project collaboration, such as better management tools and more interfacing with other software systems. The version also features improved clash checking, organising, viewing, snapping and is now certified to support the use of 3Dconnexion mouse.



Latest guide for Eurocode load combinations

The BCSA has published a design guide which fully explains the Eurocode load combinations for steel structures based on the recommendations given in BS EN 1990 *'Eurocode - Basis of Structural Design'* and BS EN 1991 *'Eurocode 1 - Actions on Structures'*.

The new guide is entitled *'Eurocode Load Combinations for Steel Structures'*, and its principal aim is to provide straightforward and easily digested guidance on the loading and load combinations for both serviceability and ultimate limit states.

The following building types are covered in the guide: multi-storey buildings - simple construction; multi-storey buildings - continuous construction; portal frames without cranes, and portal frames with cranes.

Copies of the publication can be purchased from the BCSA at £15 to non-members and £11.25 to members.

Saws re-engineered for better productivity

FICEP said it has re-engineered its range of high speed sawing systems to improve the efficiency of what it claims are amongst the fastest saws on the market with width capacities of 600mm to 2,000mm.

The company has undertaken a design enhancement to the product's gear boxes and hydraulic systems to improve productivity for those involved in the demanding environment of structural steel processing.

The saw feed system now also incorporates the more reliable and ridged all welded structure which is said to significantly reduce vibration, a common fault on most ballscrew feed systems.

Carbide band saw blades are often used to improve cutting capability but after trial testing, FICEP says similar results were achieved on its bandsaws by using the much lower cost traditional Bi-metal blades in the new feed system.

Mark Jones, Managing Director of FICEP (UK) said: "As one of the leading equipment suppliers to the steel processing, structural steelwork and fabrication industries, we are constantly looking to improve the performance of our machines. The re-engineering of our complete sawing range offers customers a whole new category of high speed machines which can more closely meet their individual requirements to ensure even faster processing."

Barrett Steel invests in new website

Steel stockholding group Barrett Steel says it has made a number of investments recently to improve operations, including the launch of a new website.

Ralph Robinson, group board member and Managing Director of the company's tubes division (pictured), said Barrett was looking to expand its operations internationally, and these plans will be boosted by its new digital marketing.

Barrett Steel appointed West Yorkshire digital design and development agency NetConstruct to support and build the new website. Following the completion of this initial project, NetConstruct were subsequently awarded a contract to manage Barrett's digital marketing.

David Bentley, NetConstruct Managing Diretcor, said: "Barrett Steel wanted greater competitive advantage and closer engagement with its customers, which it knew couldn't be achieved through a static website alone."

Mr Robinson said: "NetConstruct impressed us with their collaborative approach and understanding of our business. This digital marketing campaign will effectively expand our sales force and help us reach wider markets as we grow globally."

Diary

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

1 March 2011
Stability of steel framed buildings
Leeds

8 March 2011
Light Gauge Steel Design
Birmingham

15, 22 & 29 March 2011
On-line Steel building design to EC3
Internet

29-30 March 2011
Steel Bridge Design
Leeds

12 April 2011
Steel building design to EC3
Sheffield

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The power of recovery

An architecturally driven energy recovery facility is under construction in the East Sussex port of Newhaven. Martin Cooper reports from a plant gearing up for imminent operation.

The need to find alternative methods for waste disposal is gathering pace. With landfill sites becoming full there is an immediate need to find new ways to deal with the UK's ever increasing tonnage of waste.

For many the answer lies with energy recovery facilities (ERF), where waste is burnt, producing heat and steam to drive a turbine, which in turn generates power.

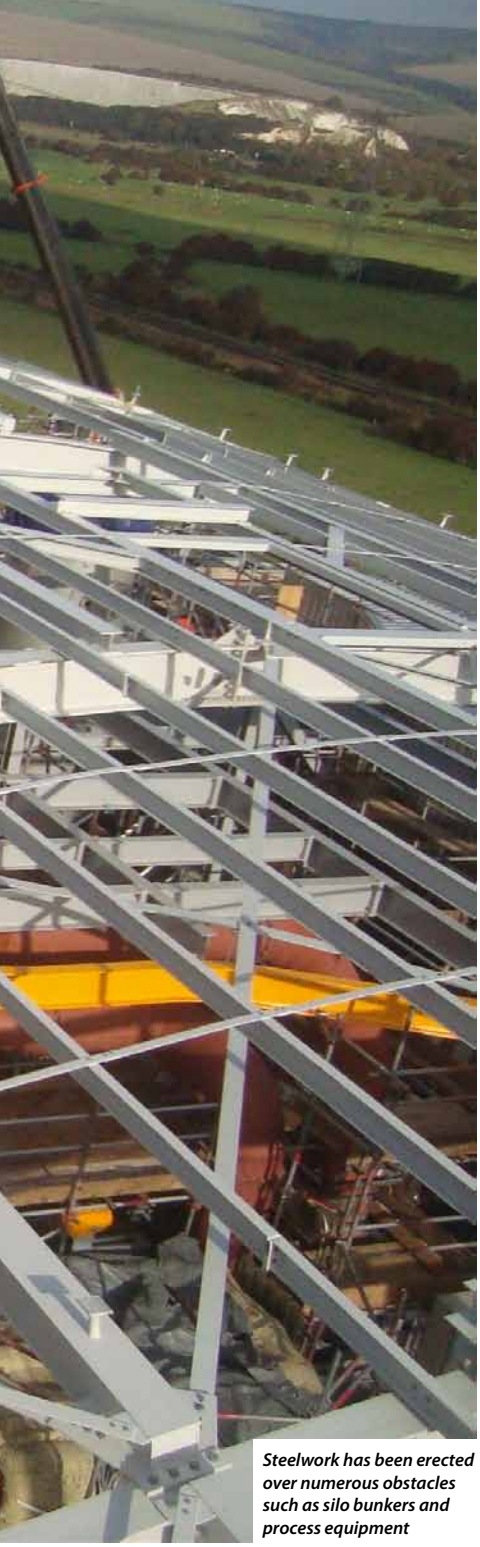
A number of these facilities have been constructed in recent times, as local authorities see it as a win-win situation of environmental waste disposal with the added bonus of surplus power which is exported to the National Grid.

However, no matter how environmental and cost effective, there is still quite often local opposition to these plants being located in or near residential properties. These possible doubts have led a project team in Newhaven to design and construct one of Europe's most architecturally-driven energy recovery facilities.

Here on the East Sussex coast and only a stone's throw from the port's town centre, a new plant is nearing completion. When operational this ERF will take receipt of some 210,000t of municipal solid waste each year, to be treated in two boilers. Power generated will run the plant with a net surplus of about 16.5 MW also being produced.

Taking into account the close proximity to the town and the adjacent Area of Outstanding Natural Beauty, this plant has been constructed as something more aesthetically pleasing to the eye than the average energy from waste plant.

These facilities are often large rectangular buildings that dominate the horizon. At Newhaven, planning conditions limited the height of the main building, and this was



Steelwork has been erected over numerous obstacles such as silo bunkers and process equipment

The silo roof is formed by curved girders radiating outwards from a compression ring

A 24-hour long welding procedure was needed to position the plate girders over the silos

FACT FILE

Newhaven Energy Recovery Facility, East Sussex

Main client: Veolia Environmental Services

Architect: S'pace Architecture & Environment

Main contractor: AE&E Inova/HOCHTIEF Construction

Process designer: AE&E Inova

Structural engineer: HOCHTIEF Consult Building/Infrastructure

Steelwork contractor: Graham Wood Structural

Steel tonnage for the roof structure: 800t

Total Project value: £140M

one of the reasons the project's designers, in conjunction with the local planning authority, decided on the facility's orientation running parallel to the River Ouse and arched in shape.

"The plant will present a positive image with its innovative shape," explains Andreas Clausen, HOCHTIEF Senior Site Engineer. "It can be seen from the major routes into Newhaven as well as the town itself, and that's one of the reasons for its special architectural design. The plant structure is incorporated and adapted into the geography of the area."

The substructure, which includes a 17m deep caisson formed for the furnace grates, boilers and refuse bunker (a design feature to further limit the height of the building), is formed with reinforced concrete. The lower outer walls and adminstration block are also concrete. The steelwork has been erected, by Graham Wood Structural, on top of and over this concrete structure and most of the facility's installed process equipment.

"The installation of heavy process equipment such as boilers and filter system within the building had to be completed before the commencement of steelwork for the building envelope. This sequence enabled commissioning of the plant to commence in early 2011." explains Mr. Clausen.

The north end of the facility houses the air cooled condenser and silos, a part of the structure where the elliptical roof arches downwards to form a 'nose' feature. The steel frame for this section begins at ground level and was constructed with a series of long plate girders, with the three main ones requiring 24 hour welding.

These three main 1m deep girders were brought to site in 20m long transportable lengths. They were then assembled on site into two halves, one 40m long and the other 60m. In a dual crane lift these girders were lifted into position and held by temporary brackets while one final weld was needed to join them together to achieve the arch's 24m height.

"Because of the girders' thickness a 600mm × 1,000mm all-round butt weld was needed and the best way of doing this was in one continuous twenty four hour weld," says Graham Wood Site Manager Pat Whelan. "As well as being easier, the procedure meant we were able to keep an ambient temperature within the welding enclosure, albeit the work was done during a blizzard!" →

The Tipping Hall takes shape

When operational this ERF will take reciept of some 210,000t of municipal solid waste each year, to be incinerated in two boilers.

Plate girders are readied for the long welding procedure

Once the stability giving main girders were erected, the rest of the arched and rounded silo frame was constructed. This consists of a spine beam and a steel compression ring that holds the steel skeleton in place. A series of secondary curved girders then form the remainder of the shape by radiating out from a central spine.

The secondary plate girders are similar to the main girders, except they are smaller and only have bolted connections.

Adjoining the silo area the arched steel frame then covers the boilers, refuse bunker and the remainder of the plant's processing equipment, a distance of some 80m. This zone is formed with a series of curved steel members which were assembled on site from six 18m long sections. Once assembled each of these 33t girders were lifted into place with the aid of the site's tower crane or a large crawler unit.

Forming the remainder of the arched structure, secondary beams were crane installed and accessed by Mobile Elevated Work Platforms (MEWPs) positioned on the internal concrete structure. For the area over the refuse bunker, access machines had to be positioned on the bunker's pit slab, a full 42m below the roof level.

"Finding locations for our MEWPs was a challenge as the building we were erecting over was full of equipment, and other trades were always working around us," comments Mr Whelan.

"To find an access strategy for the erecting of the structural steel over the deep bunker was the most challenging in this part."

The southern end of the facility doesn't feature a rounded "nose", instead it is straight ended as this part of the plant accommodates the tipping hall.

The tipping hall has one concrete wall with large incorporated vehicular tipping chutes, while large arched steel girders form the main frame. These sections are 600mm deep plate girders, assembled on site into two halves. Erection was then completed with the aid of large steel support structures, which were left in place as each girder was bolted together and positioned.

