www.newsteelconstruction.com

# NSC

New heart for Redcar

Vol 21 No.3 May/June 2013

City icon rises

Steel supports Stonehenge

Steel ready for BIM

Factory boosts Kerry economy

# SUBSCRIBE FOR FREE TO NSC

**UK and Ireland only*

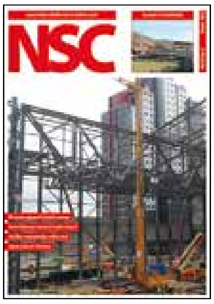











New Steel Construction keeps designers and contractors abreast of all major steel construction related developments and provides detailed technical information on key issues such as the introduction of the Eurocodes. NSC will be the first place most people hear about advances made by the extensive research 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 four 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. One of the most popular features is 50 Years Ago, looking at key projects of the past by revisiting the pages of 'Building With Steel'.

NSC is available free of charge every two months to subscribers living in the UK or Ireland by contacting us by email at *admin@newsteelconstruction.com*, or filling in the form below and faxing it to 020 7747 8199.

You can fill out this form and fax it to **020 7747 8199**, or scan and email it to **admin@newsteelconstruction.com**

Name

Position

Company

Address

Postcode

Telephone

Email






**Cover Image**
**Leadenhall Building, London**
Client: British Land
Architect: Rogers Stirk Harbour + Partners
Steelwork contractor:
Severfield -Watson Structures
Steel tonnage: 18,000t

NSC
May/June 2013 Vol 21 No 3



These and other steelwork articles can be downloaded from the New Steel Construction Website at *www.newsteelconstruction.com*

# Take a fresh look at Barretts....we have!

BARRETT Constructional Steel

Barrett Constructional Steel are dedicated solely to supplying a full range of quality steel products and associated services to the construction industry.

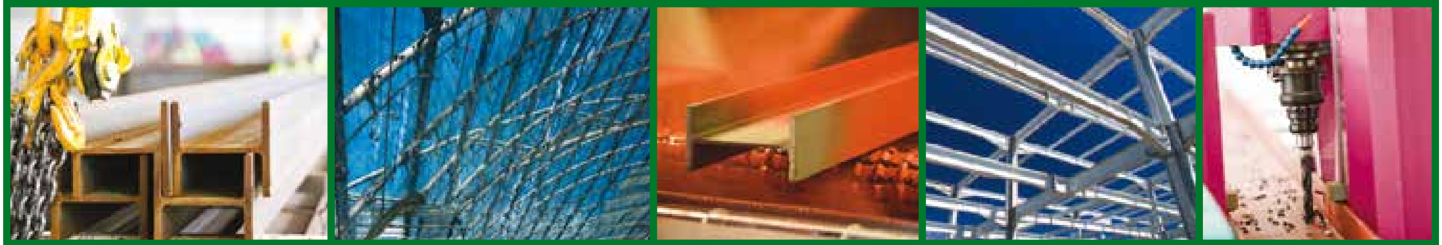
With over 80,000 tonnes of steel from stock and nationwide delivery, our experienced sales team is committed to providing our customers with a total steel solution from one source.

Plate stocks up to 200mm - Various grades

Cold/Hot Hollow sections - S275/S355/S420 - Up to 18m

Full range of structural stock - S275/S355

Huge selection of flats, angles, channels, squares and rounds



**Processing Excellence - Saving you time and money**

- Automated Shotblast and Paint lines.
- Multiple close coupled Sawing and Drilling lines with hard stamping facility. Fully CNC controlled.
- 9 tube lasers including the Fiber and Jumbo.
- Punching and Shearing for both flats and angles. Ideal for base plates, trusses,connection plates and braces.

**For more information please don't hesitate to contact us.**

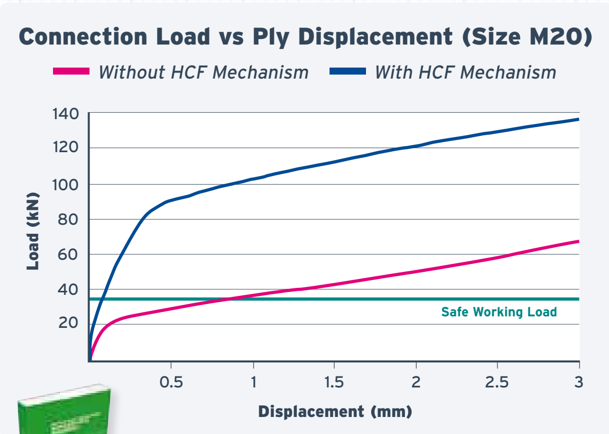
**T: 01274 474314 F: 01274 651205 E: sales@barrettconstructional.com**