Steelwork erection for the Newhaven ERF has been completed and the construction is now nearing its completion date. The first waste at the facility is scheduled for summer 2011, while the final handover to the client is due at the end of this year.

Steel and cladding drive design

"The architectural shape of this plant gave us new challenges for the structural steel erection and cladding installation, which were professionally and successfully handled," says HOCHTIEF Senior Site Engineer Andreas Clausen. "The highly engineered cladding materials support the architectural vision and were installed in what we believe is the first time for this shaped profile."

The southern part of the building (Tipping Hall, Bunker Hall) has a metallic façade as it is covered with KALZIP, the Boiler Hall and the southern end wall is clad with lightweight polycarbonate panels, while the northern end of the building (air cooled condenser and silo area) a composite steel mesh will be used.

"For the erection of structural steel as well as the installation of cladding systems we only used UK businesses," Mr. Clausen adds.

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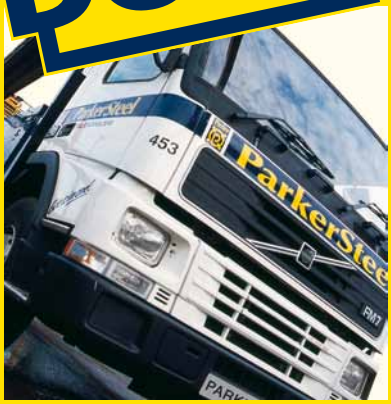

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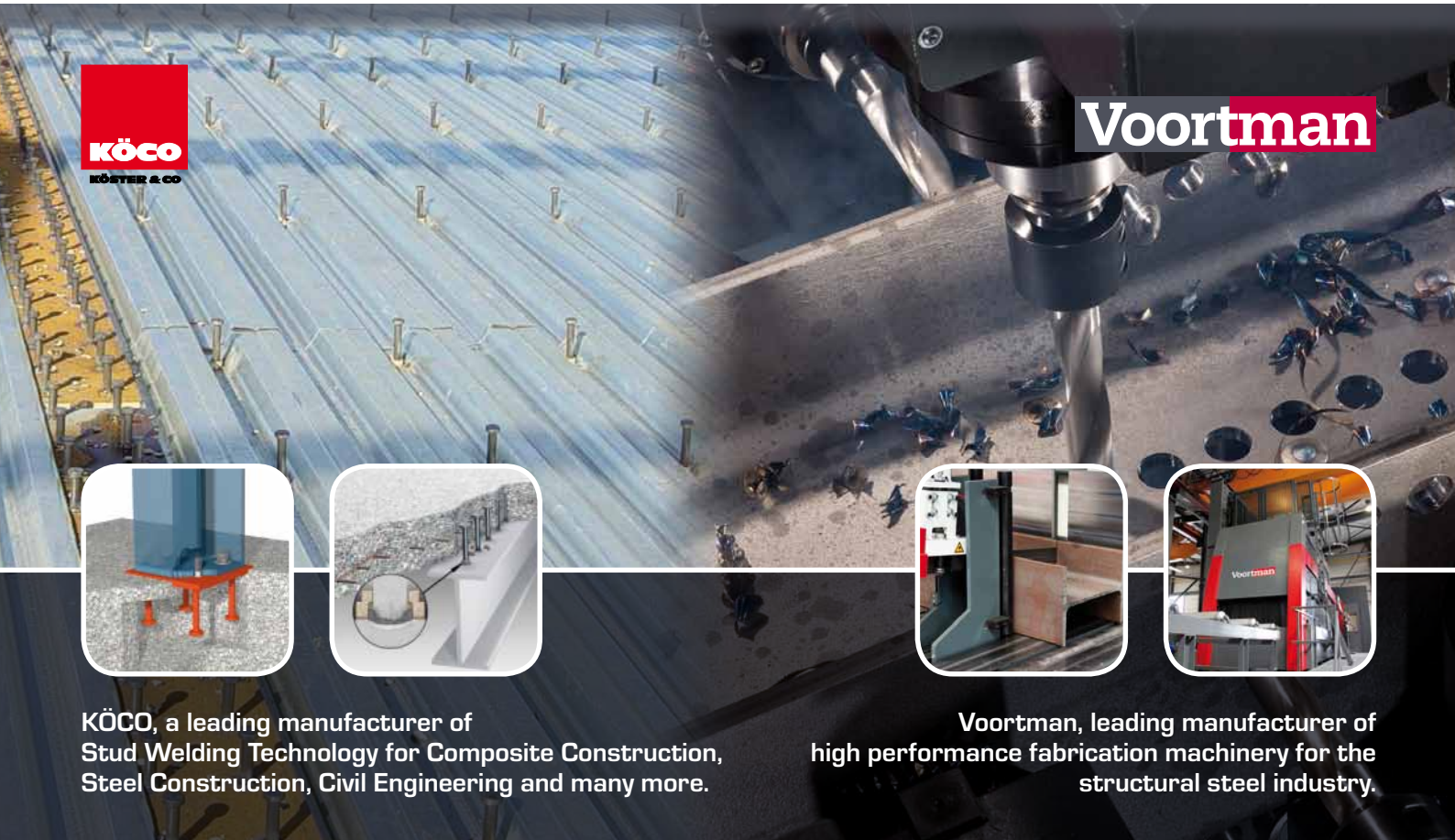

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Wall panels form party walls and internal corridors, while pre-fabricated cassettes form the ceilings

Off-site solution made to measure

The advantages of offsite construction have come to the fore in south London where a residential project is making use of a bespoke prefabricated light steel solution for a new four storey development.

Consisting of 39 residential units, spread over four floors, 166 Sumner Road, Peckham is one of the London Borough of Southwark's latest housing developments.

On this project main contractor Greenacre Homes has chosen to utilise a prefabricated lightweight steel framing solution, a method which provides a number of advantages including less work and time spent on site, a safer working environment and minimal working at height.

The factory assembled system of wall frames and ceiling cassettes was not the original framing choice for this project. Initially the job consisted of a timber frame structure, but after a serious fire in 2009, which destroyed the partially completed building, a design rethink was undertaken.

"We chose to go with a light steel solution this time as there are a number of sustainable benefits associated with offsite construction," says Greenacre Project Manager Simon Holmes. "One of the important benefits of the system is that it provides a tidy and safe site during construction, which means a significant reduction in health and safety hazards, while its ease and speed of construction is also important."

The prefabricated steel solution used on Sumner Road was manufactured and supplied by Engineered Off-site Solutions (EOS). The system primarily consists of pre-assembled wall frames and ceiling cassettes, all of which come to site fully fitted and ready for immediate erection and installation.

To produce this light steel framing system EOS initially produces a 3D model using Tekla software. Information from the model is then fed to the assembly plant's cold form framing machines, which then produce a project's bespoke units.

"Our method means we have zero steel wastage in production," explains EOS Senior Structural Engineer Christopher Shipman. "It's very sustainable, as even the steel from punched holes is collected and then recycled."

For this residential project EOS has manufactured and supplied external and internal walls frames typically measuring 2.4m x 3m. The external frames are supplied fully insulated and are even fitted with brackets for balconies to tie into, as well as channels to accommodate brickwork cladding.

Frames can also be delivered to site with windows and doors already in place, again saving the contractor valuable time and effort. However, on this project the frames were supplied with just the openings for windows and doors, allowing these fittings to be added later in the sequence.

Internal wall frames typically have the

Only one small tower crane was required to install all the steel units

Wall frames arrive on site insulated and ready to be erected

Each floor is easily bolted onto the one below

Ceiling cassettes are prefitted with strength giving lattices

same dimensions as the external units, although these party walls are not insulated and include cross bracing for overall structural stability, although the system is predominantly self-stabilising.

At Sumner Road construction of the apartments restarted in September 2010, and once the concrete ground beams were in place, the site was ready for the delivery of its first prefabricated panels. For this job the bespoke wall panels consist of a 65mm thick light steel frame, a size chosen to replicate the original timber frame.

Delivery to site was made in a just-in-time procedure with panels lifted straight off the truck by tower crane and into position on the project. Specialist subcontractor Excel Structures erected the steel system using a 'balloon' method, whereby the wall panels for one complete floor are all bolted down into position first. This then allows the ceiling cassettes to be easily dropped into place, as they hang onto the inside of the wall panels via a pre-fitted Z-hangar.

"Using the Z-hangars means the system achieves a direct wall-to-wall connection and good air tightness," explains Mr Shipman. "Each floor is easily and quickly erected as there is only one joint per floor."

Once the walls and floor cassettes have been lined and levelled, the next storey of wall frames can be added, with the erection crew working safely from the floor of the cassettes they have just erected. The process was then repeated until the fourth and topmost level was completed.

The floor cassettes typically measure 4m x 2.4m and were all prefabricated to include a high grade chipboard flooring. The underside of the cassettes features a steel lattice section to provide rigidity. Cassettes forming the ceilings in the project's communal corridors are slightly different as they do not have lattices, but instead have C-sections which came to site pre-punched with service holes.

To allow other follow-on trades to begin working on the project efficiently and quickly, each of the external wall frames also have factory fitted scaffold supports. This allows the scaffolding to be quickly erected once one storey of prefabricated units have been completed, and also allows the cladding programme to get a speedy start.

"For this four-storey project the offsite steel system was the best solution," comments Excel Structures Managing Director Jason Pritchard. "It offers versatility and long internal spans, while importantly there is no shrinkage after the structure is completed, unlike a timber frame."

Allowing the system to have large internal spans, which on this project are located in openings within some of the larger apartments, hot rolled 250mm thick load bearing beams have been erected and integrated into the system.

The final elements to be erected on this project were the cassettes forming the roof structure. This structure was formed with an identical erection method as the building's other ceilings, the only variant being that the roof slopes in four directions.

The slopes, which may have been problematical for some other construction methods, were formed with tapered lattices - varying from 250mm deep to 450mm deep - within the cassettes.

"Whatever structural shape is required it can be incorporated into the 3D model during the design stage," sums up Mr Shipman."In this way, what seemed like a complex shape was easily fabricated in our factory ready for onsite erection."

FACT FILE

166 Sumner Road, Peckham, London

Main Client: London & Quadrant

Architect: Hards Partnership

Main contractor: Greenacre Homes

Specialist subcontractor: Excel Structures

Light steel supplier: Engineered Off-Site Systems

Steel tonnage: 100t

The new civic centre rises up on the site of a former iron foundry

Civic centre kickstarts renaissance

A new steel framed office for Rotherham council is part of the first phase of the South Yorkshire town's wide ranging regeneration plans.

FACT FILE
Rotherham Metropolitan Borough Council civic centre (Riverside House)
Main Client: Evans Regeneration Investments
Architect: Carey Jones
Main contractor: GMI Construction
Structural engineer: WSP
Steelwork contractor: Billington Structures
Steel tonnage: 1,500t

Big plans are afoot for the centre of Rotherham as a large scale regeneration project has begun to breathe new life into a previously underused former industrial area. Known as Rotherham Renaissance, new high quality retail, leisure, office, residential and public space schemes are planned for a site which sits adjacent to the existing town centre and the River Don.

One of the most significant projects to get under way is an impressive new steel framed civic centre for Rotherham Metropolitan Borough Council. Offering approximately 16,000m^2 of floor space, the office consists of three blocks that are interlinked at one end by a large glazed atrium.

Incorporating metal decking means the floor to ceiling heights have been kept down, reducing the structure's overall height, compared to other framing options.

Protruding outwards from the atrium, the blocks have four, five and six storeys respectively, and are also linked via a basement car park and plant area that covers the structure's entire footprint.

With aspirations to achieve a BREEAM 'Excellent' rating, a number of sustainable elements have been included in the programme. These include ground source heat pumps, provision for a future biomass boiler and using as many local contractors and materials as possible.

This local policy also included the choice of steelwork contractor, in this case Billington Structures, which has fabricated, supplied and erected all steelwork for the job as well as installing the metal decking.

Commenting on this prestigious project, Jarrod Best, Managing Director of main contractor GMI Construction says: "This flagship development brings together a state-of-the-art building design and specification, alongside traditionally sourced materials built by a local workforce.

"The building is playing a leading role in the town's regeneration and when complete it will have an exemplary carbon footprint rating."

Constructing a steel framed building on a site which was previously the home of a large iron foundry gives the project some symmetry. However, a number of framing options were considered during the design phase, before steelwork was finally chosen.

"A braced steel frame with clear span cellular beams with a 150mm thick composite metal deck slab was recommended as the solution most compatible with the client's aspirations. This provides an economic quality building with a minimum of 15m clear spans between columns," explains WSP Associate Neil Wilkinson.

Concrete framing options were discounted as more expensive and time consuming, while the steel option offered the advantage of a lighter structure which consequently meant a more economical →

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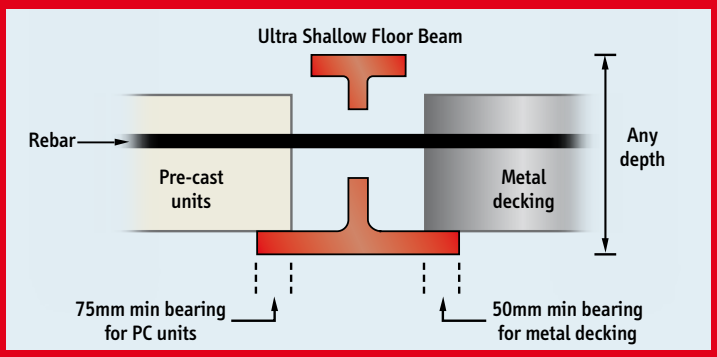

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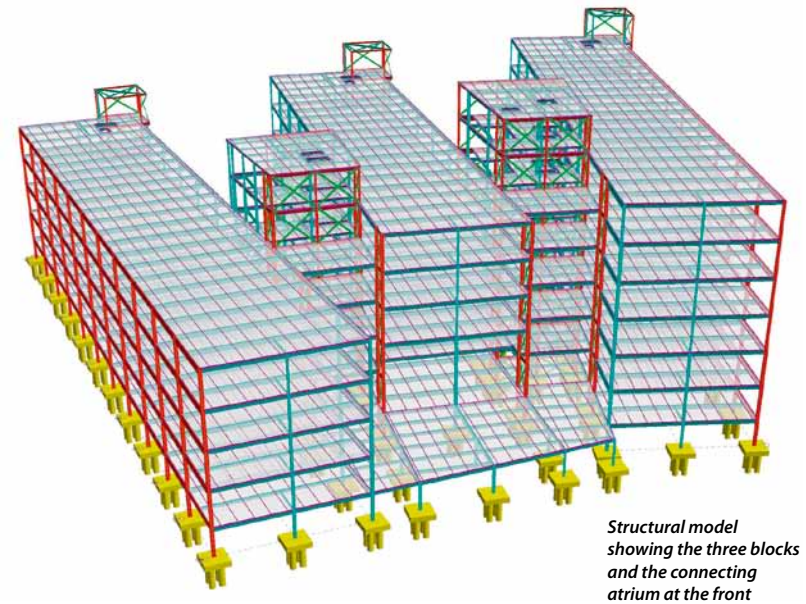
Cross bracing has been added to the cores for structural stability



Structural model showing the three blocks and the connecting atrium at the front

substructure. Using 15m long Westok cellular beams, designed with 425mm holes at 650mm centres, offers the desired open plan flexibility for each of the floors, while accommodating the services within the structural void. Incorporating metal decking means the floor to ceiling heights have been kept down, reducing the structure's overall height, compared to other framing options, which again has kept costs down.

Structurally each of the three blocks are based around a regular 15m x 7.5m grid pattern. As steelwork begins at basement level, this uniform grid is also replicated in the partially subterranean car park. Stability for the building is derived from a combination of bracing in the core areas and moment connections along the two outermost elevations.

Steel cross bracing has been inserted into each of the three stair cores located at the end of each of the blocks, while in the atrium, the building's two main lift cores are also braced for vertical stability.

"The atrium lift cores along with the stair cores don't stabilise the entire structure, we still needed more," adds Mr Wilkinson. "The main north and south elevations of the two outer blocks have moment connections in every bay. This was the only solution as we couldn't add bracing here because of windows."

Due to the site's industrial past a large scale remediation programme was carried out prior to the construction of the civic centre. When GMI started on site it firstly had to plateau the site and approximately 15,000m^3 of overburden was removed. Once the required approximate 18m deep CFA piles were installed, a culvert which ran right across the site had to be diverted, and then the structure's footprint was completely ringed by a continuous series of 12m deep steel sheet piles.

The close proximity of the River Don means the site is within a flood zone as

The civic centre will be the catalyst for Rotherham's larger regeneration plans

defined by the Environment Agency. Installing sheet piles, founded on mudstone, effectively seals the site off from any possible water seepage in the event of any flooding.

Once these preliminary works had been completed, GMI began casting the ground beams and retaining walls, and once this was done steelwork erection was able to begin.

"Working in a north to south direction we had a rolling scheme, with the steelwork erectors following on behind the initial concreting team," explains GMI Senior Project Manager Gary Oates.

The completed stone plateau slab gave Billington's erection team a laydown area for its steelwork deliveries as well as the precast stair units which it also installed. The rolling construction sequence was then continued with the metal decking and the concrete floors installed after each of the three blocks was erected.

Steelwork has now been completed on the project with the cladding now well under way on all parts of the structure. Each of the façades is to be covered with red sandstone panels, a colour chosen to complement many of the town's older buildings. Rainscreen is being applied to the structure's cores, while modular glazing panels have been installed for all of the windows.

The main shell of Rotherham's new civic centre is scheduled for completion in September, with final fit-out being concluded by early 2012.

Portal frame spearheads regeneration

One of Scotland's largest regeneration projects is under way on the site of a former distillery in Dunbartonshire. NSC reports on one of the initial structures of the scheme.

Steel construction as well as modular offsite techniques are helping to fast track the delivery of a £20M manufacturing facility for Aggreko, the supplier of temporary power and temperature control solutions.

Located on a 16-acre site within the Lomondgate development near Dumbarton, the facility will replace Aggreko's existing plants, which are currently spread around the West of Scotland, creating up to 200 jobs.

With an overall footprint of 14,800m^2 the new single storey facility will house the design, manufacturing and assembly of Aggreko's power and temperature units. To minimise the carbon footprint of the plant, the energy produced during generator tests will be fed back into the National Grid.

Although part of the Lomondgate scheme, the Aggreko plot was a greenfield site adjacent to the former distillery. When main contractor Morgan Sindall started its works in September, a large scale cut and fill operation was undertaken to level the ground. This was followed by soil stabilisation and the installation of some 4,400 piles to depths ranging from 4m to 15m.

"The ground was very soft and required a lot of preliminary work," explains Allan Currie, Morgan Sindall Project Manager. "Concrete strip foundations have been installed onto the piles and the steelwork is then erected and bolted down to these."

Structurally the plant is a large steel portal frame, consisting of 23 × 7.2m bays and three 31m spans across the width. To form this large internal area trusses for the roof were brought to site in 15.5m lengths. These were then assembled on site into 31m-long sections (one span) before being lifted into place by mobile crane.

Nine of the building's bays, covering all three spans and representing approximately 40% of the building's area, have integrated high level steel beams which will support overhead travelling cranes.

The crane beams span between and are fixed to rows of internal portal columns. The beams will support two 32t capacity cranes in each bay.

In the event of Aggreko deciding to reconfigure the internal layout of the building and increase the area in which the overhead cranes operate, all columns have been designed to support these extra beams.

The steel programme is on schedule despite some inclement weather conditions

High level crane beams can be added throughout the structure

A visualisation of the completed Aggreko facility

FACT FILE

Aggreko manufacturing plant, Lomondgate, Dunbartonshire,

Client: Aggreko

Architect: Bradford Robertson

Main contractor: Morgan Sindall

Structural engineer: Struer

Steelwork contractor: Atlas Ward Structures

Steel tonnage: 1,100t

Project value: £60M

As the steelwork has been future proofed, no modification of the frame would be necessary if more crane beams are added.

"Many of the portal columns are heavier than they currently need to be, but the entire portal frame has been designed for possible future expansion of the crane beams," explains Kenny Stevenson, Struer Project Engineer.

Also attached to the 12m-high roof trusses are a series of M&E piping systems. These are being prefabricated offsite, not only to speed up the construction process, but also to minimise work at height.

Sitting alongside the main frame structure there is a single storey administration block. Measuring 25m wide, the attached steel framed structure covers an area of approximately six grids (43.2m) and adjoins the main building via a glazed atrium.

Nine of the building's bays have integrated high level steel beams which will support overhead travelling cranes

Structural engineer Struer had to carefully design the connection between the main building's frame and the glass roof, as this joint also dampens any vibrations from crane movements, effectively sealing off the office block.

This winter's severe weather has affected the construction programme and Atlas Ward's steel erection was halted for four weeks either side of Christmas.

"It was too cold to pour concrete and so the strip foundations couldn't be installed," explains Mr Currie. "This obviously meant the steel erection had to stop."

Atlas Ward has been back on site since mid-January and steel erection is due to be completed this month (March). Following on behind the steelwork erectors, the cladding process has now begun. The main plant building and office will feature a combination of both composite panels and curtain walling.

The Aggreko plant is scheduled for completion in June.

The large portal framed building will be Aggreko's main manufacturing base

Airport expansion cleared for take-off

The steel frame consists of three spans and a centrally located mezzanine level

FACT FILE
Terminal Building, London Southend Airport
Main client: Stobart Developments
Architect: RPS
Main contractor: Buckingham Group
Structural engineer: RPS
Steelwork contractor: Barrett Steel Buildings
Steel tonnage: 180t

Major developments are taking place at Southend Airport with the construction of a new terminal building central to the facility's plans to be a gateway to the London 2012 Olympic Games. Martin Cooper reports.

During the 1960s Southend Airport was the UK's third busiest airport, catering to cross channel short hops and package holiday airlines. In the intervening years other southeastern airports have grown up and overshadowed Southend, but the facility has big plans and current developments will see a significant increase in passenger numbers by as early as next year.