Hollo-Bolt® by lindapter®

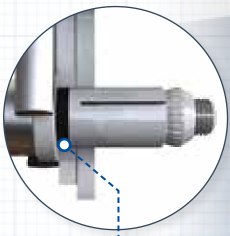
# High Clamping Force for Structural Joints

HIGH CLAMPING FORCE · CE

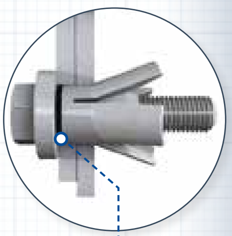
The Hollo-Bolt High Clamping Force (HCF) is optimised for primary SHS connections and features a patented mechanism to produce three times more clamping force for a more secure connection, as shown below:




*The Hollo-Bolt is recognised as a structural connection in the BCSA/SCI 'Green Book' Connection Manual.*



HCF Mechanism before installation



HCF Mechanism compresses during installation to achieve **3x Clamping Force**

*Scan the QR code to watch the video*

To view the significance of increased clamping force, watch the new video at **www.hollo-bolt.com**

# Steel sets a safety example

**Nick Barrett - Editor**

News from the BCSA's members that the steel sector's already highly creditable health and safety performance has improved further in 2012 makes happy reading in our News section this month. The number of reportable accidents recorded under RIDDOR, the Reportable Injuries, Diseases and Dangerous Occurrences Regulations, fell by 24% during the year.

This is all the more encouraging considering that there was a reduction of 25% in 2011 and a reduction of 25% the year before that as well. A bit of complacency might have been expected after even one year's success on that scale, but the steel construction sector is committed to continually improving safety, as these statistics indicate.

There were no fatal accidents during 2012 and there was a reduction of 60% in accidents involving 'slips, trips and falls'. Somebody – a lot of people actually – is obviously doing something right. Steel has for long been able to boast that it is an inherently safer construction technique than alternatives, with most work carried out by highly trained and skilled workers in factory controlled conditions, rather than on potentially hazardous construction sites amid the confusion of multiple trades operating hard up against one another.

When steel comes to site for erection work is mostly carried out from the relative security of mobile elevating work platforms (MEWPs) where erectors are harnessed and all possible fall prevention procedures are adopted. Steel erectors are highly trained and experienced in working with MEWPs, which is why their safety record when using MEWPs is excellent, something not all trades can boast of.

Improvements from these levels only come from a lot of focussed hard work on the part of all those involved, including the increasingly safety conscious site operatives themselves, supervisors and site managers, main contractors taking their safety responsibilities very seriously, and safety managers.

In the steel sector credit has also to be given to the BCSA's health and safety committee which encourages the spread of safety best practice among members. The target for the construction industry must remain zero accidents and the steel sector is showing the way to go.

### Tough task for awards judges

When the going gets tough, the tough get going, says Chairman of the judges of this year's Structural Steel Design Awards David Lazenby. The shortlist is announced this month, see News, and16 steel projects have been selected to go forward for final judging.

Despite the continuing poor workloads the awards, now in their 45th year, brought forward an extremely high quality of entry, with projects from all over the UK and from a wide variety of sectors including commercial, transport, bridges, industrial facilities, energy, education and tourist attractions. They are also of varying sizes, proving that to succeed at the SSDA not only big is beautiful. Good luck to all on the shortlist.

NSC

**EDITOR**
**Nick Barrett** Tel: 01323 422483
*nick@newsteelconstruction.com*
**DEPUTY EDITOR**
**Martin Cooper** Tel: 01892 538191
*martin@newsteelconstruction.com*
**CONTRIBUTING EDITOR**
**Ty Byrd** Tel: 01892 553143
*ty@barrett-byrd.com*
**PRODUCTION EDITOR**
**Andrew Pilcher** Tel: 01892 553147
*admin@newsteelconstruction.com*
**PRODUCTION ASSISTANT**
**Alastair Lloyd** Tel: 01892 553145
*alastair@barrett-byrd.com*
**NEWS REPORTER**
**Mike Walter**
**COMMERCIAL MANAGER**
**Sally Devine** Tel: 01474 833871
*sally@newsteelconstruction.com*