Currently the airport serves some 48,000 passengers per annum, with the main obstacle to increasing this figure being its short runway, which is unable to cater for new, modern and fuel efficient aircraft. This is being rectified as planning permission has recently been granted for a runway extension which will allow the airport to attract more services.

Other recent developments have seen a new steel framed control tower constructed, a building which is better situated to observe the entire airfield than the existing tower; and a railway station has been constructed which will offer direct train services to London Liverpool Street Station and Stratford International.

To cope with the expected increase in passengers Buckingham Group is constructing a new terminal building, a contract that is central to the airport's overall expansion plans. This contract also includes the building of a diverted taxiway and five aircraft stands.

The new terminal and associated works are all scheduled for completion by September, with the building open for business in October. Coupled with the direct train services to Stratford, the new terminal will enable London Southend to offer itself as an alternative gateway for next year's London Olympics.

Situated on the eastern perimeter of the airfield and conveniently close to the new rail station and car park, the terminal building will offer 4,000m² of floorspace, spread over two levels.

Main contractor Buckingham started

The new terminal building is central to the airport's expansion plans

on site last September and early works on this greenfield site consisted primarily of the installation of piled foundations. The steel frame was then erected by steelwork subcontractor Barrett Steel Buildings.

The majority of steelwork was completed early last month (February) with the exception of the baggage handling area and two feature canopies. The baggage handling area is a single storey structure, measuring 20m × 20m and 4m high, that adjoins the southern end of the terminal building.

"This section of the steelwork has to wait until the southern elevation has been clad," explains Dave Starmer, Buckingham Project Manager. "Although it's only a single storey structure, the cladding team would find it difficult working around and over the erected steel."

A steel framed terminal offers a number of advantages and the material was always the choice of the design team. As the structural design consists of a large open plan structure incorporating long spans and topped with a curved roof, steel was the choice for economics and speed of construction.

"Using steel has also given the design flexibility for future expansion," says Steve Chambers, Design Project Manager for Stobart Developments. "Phase two of our

The new terminal will allow London Southend to offer itself as an alternative gateway for next year's London Olympics

programme could see an extension added to the northern end of the terminal, effectively doubling its overall size. The steel frame has been designed for this eventuality."

To easily facilitate the expansion of the terminal building, the northern elevation of the main frame has been designed so that one grid line of gable posts can be removed without disturbing the overall structural stability. A new steel frame can then be seamlessly bolted onto the existing frame to form the extension.

The main frame includes a series of 14m-long Westok cellular beams spanning over two open concourse areas as well as a centrally positioned mezzanine floor which runs down the central spine of the terminal from north to south.

Erected individually, there are three Westok beams in every full span of the terminal building's roof. These roof beams are all pre-cambered to form the 60m radius curved roof which reaches a height of 10m at its apex.

Perimeter and internal columns are all set at 6m centres, with the outer columns which support the eaves, reaching a height of 6m and the columns forming the mezzanine and central portion of the roof reaching a full height of 10m.

"Because of the regular grid pattern and the fact that no steel section is longer than 14m, we were able to erect the main frame with just one mobile crane," says Barrett Steel Buildings Associate Director (Design) Chris Heptonstall.

Stability for the main frame is provided by bracing located in the gables, as well as feature rod bracing positioned along both of the main façades. As these two main elevations are to be fully glazed, the bracing will remain exposed and so architecturally pleasing 20mm diameter crossed rods were chosen for their aesthetic appeal.

As well as a brief return visit to erect the baggage hall, Barrett will also return to erect the two feature canopies once the main elevations have been glazed. The canopies are basically extensions of the curved roof and protrude outwards by a further 6m.

The canopy will be formed with a series of curved beams supported on 5.5m high CHS sections. The main part will be clad with an aluminium standing seam roof, but the canopy will differ as it will be clad with translucent sheets with brise soleil on the tips.

Buckingham says the project is on schedule for its late summer completion,

Feature rod bracing along the main elevations will remain exposed

Pre-cambered Westok beams have been used for economic reasons throughout the structure

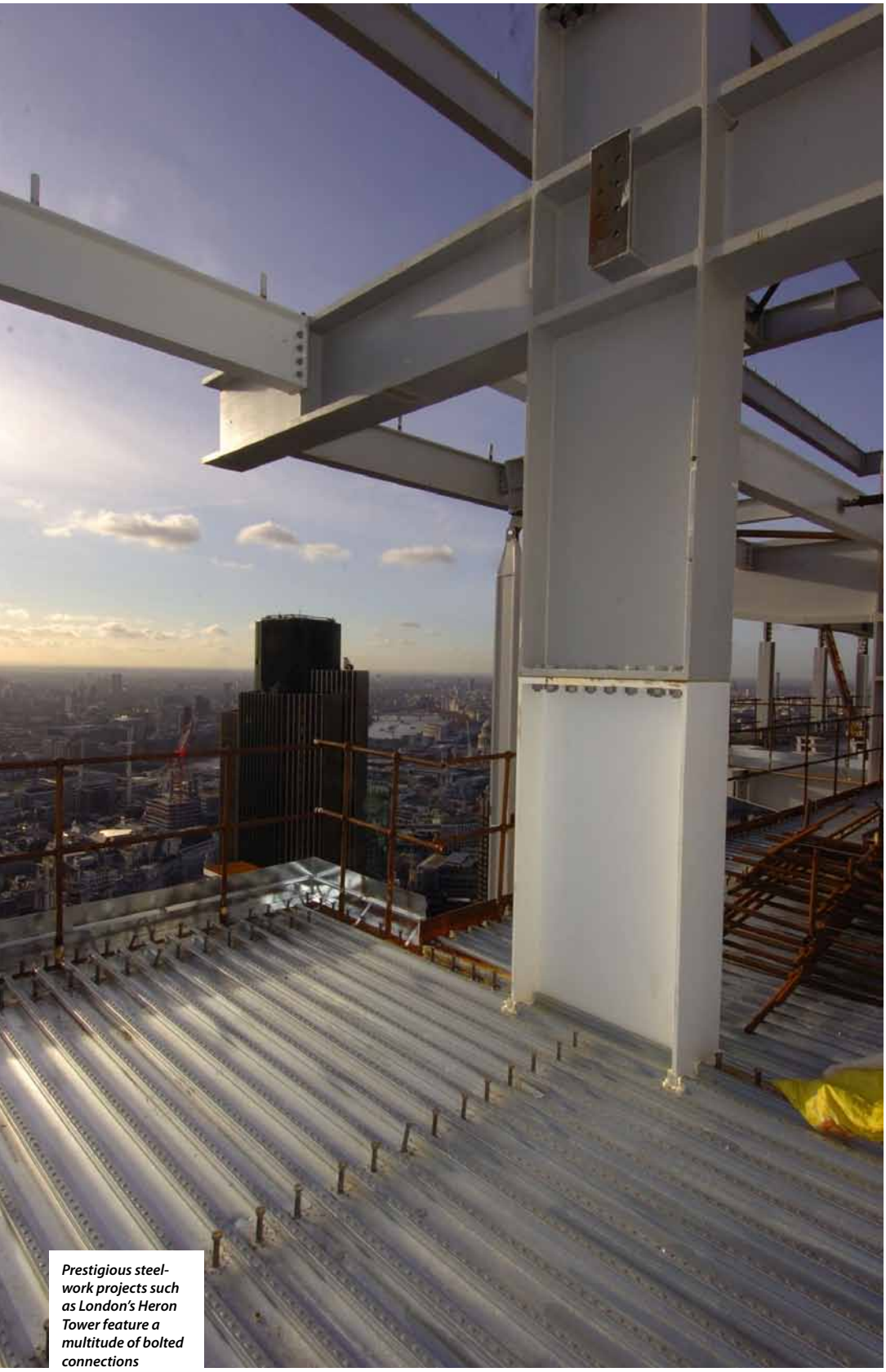
and even though the team has been working within a 'live' airfield environment, no problems have arisen.

"We are continually liaising with the Civil Aviation Authority, to iron out any potential problems," says Mr Starmer. "We have a security fence around our site which affectively seals us off from the airfield. Once we begin working on the taxiways this fence will be extended into the airfield, again isolating our work from the 'live' environment."

London Southend Airport probably will not reclaim its top three UK airports spot, but a new prosperous era is on the horizon and it could be serving two million passengers by 2020, with its new steel framed terminal building at the forefront of this new era.

Bolts – the vital components

Structural bolts are one of the main elements of a steel frame and their manufacturers and suppliers form an important part of the steel construction supply chain.



Prestigious steel-work projects such as London's Heron Tower feature a multitude of bolted connections

Structural bolts play a vital, if slightly unheralded, role in steel construction, as the majority of steelwork projects will always have an abundance of bolted connections. For this reason bolts or fasteners are considered to be one of the main structural elements in a steel frame and vital to a structure's safety and speed of completion.

Along with other vital components such as the steel sections themselves, intumescent paint and light steel sections, bolts are a crucial part of the steel construction supply chain.

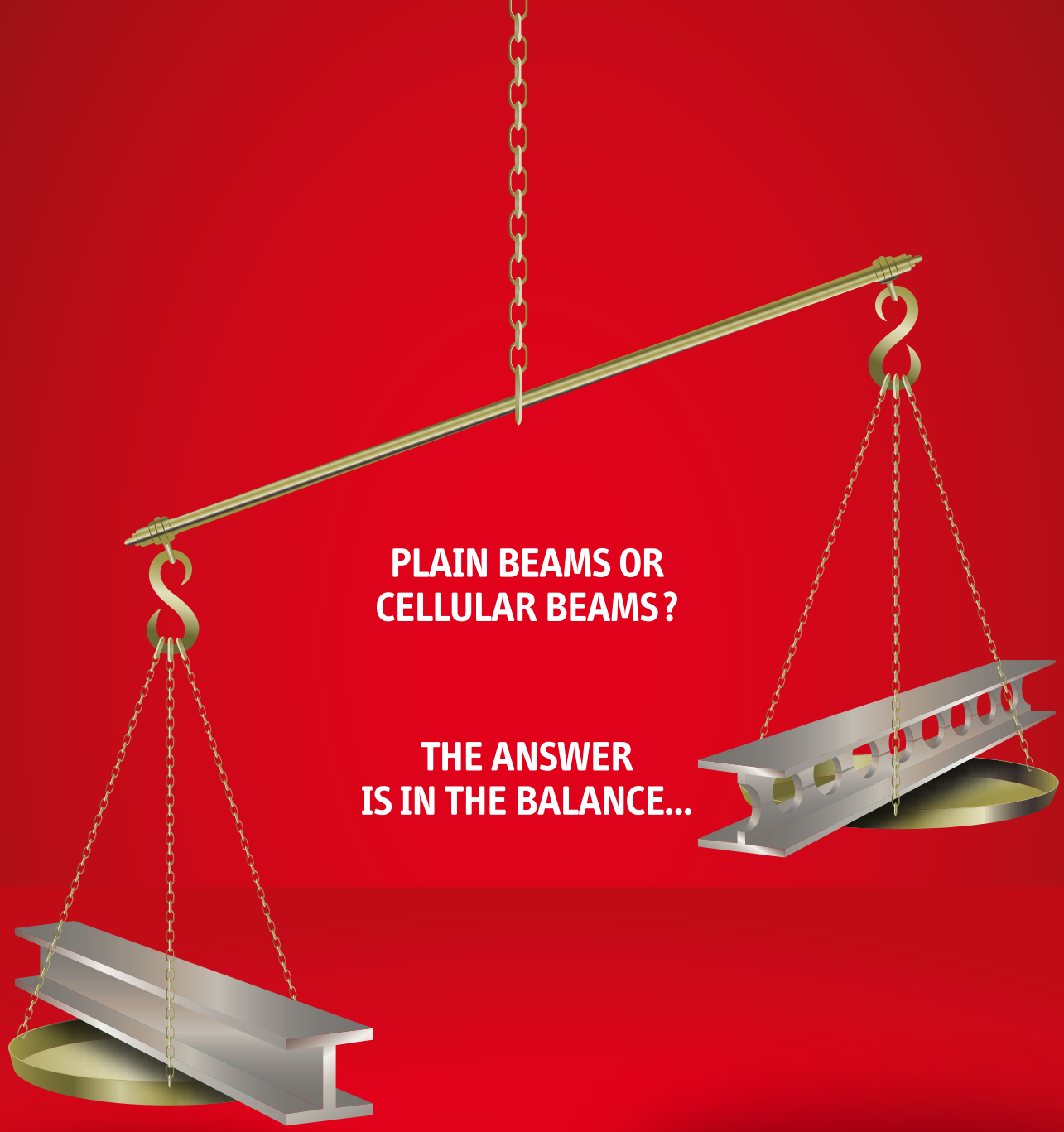
To keep the UK and Irish markets adequately supplied with structural bolts requires an extensive network of manufacturers, suppliers and distributors spread throughout the British Isles. This important supply network also has tentacles that stretch around the globe as many of the products are manufactured and sourced from overseas.