**CHANGES TO THE MAILING LIST**
If you wish to notify us of a change:
Members BCSA and Non Members
Telephone BCSA on 020 7747 8126
Members SCI Telephone SCI on 01344 636 525

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

**The Steel Construction Institute**
Silwood Park, Ascot, Berkshire SL5 7QN
Telephone 01344 636525 Fax 01344 636570
Website *www.steel-sci.com*
Email *reception@steel-sci.com*

**Tata Steel**
PO Box 1, Brigg Road, Scunthorpe,
North Lincolnshire DN16 1BP
Telephone 01724 405060
Website *www.tatasteelconstruction.com*
Email *construction@tatasteel.com*

CONTRACT PUBLISHER & ADVERTISING SALES
**Barrett, Byrd Associates**
7 Linden Close,
Tunbridge Wells, Kent TN4 8HH
Telephone 01892 524455
Website *www.barrett-byrd.com*

**EDITORIAL ADVISORY BOARD**
Ms S McCann-Bartlett (Chair); Mr N Barrett;
Mr D G Brown, SCI; Mr M Crosby; Mr R Dixon, BCSA;
Mr R Gordon; Mrs K D Lloyd, BCSA;
Mr A Palmer, Buro Happold;
Mr G H Taylor, Caunton Engineering;
Mr M Thompson, Mott MacDonald;
Mr O Tyler, Wilkinson Eyre Architects

The role of the Editorial Advisory Board is to advise on the overall style and content of the magazine.

New Steel Construction welcomes contributions on any suitable topics relating to steel construction. Publication is at the discretion of the Editor. Views expressed in this publication are not necessarily those of the BCSA, SCI, Tata Steel or the Contract Publisher. Although care has been taken to ensure that all information contained herein is accurate with relation to either matters of fact or accepted practice at the time of publication, the BCSA, SCI, Tata Steel and the Editor assume no responsibility for any errors or misinterpretations of such information or any loss or damage arising from or related to its use. No part of this publication may be reproduced in any form without the permission of the publishers.

All rights reserved ©2013. ISSN 0968-0098

# Steel sector's quality highlighted by SSDA shortlist

The shortlist for the 45th Structural Steel Design Awards (SSDA) has been announced by the British Constructional Steelwork Association and Tata Steel.

This year's shortlist consists of 16 projects and reflects steel's appeal with a variety of sectors ranging from offices/commercial, transport, energy, education and sports facilities and a variety of bridges, together with a theatre and a major tourist attraction.

David Lazenby CBE, Chairman of the SSDA Judging Panel, said: "The judges are conscious of trends over the years. It remains clear that closer and cooperative relationships within project teams (including the client) have never been more important, nor the need for a thoroughly professional approach to the training and qualification of people, and proper traceability of processes and materials.

"This year we again see a highly professional performance from the industry, with technical competence and careful management of the work. These are not achieved easily, but are key to the satisfaction of the client."

The winners of the 2013 SSDAs will be announced at an evening reception at Madame Tussauds in London on 9 July.

**SSDA shortlist 2013**

**10 Brock St, London**
**A406 Wilmer Way Footbridge, London**
**Air W1, London**
**Brent Civic Centre, London**
**Emirates Air Line, connecting Greenwich Peninsula and The Royal Docks, London**
**Manchester Road Bridge, Bradford**
**Marlowe Theatre, Canterbury**
**NFC St Georges Park, Burton-on-Trent**
**Sky Wind Turbine, London**
**Snow Hill 2, Birmingham**
**South Wolverhampton & Bilston Academy, Wolverhampton**
**The Crystal, London**
**The Cutty Sark, London**
**Saints Stadium Footbridge, St Helens**
**The Shoal, London**
**Twin Sails Bridge, Poole**

## Progressive faculty opens in Coventry

Recently opened by Princess Anne, Coventry University's new 15,000m² Engineering and Computing Building offers an array of world class teaching facilities and has achieved a BREEAM 'Excellent' rating.

Working on behalf of main contractor Vinci Construction, Traditional Structures fabricated the steel to an Arup Associates structural design and erected the frame.

The faculty is formed of two L-shaped blocks which are linked by a glazed entrance atrium at one corner. The lower southern four-storey block houses three lecture theatres, breakout spaces and the main conference meeting room.

The taller northern block accommodates a café, IT and electronics laboratories, staff and academic offices as well as research and common rooms.

A state-of-the-art engineering teaching facility for the 21st century has been created as the building accommodates flight simulators, an air traffic control room, car engines donated by Jaguar, full scale racing car prototypes, vibrating automotive suspension simulators, a full scale Harrier jump jet with wind tunnel and one of the largest cryogenic magnets in Europe.

## Steelwork boost for cancer research

Work on the new £28.5M Manchester Cancer Research Centre (MCRC) laboratory facility is under way at the Christie Hospital in south Manchester.

Approximately 500t of structural steelwork is being fabricated, supplied and erected by EvadX working on behalf of main contractor Pochin.

Steel construction will come to the fore on this project as the building features a number of architectural elements best accomplished with a steelwork solution.

The front of the structure has a large cantilevering façade formed with a series of 16m long × 4.4m deep trusses.

Andrew Roberts, EvadX Project Manager said: "The trusses support the second floor of the building, while the first floor in this part of the hospital is hung from them."

Other façades have raking perimeter columns to achieve the desired sloping walls. This architectural feature will help maximise the footprint of the building as the floorspace increases the higher one goes in the structure.

Once complete next year the facility will house 150 researchers who will work on developing new ideas and treatments. The research will focus on radiation therapy, lung cancer, women's cancers, melanoma and haematological oncology.

# Specification to ease prequalification process

To help streamline the sometimes lengthy construction prequalification process, the British Constructional Steelwork Association (BCSA) has aligned its membership assessment form to PAS 91:2013.

Publicly available specification PAS 91:2013 sets out the content, format and questions commonly used for prequalification for construction project tendering.

"By aligning the membership assessment with PAS 91:2013 our members will have already answered the relevant questions for prequalification," said Pete Walker, BCSA Director of Health, Safety and Training.

"This will streamline the process and hopefully mean PAS 91:2013 becomes the most widely used scheme, superseding other schemes. The BCSA is already a registered member of Safety Schemes in Procurement (SSIP), which is also aligned to the health and safety section of PAS 91:2013"

In the construction supply chain, many suppliers seeking to demonstrate their suitability for delivering construction projects are required to submit to frequent prequalification processes involving many different questionnaire forms.

The BCSA said this leads to considerable unnecessary effort and wastes time and money, not only for those suppliers but also for the buyers and assessment providers who have to read and evaluate the varied information provided in many different formats.

"The many procurement offices that choose for whatever reason, to undertake their own prequalification activity, exacerbate this proliferation of questions and formats," added Mr Walker.

The use of a set of common criteria by those who undertake prequalification activity or provide prequalification services will help to streamline tendering processes by reducing the need for multiple prequalification processes, facilitating the identification of suitably qualified and experienced suppliers, and increasing consistency between various prequalification databases.

## Bridge to future development

A new 84m long pedestrian and cycle bridge has been installed across the A9 linking Inverness city centre with the 215 acre Inverness Campus development.

Highlands and Islands Enterprises' multi million Campus development will include new colleges, a primary care centre and a hotel. Work on these buildings is scheduled to begin as soon as Morgan Sindall has completed the bridge, and other infrastructure works.

The steel bridge was fabricated and assembled by Cleveland Bridge. It is 9m wide, weighs 290t and was brought to site as six main girders, two 36m long and four 24m long 'sections.

"We assembled the bridge on 2m high stillages on an adjacent site," said Paul Walmsley, Cleveland Bridge Project Manager. "We welded the girders and crossbeams, as well as installed the metal deck."

Once the bridge was assembled and clad, Morgan Sindall and heavy lift specialist Mammoet installed the bridge during a single night time road closure.

The bridge structure was jacked up and transported to its permanent position by self propelled mobile transporters (SPMTs). Once in position it was lowered onto its permanent bearings.

Commenting on the installation, Neil Duncan, Area Director at Morgan Sindall, said: "Good transport and pedestrian infrastructure is vital in a large scale project such as Inverness Campus, so we are pleased to have put in place this crucial piece in the development."

# University benefits from £3.5m car park

A three-storey car park has officially opened at the University of Essex, offering students and staff an additional 357 parking spaces.