For economic reasons UK bolt suppliers only manufacture some of their products in this country, with the majority of bolts coming from abroad. UK companies have also set up joint ventures and even wholly-owned factories in the Far East to aid the supply chain.

The leading bolt suppliers and manufacturers that supply the UK and Irish markets are all BCSA associate members. Being associate members helps them raise their individual profiles within the steel construction sector as well as raising awareness of the products among their primary customer base, which is of course mostly BCSA members.

By setting up a Working Group for Fasteners in 2007, the BCSA has helped suppliers and manufacturers of bolts spread best practice throughout the steel construction supply chain.

One of the aims of the Working Group is to assure specifiers of bolts that they are buying products from companies with strict quality control procedures in place. By purchasing bolts from BCSA associate members, customers can also be assured that the products are of the highest standard and CE approved. Bolt suppliers' UK premises are all CE approved, while having ISO 9001 means strict quality control is in place and guaranteed from point of manufacture all



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All bolts are thoroughly tested as their use is safety critical

the way to the construction site. Regular contact and visits to overseas facilities means company's factories are producing bolts to the highest standards, wherever they are located.

Bolts manufactured and supplied to the steel construction sector are safety critical and must function in the most testing of environments. Controls are set in place and suppliers will rigorously audit their manufacturing processes.

The BCSA Working Group has also been responsible for innovations within the sector and one of the most recent has been the colour coding of bolt sizes. The practice of putting one size of bolt only in a unique coloured bag is nearly universal and has helped erectors and project teams identify the correct item more quickly, which has cut down on time spent looking through stock. In a safety critical industry, such as steel construction, the colour coding of bags has also meant a safer work place as it has lessened the chances of someone using the wrong bolt.

The BSCA's model specification for bolts is another innovation and one which is

Bridge structures usually contain bolted connections

continually updated. It was most recently updated at the end of February when the Standards were all updated to European Standards. The updated specification also refers to stockists and distributors of fasteners being accredited to Sector Scheme 3. This is a new scheme that provides a specific interpretation of ISO 9001 for stockists and distributors. Members of the BCSA's working Group for Fasteners were instrumental in developing the scheme, which is set to become a requirement for buyers of structural fasteners.

The BCSA Working Group for Fasteners is also held in high esteem as a useful forum for discussing the important issue of the day. It has allowed the bolt suppliers and steelwork contractors to jointly discuss matters such as European Standards; how best to adopt them and what consequences it will have on the sector.

As many of the members also sit in on committees dealing with European and British standards, the Working Group acts as a conduit for circulating new information and views.

The Group is considered to be vital as the steel construction sector accounts for a large chunk of bolt suppliers overall market and turnover, more than 40% in some cases.

Keeping the steel sector adequately supplied means bolt suppliers will endeavor to provide a comprehensive range of structural bolts and fasteners, as well as keeping a supply of up to six months worth of stock.

Suppliers will aim to predict the market's peaks and troughs, by stockpiling the most popular sizes, while also maintaining sufficient quantities of all other bolts and fasteners. As many of these products are imported, this is no mean feat, as logistics on a worldwide basis are required.

The most popular bolt sizes in the UK and Irish markets are typically M20 (20mm diameter) up to M24 (24mm diameter) units, with lengths between 50mm and 100mm most in demand. However, this core product range also includes diameter sizes up to and beyond 100mm and suppliers can manufacture and procure bespoke sized bolts for a particular project.

Bolt suppliers will also stock, and in some cases manufacture, various associated products such as nuts, washers, machine screws and studs. This is because other industrial sectors also take advantage of the high standards set by BCSA associate members procedures. Bolt companies will typically supply sectors such as the rail industry, with the wind energy sector fast becoming a major market for these products.

BCSA Working Group for Fasteners

- Mabey Bridge
- The Steel Construction Institute
- Kingspan Structural Products
- William Hare
- Highways Agency
- Cooper and Turner
- Andrews Fasteners
- Lindapter International
- Hilti (GB)
- Tension Control Bolts
- BAPP Group

The BCSA Working Group for Fasteners is open to all BCSA members and those interested in joining should contact *David.Moore@Steelconstruction.org*

Picture courtesy of Cooper & Turner

A bolt ready for testing in a tensile testing machine

Design of beams with large web openings

Dr. Siamak Bake of the SCI addresses some of the issues associated with the design of these beams, explains the new Eurocode-based approach proposed by the SCI to design these beams at room and elevated temperatures and its calibration and verification against the Finite Element Analyses.

Introduction

The design of steel beams with large web openings has been a controversial topic over recent years. The only relevant codified design approach for these beams was proposed in the Annex N of prEN 1993-1-1 (1998). However, the Annex did not cover all common failure modes of such beams and was superseded later due to reliability concerns.

Due to the specific geometry of the beams with web openings, various failure modes are expected including web post buckling and bending, Vierendeel Bending and global bending at opening(s). The SCI has proposed a new design model in the recent publication P355 which checks these failure modes and may be used for composite and bare steel sections, rectangular and circular openings, full and partial shear connection, highly asymmetric sections, opening eccentricity, elongated and stiffened openings. This model is verified against Finite Element Analysis (FEA) for a wide range of geometries carefully chosen to fail in different modes.

Failures in the web post

Failure in beams with web openings generally occurs either in the web post or the bottom Tee. Web post buckling and bending are the common failure modes of the web post. In the design model a "strut" model is adopted, which simulates the web post with an equivalent diagonal strut in compression and has been calibrated against a wide range of FEA.

One of the more challenging issues is to determine a reasonable distribution of the vertical shear between the top Tee, bottom Tee and concrete slab as this has a significant effect on the web post behaviour. The design model initially assumes that the slab carries a shear load in proportion to the resistance of the slab, compared to that of the whole section. The remainder of the applied shear is then distributed between the Tees to minimise the web post moment (possibly to zero) which requires a higher shear in the bottom Tee. However, the shear force in the bottom Tee is also limited by its bending resistance and therefore the distribution of shear may require a single iteration to increase the contribution of the top Tee. The resulting stress distribution is in agreement with the investigations into the internal forces in the FE models, minimises the web post moment and results in realistic calculations of the web post resistance.

For the web post buckling check, openings are generally treated as closely spaced or widely spaced openings, depending on their length (effective length for circular openings) compared to the web post width. This affects the effective length of the strut and the compressive force it is designed for (Figure 1).

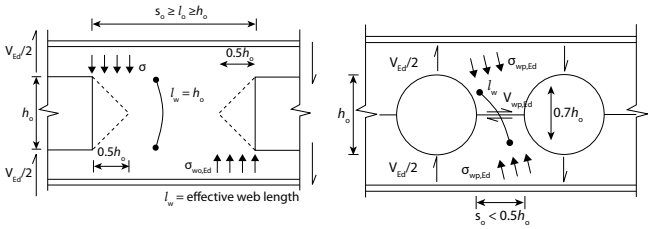


Figure 1: The "Strut" model for closely spaced and widely spaced openings

Failures in the bottom Tee

The transfer of the vertical shear across the openings causes secondary moments in the top and bottom Tees. The so-called Vierendeel Bending failure occurs when four plastic hinges form in the top and bottom Tees and a mechanism forms (Figure 2).

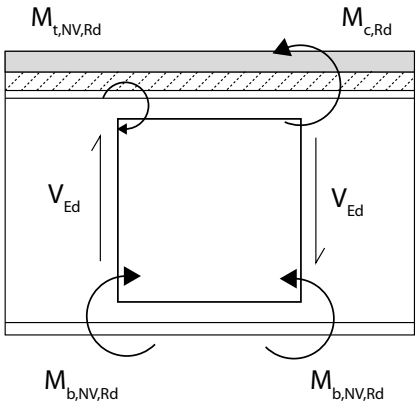


Figure 2: Vierendeel Bending

The design model checks Vierendeel Bending using the following expression:

$$2M_{bT,NV,Rd} + 2M_{tT,NV,Rd} + M_{vc,Rd} > V_{Ed}\ell_e$$

where $M_{bT,NV,Rd}$, $M_{tT,NV,Rd}$ and $M_{vc,Rd}$ are the bending resistance of the bottom Tee, top Tee and concrete slab respectively and V_{Ed} is the applied shear at the centre of the opening. The design model takes into account the reduction of the bending resistance of the Tees due to interactions with the shear and axial force. Circular openings are checked by replacing them with an equivalent rectangular opening with a height and length equal to 0.9 and 0.45 of their diameter.

The second possible failure mode of the bottom Tee which is covered in the design model is its failure due to global bending. This mode of failure is checked by comparing the tensile force in the bottom Tee to its resistance.

Finite Element Analysis

The SCI have developed advanced Finite Element (FE) models using ANSYS to calibrate and validate the design model at room temperature and in the fire condition. FE models were developed using layered shell elements to model the concrete slab. This allowed the reinforcing mesh and steel deckling to be incorporated into the model as a mid-layer and a bottom layer of the layered shell element. Eigenvalue analysis was carried out prior to the main structural analysis to determine the first local and global buckling modes. These modes were then introduced to the model with suitable imperfection amplitudes derived from the design codes. The number of shear studs was increased by a factor of three in the models (with a lower stiffness) to overcome the numerical issues due to local concentration of stress in the concrete in the vicinity of the studs.