The £3.5m scheme was constructed by Bourne Parking and is clad on all façades by 6.5km of feature cedar vertical fins, with integrated measures reducing the scheme's environmental impact; including 'green walls', electric vehicle charging points, energy efficient LED lighting and photovoltaic cells on the roof.

The total number of spaces on campus now exceeds 1,800, improving car parking provision for the 6,000 students who live off campus and more than 2,250 staff and visitors using campus facilities. The University said the increased capacity will also ensure it continues to attract the highest quality students and teaching staff.

## NEWS IN BRIEF

The **William Hare Group** has secured the rights to supply and install the Holorib, Ribdeck and Superib composite metal deck products. First launched in 1972, the Holorib re-entrant profile and the later generation Ribdeck trapezoidal sections are popular products and have been used at 1 Canada Square in Canary Wharf and 20 Fenchurch Street in the City of London.

**Tekla**'s latest version of the building information modeling (BIM) software Tekla Structures19 is said to help construction companies take advantage of the constant changes in the industry. "We want to help the construction industry to change the bottom line for the better, regardless of the materials they use," said Tekla's Executive Vice President, Deputy CEO and GM of Trimble Buildings Structures Division Risto Räty. The new version is available at *www.teklastructures.com*.

The **SCI**'s series of two year technology projects for the International Stainless Steel Forum (ISSF) has concluded with the launch of the new worldstainless extranet. Designed to better serve ISSF's members, the extranet's structure is said to have been simplified and streamlined to enhance the user experience.

**FICEP** has invested heavily in its manufacturing facility at its Italian headquarters in Gazzada Schianno, with the building of a new 2,000m$^2$ showroom, which houses 10 medium to large fully operational CNC machines, and associated materials handling systems, as well as a FICEP Academy.

**AceCad Software** was pleased to welcome MP for Streatham and the Shadow Business Secretary, Chuka Umunna, accompanied by the MP for Derby North, Chris Williamson, to its headquarters in Derby. They met with AceCad's General Manager, John Halahan and Sales Manager, Steve Watson, to discuss the difficulties of doing business internationally and the use of its software in the construction industry with particular reference to BIM.

## AROUND THE PRESS

**Construction News**
***14 March 2013***
**Steel choice for college project**
[Royal Greenwich UTC] – The existing steelwork in the warehouse set a precedent for using the material in the teaching block, but it was also an obvious choice because it facilitated a lighter structural frame, says Clarke Nicholls Marcel associate John Matthews. "The ground conditions were poor, so to limit loading on the foundations, the steel option was preferred.

**Construction Manager**
***10 April 2013***
**Building the shape of things to come**
[Leadenhall Building] – British Land says the building's design is unique: rather than having a central core, its perimeter tubular megaframe provides lateral stability. Virtually all of the structural steel will be visible through the glazing when the building is complete.

**Construction News**
***14 March 2013***
**Steel breaks the boundaries**
[20 Fenchurch Street] – "Commercially there are huge benefits in using 4D BIM because problems are identified and solved before reaching site," says Canary Wharf Contractors associate director of construction operations Charlie Paul.

**Building Magazine**
***8 March 2013***
**The £60M prospectus**
[Coventry University Engineering and Computing Building] – Virtually every steel column and beam has been stamped with its structural loading capacity displayed in bright, colourful numbers. "We wanted the building to be the ultimate teaching tool," explains Professor Gerry Ackerman.

**New Civil Engineer**
***11 April 2013***
**Crystal clear thinking pays off**
[Siemens Crystal building, London] – "It's a really clever structure that reduces the amount of steelwork. You have columns that seem like they are twisting but they are not really – they are tapering in different axes at the top and bottom," says Arup lead building service engineer Mark Plummer.

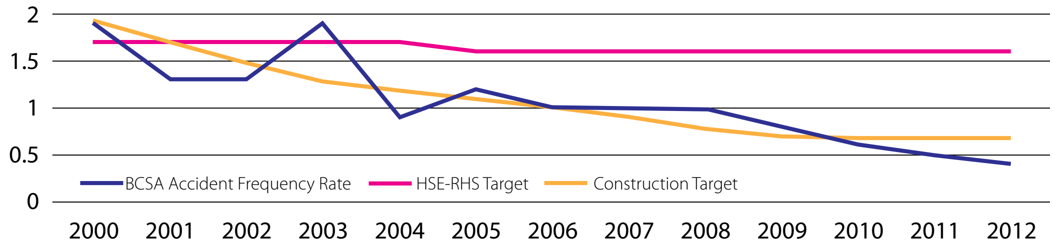
# BCSA accidents reduced by 24%

The accident injury statistics for BCSA members in 2012 has revealed that the number of reportable accidents recorded under Reportable Injuries Diseases and Dangerous Occurrences Regulations (RIDDOR) has decreased by 24% in the last 12 months.