Fire testing & validation

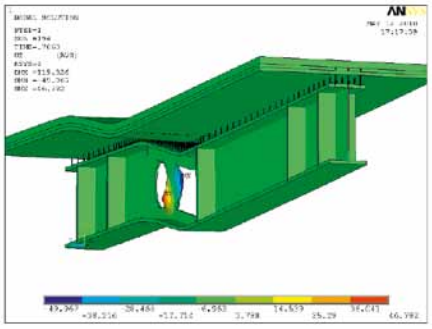
The SCI also carried out a fire test on a beam with rectangular web openings as part of a project sponsored by the Association for Specialist Fire Protection (ASPF). SCI's contribution included preliminary investigations using advanced heat transfer and structural analysis, to finalise the geometry of the test beam and the applied loads. Back-analysis of the test data was also carried out to investigate the design model and its reliability.

The FE approach implemented within ANSYS was validated against the ASFP fire test and recent tests on cellular composite floors carried out as part of a European project. The FE approach was generally able to predict, to a high accuracy, the failure modes and loads (or critical temperature) observed in the tests (Figure 3).

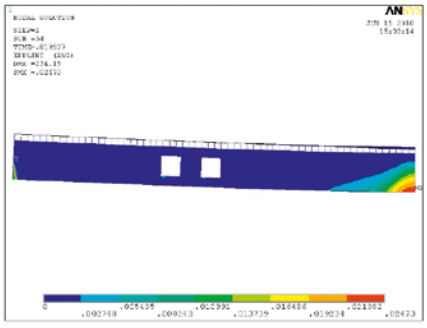
Figure 3: FE model correctly predicting the web post buckling failure occured in the ASPF fire test

Calibration of design model against FE results

The SCI calibrated the design model against the FE results for a wide range of composite beams with circular and rectangular openings. This allowed the investigation of each failure mode included in the design model. Figure 4 presents the four main failure modes of these beams among which web post buckling (mode "a") and Vierendeel Bending (mode "d") are expected in high shear zones and bending failures (modes "b" and "c") near the mid-span.

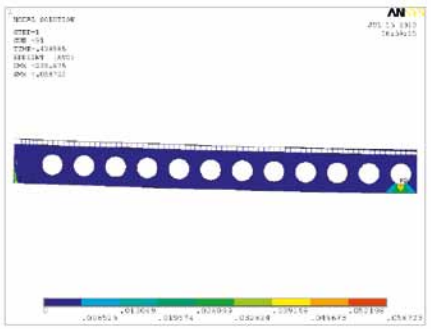


a) Web Post Buckling

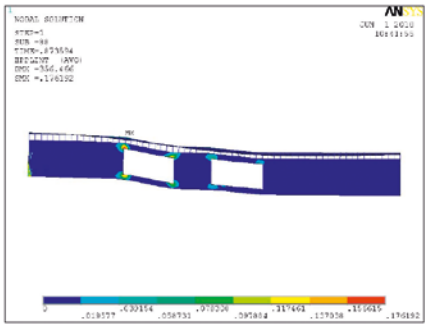


b) Global Bending at mid-span

Figure 4: Main failure modes observed in the FEA



c) Global Bending at opening



d) Vierendeel Bending

Figure 5 compares the failure loads and modes predicted by the FEA and the design model for 14 composite cellular beams with different Tee sections, opening diameters and spacing. All beams were 15 m span and subject to a UDL. A good agreement was observed in terms of the failure mode and failure load. The design model was reasonably conservative in predicting the failure due to web post buckling and gave results similar to those obtained from the FEA for global bending failure.

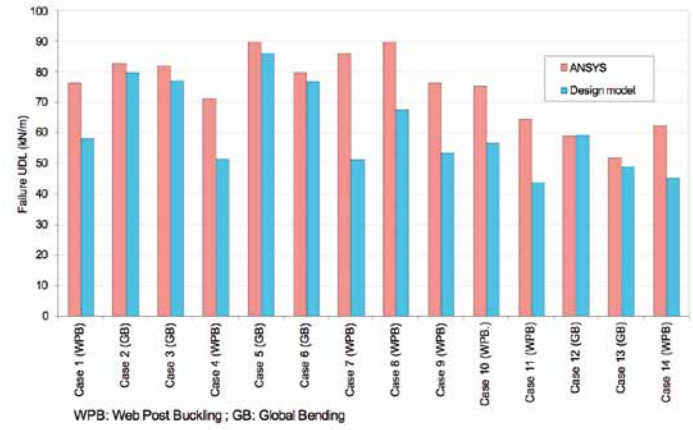


Figure 5: Design model against the FE results

Fire design

The design model was extended to include the fire design of beams with web openings. The design model provides a critical temperature for each failure mode depending on the load utilization factor and the assumed temperature distribution. The design model is generic and can be used for fire protected beams where the ratios of the temperature of the slab, top flange, web and web post, to the bottom flange temperature are specific to the fire protection used.

Generally, the web buckling failure mode becomes more dominant at elevated temperature. This is because firstly steel loses its stiffness at a higher rate than its strength, and secondly because the bottom Tee experiences higher temperatures than the top Tee. This means the top Tee contributes more in resisting the vertical shear which leads to a higher web post moment.

Further information

Details of the design approach, worked examples and flowcharts presenting the procedures to be used in design are available in SCI publication P355, for room temperature design, and RT 1356 for fire design. These are available for download from the Steelbiz website (*www.steelbiz.org*).

Steel's contribution to the Oil and Petro-Chemical Industries

Steel, in one form or another, is used more extensively than any other metal in practically every branch of the oil and related industries. In fact the phenomenal growth of the oil industry in this century is closely bound up with the use of mild steel in place of cast and wrought iron at the turn of the century. Since then the partnership of steel and oil has never been broken. At every stage of oil recovery, refining and distribution, steel is the metal which predominates. Steel is used in drilling rigs for boring, pumping units for getting crude oil to the surface of the earth, pipelines, land and sea tankers, storage tanks, pressure vessels, refinery units and so on throughout all the scientific ramifications of the industry. In general, wherever the operating conditions do not specifically demand the use of non-ferrous metals, steel is the automatic choice for equipment construction.

Steel is certainly the most spectacular construction material used in the oil industry. In any great refinery hundreds of acres are covered with massive cylindrical steel tanks, all scintillating in the sunlight and creating a powerful impression of strength. Visually and mentally the impact is of a tremendous beauty and significance: these tanks hold many thousands of tons of oil to supply the ravenous power demands of the modern world.

If the tank farms impress the lay observer with their size and acreage, there are many other structures on a refinery which can do the same by their shape or sometimes their sheer complexity. There are distillation units, catalytic crackers, platformers and all the mysterious and fascinating plants which look so formidable and stand up so aggressively. They are all of steel plate and they all use structural steel. From one end of a refinery to the other, steel is the structural medium. The oil industry is one of the largest users of structural steel in the country.

A POST-WAR INDUSTRY

It must be remembered that oil refining and the manufacture of petro-chemicals in Britain are predominantly post-war industries. Indeed, they represent some of the most outstanding technical developments in this country since the war ended. Their growth has been phenomenal. Their importance to our economy is incalculable.

It is gratifying to members of the British Constructional Steelwork industry that they have been able to make a substantial contribution to this great enterprise.

THE 'MASTER PLAN' FOR REFINERIES

Before the last war it was the custom for Western European countries to import refined products and although a certain amount of refining was carried out, it was negligible compared to modern operations.

Nor was there any great urge to build up the refining capacity of Western Europe because the general tendency was to refine in the countries of origin. The Anglo-Persian Oil Company, for example, used Abadan in Persia for the bulk of their refining operations – and incidentally, at its operational zenith Abadan was the world's largest refinery. Venezuelan crude oil was refined at Caracas and of course the USA – which was then by far the largest single producer of crude oil in the world – was well equipped with a network of refineries.

The USA was also a considerable exporter of refined products. Today the position has completely changed and the USA is a net importer of crude oil. The centre of gravity for the oil industry has swung to the Middle East where the great reserves of oil are held: Iraq, Iran, Kuwait, Saudi Arabia and more recently Libya and the Sahara.

DILEMMA OF THE 'HAVE-NOTS'

A country which lacks natural oil within its own boundaries must either import crude oil ore refined products and is thus placed in a very vulnerable position – particularly since oil is vitally required for a wide and constantly changing range of uses. In war time the situation could be disastrous.

The decision whether to refine in the country of origin or at home cannot have been easy. War-time experience must have been the deciding factor and in 1945 the British oil companies began an enormous plan of domestic refinery expansion which is still continuing. The most recent refinery in Britain to 'go on stream' is the Esso Refinery at Milford Haven, opened by the Duke of Edinburgh on November 3rd 1960.

Other new refineries completed since the war are Kent, Isle of Grain (British Petroleum Co Ltd), Grangemouth (British Petroleum Co Ltd), Fawley (Esso Petroleum Co Ltd), Coryton (Mobil Oil Co Ltd). The Shell Petroleum Co Ltd have greatly enlarged their refineries at Stanlow and Shell Haven.

Above: British Petroleum Company's Grangemouth Oil Refinery in Scotland, as seen at night from the north bank of the Firth of Forth

Crude oil distillation unit, Shell Haven, Essex

PETRO-CHEMICALS

Synthetic rubber was one of the first petro-chemical products. Since its introduction there has been an almost ceaseless flow of new synthetic products and materials based on oil. Petroleum is the source of a vast range of valuable chemicals produced at the rate of several million tons a year.

Plastics, synthetic detergents, solvents, paints and synthetic fibres are some of the more important petro-chemical products. The describe their manufacture here would be impossible and indeed irrelevant. The point to be made is that plants are being erected in this country not only by the oil companies but by the industries interested in the manufacture and use of these products.

FROM BUILDING WITH STEEL, FEBRUARY 1961

The oil companies are extremely active in this field. The Shell company took over Petrochemicals Ltd in 1955. British Hydrocarbon Chemicals Ltd is operated jointly by British Petroleum Co Ltd and the Distillers Co Ltd. Similar companies have come into existence and it is clear that the most important developments in the oil industry will emerge from petro-chemicals.

A BRITISH INDUSTRY

Looking back is always easier than looking forward and it is interesting to recall the situation which confronted the oil companies when they began their ambitious programme in 1945.

the men who had fought in it but also the factories and their plant which had been ceaselessly turning out war material. Both men and machines were run down.

THE PROGRAMME COMPLETED

Yet, by one means and another, the work was undertaken and carried out. Companies who knew nothing about equipment for the oil industry – whose standards are extremely high – combined with the few companies with pre-war experience to form the basis of an industry which in its way has grown as large and powerful as the oil industry itself.

Their native skills permitted British companies to manufacture

Top: Part of the storage installations on the Thames owned by London and Thames Haven Oil Warves Ltd. Thames Haven is the largest independent storage installation in Europe.

Above: The 'Orient Explorer', first British-built mobile drilling platform, now operating off the coast of Borneo. It has living accommodation for 56 men.

Above: Catalytic cracker unit at British Petroleum Company's Kent refinery. This unit produces high grade petroleum products.

Below: General view of pressure storage showing spherical tanks for butane and vertical tanks for propane at Stanlow refinery.

It must be remembered that the USA is the natural home of the oil industry. Oil is indigenous to the country and since the days when Colonel Drake bored his successful well practically every notable development has come from the American oil industry. Oil companies all over the world had therefore always automatically turned to the USA for the equipment they required to find oil or to treat and refine it.

In 1945, however, there were no dollars in Britain to buy that equipment. The oil industry had therefore to turn to the skills of the British engineering industry for help.

It was not a promising situation. The war had not only exhausted

successfully under licence specialised American oil equipment. This is a practice which has grown and today no only can practically all oil equipment be made in this country but the oil companies buy British made equipment as a first choice.

This structural steel industry played its vital part in all this great activity and will continue to do so as long as the oil industry operates.

In parenthesis and to illustrate the vastness of the international oil industry – of all the ships sailing the oceans of the world at any time, 11% are oil tankers.

Right: The fluid catalytic hydroformer at Esso refinery, Fawley. This plant was erected at a cost of £4 million to produce high grade quality petrol out of low-octane raw naptha

STEEL CONSTRUCTION

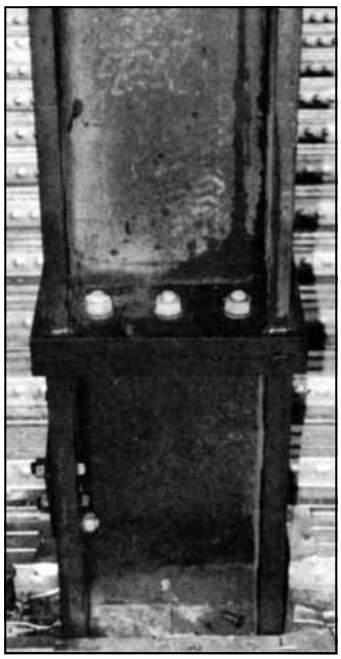
New Westminster and Chelsea Hospital

A year ago, Graham Wood Structural Limited were appointed to provide the structural steel for the new Westminster and Chelsea Hospital. The contract covered 6,000 tonnes of steelwork plus metal decking and staircases.

Graham Wood's erection of the structural steel frame for the hospital is on programme, and completion happily coincided with the Foundation Stone ceremony attended by Secretary of State, Kenneth Clarke, on Wednesday 19th September 1990. The 46 weeks steelwork site programme means that the building of the hospital is on target for the expected 5 year concept-to-completion period, which represents half of that traditionally needed to build a new hospital.

Fast-track techniques engineered by the Waterman Partnership and managed by Laing Management Contracting have heklped to accelerate more traditional building methods, which Graham Wood have supplemented by more efficient standard steelwork connection concepts, and the incorporation of standard steel staircases. These standard staircases, designed by Graham Wood in co-operation with the Architect, Sheppard Robson, have proved easier to supply and fix through standardisation of fixing details and lighter construction.

The 650 bed teaching hospital will be built for the NWTRHA on the site of the 111 year old St Stephans Hospital in Fulham Road.



The 1,110,000 sq ft hospital will comprise lower ground, ground and fibe upper levels designed around a central atrium. Car parking is provided at basement level. Two separate buildings housing a Mental Health Unit and a Nurses Home will also form part of this 'fast track' scheme on the 7.5 acre site.

Members of the development team are:

Client - North West Thames Regional Health Authority, *Project Manager* - CS Project Consultants, *Architect* - Sheppard Robson, *Structural Engineer* - Waterman Partnership, *Services Engineer* - Donald Smith, Seymour and Rooley, *Quantity Surveyor* - Gleeds, *Main Contractor* - Laing Management Contracting.

New and revised codes & standards

From BSI Update February 2011

BRITISH STANDARDS

BS 4933:2010
Specification for ISO metric black cup and countersunk head bolts and screws with hexagon nuts
Supersedes BS 4933:1973

BS EN PUBLICATIONS

BS EN 10029:2010
Hot-rolled steel plates 3 mm thick or above. Tolerances on dimension and shape.
Supersedes BS EN 10029:1991

BS EN 10051-1:2010
Continuously hot-rolled strip and plate/sheet cut from wide strip of non-alloy and alloy steels. Tolerances on dimension and shape
Supersedes BS EN 10051:1991+A1:1997

BS EN 10169:2010
Continuously organic coated (coil coated) steel flat products. Technical delivery conditions
Supersedes BS EN 10169-1:2003, BS EN 10169-2:2006 and BS EN 10169-3:2003

BS IMPLEMENTATIONS

BS ISO 16163:2010
Continuously hot-dipped coated steel sheet products. Dimensional and shape tolerances
Supersedes BS ISO 16163:2005

NEW WORK STARTED

BS 5975:2008/A1
Code of practice for temporary works procedures and the permissible stress design of falsework

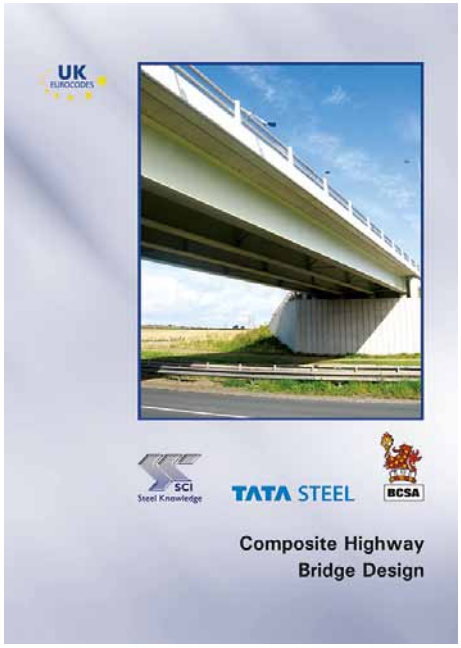
ISO PUBLICATIONS

ISO 11666:2010
Non-destructive testing of welds. Ultrasonic testing. Acceptance levels
Will be implemented as an identical British Standard

ISO 15510:2010
Stainless steels. Chemical composition
Will be implemented as an identical British Standard

ISO 17640:2010
(Edition 2)
Non destructive testing of welds. Ultrasonic testing. Techniques, testing levels, and assessment
Will be implemented as an identical British Standard

Composite Highway Bridge Design



This publication provides design guidance for multi-girder and ladder deck forms of construction and includes guidance in relation to integral bridges that reflect the rules in the Eurocodes.

Content of this publication includes: ·

- Guidance on detailed design in accordance with the Eurocodes
- Explanation is given for the application of the principles and the rules in the relevant parts of the eurocodes
- Design of components and connections, in terms of both strength and best practice for construction and durability.
- Descriptions of the forms of integral abutment and the implications on the design of the superstructure.
- Non-contradictory complementary information (to be used in conjunction with Eurocode rules) for determining the slenderness of the bare steel beams during construction.

This publication is a companion to Composite Highway Bridge Design: Worked Examples

Price £50.00 (BCSA and SCI member price £25.00)

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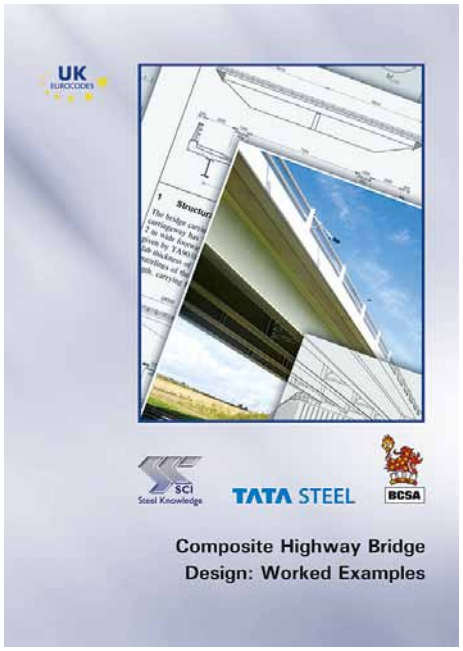
Composite Highway Bridge Design: Worked Examples



For anyone wishing to design a composite bridge this publication presents two worked examples, one for a two-span multi girder integral bridge and the other for a three-span ladder deck bridge. The examples cover the principal steps in the verification of the design in accordance with the Eurocodes, as implemented by the UK National Annex.

The calculations in this publication illustrate the principal design considerations that are discussed in the companion publication (P356).

The examples include:

- Summary of design situations to be considered and applicable actions, covering, loads, bending moments, shears and buckling
- Illustrations of the global analysis model and tabulation of results
- Evaluation of design values of effects at key locations, during construction and in service
- Verification of the adequacy of the bare steel girders during construction and the composite girders in service
- Verification of longitudinal shear connections and fatigue resistance

The detailed design of the deck slab, for local loading is not covered in either example.

Price: £60.00 (BCSA and SCI Member Price £30.00)

Catalogue number	**P357**
ISBN number	978-1-85942-195-6
Authors	D C Iles MSc ACGI DIC CEng MICE
Pagination	129 pp
Pages	A4 Paperback
Publication date	2010

Receive both these publications free when you attend the 2-day Design of Steel Bridges course 29 and 30 March 2011, Leeds (see www.steel-sci.org/courses for details)

Essential aids for Eurocodes and CE Marking

Steel Building Design: Design Data, In accordance with Eurocodes and the UK National Annex - P363

This edition of the 'Blue Book' provides resistances in accordance with the UK version of Eurocode 3 (parts 1-1, 1-5, and 1-8) together with its UK National Annexes. It includes member resistance tables for steel members in compression, bending and tension. Tables are also provided for combined bending and compression, web resistance and shear resistance. Section property data is included for rolled I sections, ASB sections, channels, angles and hollow sections. Resistances are also given for common member types, ordinary (non pre-loaded) bolts, pre-loaded bolts and welds.

Price £80.00
(BCSA and SCI member price £60.00)

Steel Building Design: Worked Examples – Hollow Sections – P374

This publication offers designers of steel building structures in the UK, a series of examples of design to the Eurocodes. The examples illustrate the Eurocode approach to design using structural hollow sections and have full references to the relevant clauses and appropriate NCCI. The examples can serve as templates for designers to use for their own design. This publication covers the use of structural hollow sections.

Price £20.00
(BCSA and SCI member price £10.00)

Steel Building Design: Introduction to the Eurocodes – P361

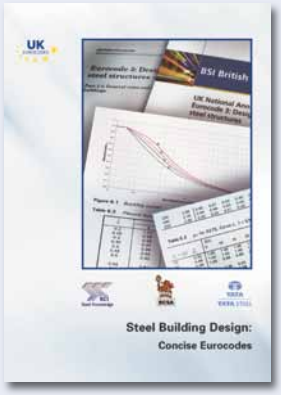
For designers using the Eurocodes for the first time, this publication offers an overview of the Eurocode standards and the national annexes that implement them. It addresses the basis of structural design and the combination of actions (loads) that should be considered and introduces the aspects of detailed design for steelwork according to Eurocode 3 and composite construction according to Eurocode 4.

Price £20.00
(BCSA and SCI member price £10.00)

Steel Building Design: Medium Rise Braced Frames – P365

For new designers, this guide provides an introduction to the major features of multi-storey design. For more experienced designers, the guide illustrates the key changes when designing to the Eurocode, in particular the revised approach to frame stability. A worked example showing the design of the major elements is included.

Price £40.00
(BCSA and SCI member price £20.00)

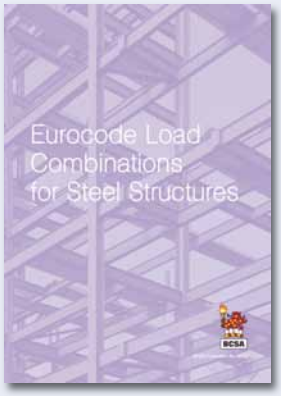


Steel Building Design: Concise Eurocode – P362

This guide simplifies the apparent complexity of the Eurocodes for steel design, providing the designer with a digestible approach to common tasks.

Guidance is presented on design routes, with references to Eurocode clauses. Formulae are converted into look-up tables and design tips are highlighted. The compilation includes the related provisions in the UK National Annexes and appropriate non-contradictory complementary information.

Price £50.00
(BCSA and SCI member price £25.00)

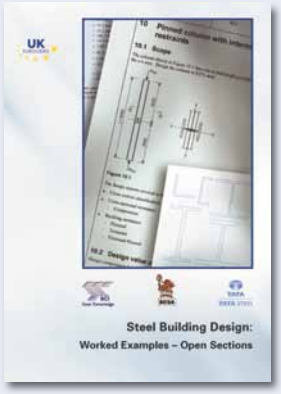


Eurocode Load Combinations for Steel Structures

This design guide explains the Eurocode load combinations for steel structures based on the recommendations given in BS EN 1990 'Eurocode - Basis of Structural Design' and BS EN 1991 'Eurocode 1 – Actions on Structures'. Straightforward guidance is given on the loading and load combinations for both the serviceability and ultimate limit states for the following building types:

- Multi-storey buildings – Simple construction
- Multi-storey buildings – Continuous construction
- Portal frames without cranes
- Portal frames with cranes

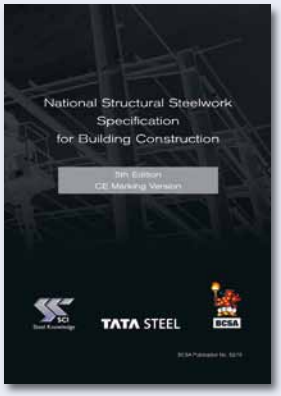
Price £15.00
(BCSA and SCI member price £11.25)



Steel Building Design: worked examples – open sections – P364

For designers of steel building structures in the UK, this publication offers a series of worked examples of design to the Eurocodes. The examples illustrate the Eurocode approach to design and have full references to the relevant clauses and appropriate NCCI. The examples can serve as templates for designers to use for their own design when using open sections, such as beams and columns.

Price £50.00
(BCSA and SCI member price £25.00)



National Structural Steelwork Specification for Building Construction 5th Edition (CE Marking version)

This edition of the National Structural Steelwork Specification is fully compliant with the new European standard for fabrication, BS EN 1090-2 and the CE Marking standard BS EN 1090-1. This new version does not supersede the earlier version of the NSSS which still remains current for those applications which do not require CE Marking.

Price £25.00
(BCSA and SCI member price £18.75)

BCSA

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AD 355
Hydrogen embrittlement of bolts

The Advisory Desk has been asked to draw attention to the need to ensure avoidance of hydrogen embrittlement of higher grade bolts (above property class 8.8) that are galvanized or metal coated. This is unrelated to the requirement that bolts have sufficient toughness to meet the requirements for avoidance of brittle fracture at low temperatures, which was discussed in Advisory Desk Note AD 332.

Guidance on avoidance of hydrogen embrittlement in higher grade bolts is given in Guidance Note 8.02 in *Steel Bridge Group: Guidance notes on best practice in steel bridge construction* (SCI publication P185, available on Steelbiz).

Generally, the risk of hydrogen embrittlement is avoided by appropriate treatment during manufacture but it is essential that proper and reliable certification is provided for the bolts and their coating in accordance with the recognised European and international standards.

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AD 356
Design of compression stiffeners to BS EN 1993

This Advisory Desk note presents a summary of the procedure for the design of compression stiffeners in accordance with BS EN 1993.

In BS 5950-1:2000, the need for and design of such stiffeners was covered by clause 4.5.2 (Bearing capacity of web) and clause 4.5.3 (Buckling resistance). In BS EN 1993 the need for compression stiffeners due to transverse force is presented in BS EN 1993-1-5:2006, clause 6 (Resistance to transverse forces).

Although not stated, this clause covers both "web bearing" and "web buckling" mode of failure. If the design resistance of the unstiffened web is insufficient, transverse (compression) stiffeners should be provided in accordance with clause 9.1 and 9.4 of BS EN 1993-1-5:2006.

A summary of the design procedure for compression stiffener designed as a cruciform section (see figure 1 below) is:

	Term	Formula	BS EN 1993	Clause	Equation
1	$A_{eff.stiff}$	$(2 \times A_s) + [(2 \times 15 \times \varepsilon \times t_w) + t_s] \times t_w$	-1-5	9.1	
2	$I_{eff.stiff}$	$(2 \times L_{s.eff} + t_w)^3 \times t_s/12$ Excludes web	-1-5	9.1	
3	$i_{eff.stiff}$	$\sqrt{(I_{eff.stiff}/ A_{eff.stiff})}$			
4	λ_1	93.9ε	-1-1	6.3.1.3 (1)	
5	L_{cr} (= ℓ)	$\geq 0.75 \times h_w$	-1-5	9.4 (2)	
6	$\bar{\lambda}$	$L_{cr}/(i_{eff.stiff} \times \lambda_1)$	-1-1	6.3.1.3 (1)	
7	α	Imperfection factor = 0.49 Buckling curve 'c'	-1-5 -1-1	9.4 (2) refers to Table 6.1	
8	Φ	$0.5[1 + \alpha (\bar{\lambda} - 0.2) + \bar{\lambda}^2]$	-1-1	6.3.1.2	6.49
9	χ	$1/[\Phi + \sqrt{(\Phi^2 - \bar{\lambda}^2)}]$ $\chi \leq 1.0$	-1-1	6.3.1.2	6.49
10	$N_{b,Rd}$	$\chi \times A_{eff.stiff} \times f_y/\gamma_{M1}$	-1-1	6.3.1.1 (3)	6.47

Table Notes:

Read in conjunction with figure 1 opposite.

a. Formulae 1, 2 and 3 are for a symmetrical stiffener arrangement.
b. Refer to EN 1993-1-5: 2006 – clause 9.1 (2) for limiting web lengths
c. Effective stiffener length, $L_{s.eff} = \min(L_s, 14 \times t_s \times \varepsilon)$.
   $(14 \times t_s \times \varepsilon)$ is from BS EN 1993-1-1, Table 5.2 (class 3, outstand)
d. $A_s = L_{s.eff} \times t_s$
e. $\varepsilon = \sqrt{(235/f_y)}$
f. $f_y = \min(f_{y,stiff}, f_{y,beam})$
g. h_w = clear depth between flanges (not depth between fillets)
h. $\gamma_{M1} = 1.0$ (UK National Annex)

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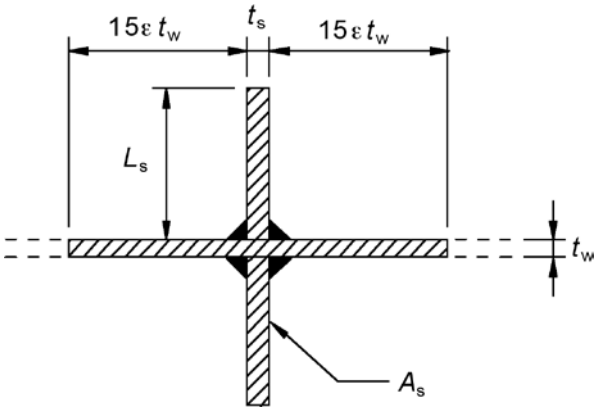

Figure 1. Effective cross-section of stiffener

Strength from Advisory Service

Designing and building in steel has never been as straightforward as it is today, and steel still remains the material of choice for construction in the UK. The steel sector provides comprehensive and in-depth technical back up to ensure that those using steel have all the guidance and support they could need at their finger tips.

The co-ordinated and comprehensive support provided by the BCSA's Structural Advisory Serivce is free of charge to specifiers, clients and designers. Technical experts are on hand to provide an extensive range of services, including design assistance on structural form, performance of steel buildings, seminars and in-house CPD presentations, etc.

Richard Dixon, Manager, Structural Advisory Services, who heads up the network of Regional Technical Managers throughout the UK and Ireland said: "We have a team of experienced regional engineers who are on hand to offer design support and advice to designers, and to point them to the wide range of technical guidance and resources available to them and inform them in a practical way on key topics like EC3 and the sustainability of steel construction through in-house CPDs."

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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 £1,400,000
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&B Group Ltd	01942 676770	●		●	●	●	●	●		●	●	●		●		✓	Up to £1,400,000
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
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
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✓	Up to £4,000,000
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
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 £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*
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*
Tubecon	01226 345261						●	●	●	●				●	●	✓	Above £6,000,000*
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
Balfour Beatty Utility Solutions Ltd	01332 661491
Griffiths & Armour	0151 236 5656

Company name	Tel
Roger Pope Associates	01752 263636
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								●	

Company name	Tel	1	2	3	4	5	6	7	8	9
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 Steel Ltd	01274 682281								●	
Cellbeam Ltd	01937 840600	●								
Cellshield Ltd	01937 840600							●		
CMC (UK) Ltd	029 2089 5260							●		

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.

BCSA steelwork contractor member	Tel	FG	PG	TW	BA	CM	MB	RF	AS	QM	Contract Value (1)
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
Cleveland Bridge UK Ltd	01325 502277	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●	●	●	●			●	●	✓	Up to £800,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●		●	●	✓	Up to £4,000,000
Painter Brothers Ltd	01432 374400	●		●					●	✓	Up to £6.000,000
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
Non-BCSA member											
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
Carver Engineering Services Ltd	01302 751900	●	●	●	●		●	●	●	✓	Up to £2,000,000
Cimolai Spa	01223 350876	●	●	●	●	●	●			✓	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 £800,000*
Millar Callaghan Engineering Services Ltd	01294 217711	●						●		✓	Up to £800,000
N Class Fabrication & Installation	01733 558989	●	●	●	●			●		✓	Up to £800,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓	Up to £3,000,000*

Company name	Tel	1	2	3	4	5	6	7	8	9
Composite Metal Flooring Ltd	01495 761080	●								
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						●			
Jamestown Cladding and Profiling	00 353 45 434288	●								
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	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	●								
Studwelders Composite Floor Decks Ltd	01291 626048	●								
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						●			

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