"The 24% reduction is a very good result that demonstrates the industry is committed to improving working practices and procedures," said Pete Walker, BCSA Director of Health, Safety and Training.

"Some of these practices are developed with the BCSA health and safety committee to address the current issues and best practice. They are based on shared experiences and are helping to reduce accidents and injuries."

Statistics for 2012 show there have been no fatal injuries in the year while reportable injuries have all been reduced including the 'slips, trips and falls' category which was reduced by 60%.




# Cellular beams help create development centre

An economical long span floor solution has been installed for the £40M Sainsbury Product Development Centre (PDC) at Ansty Park, Coventry.

The PDC forms an integral part of the new store support centre (SSC) for Sainsburys, which will initially provide a new home for 530 staff re-locating from the existing SSC.

The new SSC provides bespoke research and development facilities, and enables some 1,300 staff to be accommodated. The two-storey structural steelwork PDC provides mock retail space for Sainsburys to develop and test new product lines.

Main contractor for the project was RG Group and ASD Westok supplied the frame's cellular beams, working closely with steelwork contractor H Young Structures. Together, a decision was taken to change the originally conceived 12m × 6m × 12m grid at 6m centres, to the more economical 15m × 15m grid at 6m centres.

Working to a 560mm depth restriction and onerous M&E service integration requirements, Westok designed a cellular beam with elongated cells to meet with the clients' requirements.

ASD Westok Chartered Structural Engineer John Callanan, said: "We're delighted to be providing composite floor beams for yet another Sainsbury's scheme. At Ansty Park, we looked at a considerable number of floor options and cell arrangements for H Young. The Westok beam proved to be the optimum solution, with the continuous string of cells providing the maximum flexibility for future service integration the client required. We also achieved an overall tonnage saving by opting for the longer 15m grid."

# Online steel information resource relaunched

The Steel Construction Institute (SCI) has re-launched Steelbiz, its online library of technical information and resources on every aspect of steel construction. Steelbiz provides access to a wide range of material including: technical guidance, design data, calculation tools, case studies and worked examples.


Three new improvements have been added to Steelbiz;

- A revised dynamic search facility enables users to easily browse resources by subject (such as structural systems) and to further filter their results by type of resource for example standards and regulations or publications.
- An updated library of content including all the latest revisions of SCI's current technical information, most of which is available in PDF format.
- A new user interface and an updated logo to give Steelbiz a refreshed and updated look!

The SCI says Steelbiz continues to provide everything that design engineers need in order to design confidently and safely with steel, with information quality assured and written to the latest Eurocode standards and building regulations.

# Work starts on Bexleyheath makeover

Steel construction will be playing a central role in creating a new civic office and town centre amenities in Bexleyheath, Kent.

Work has recently started on converting and enlarging the former Woolwich Building Society headquarters into the London Borough of Bexley's new HQ.

Having stood empty for more than four years, refurbishment will include the construction of a 2,000m$^2$ two-storey steel framed extension to be erected by Graham Wood Structural.

Once the work is complete in early 2014 and the council has decamped into its new premises, the nearby existing civic centre will be demolished making way for a Tesco store, car park, restaurants and a large open community space.

## Excellent distribution park completed with steel

A new industrial warehouse development, consisting of five units, has been completed at Park Royal in west London.

Known as Central Park, developer Goya Developments said it is the first speculative warehouse project in the UK to offer cutting edge, energy saving technologies to reduce carbon emissions by over 25% as well as achieving BREEAM 'Excellent' ratings to all units.

The steel framed warehouse units were all erected by Caunton Engineering working for main contractor Winvic. Approximately 650t of steel was needed, with 300t of that total being used on the project's largest unit which is 180m long with one single 36m internal span.

"The biggest warehouse actually consists of five units as the large portal framed structure has been sub-divided," said Grenville Griffiths, Caunton Engineering Project Manager. "However, the partitions have removable steel posts so the building could be reconfigured in the future."

All of the warehouses feature internal office space, photovoltaic panels, rainwater harvesting, air source pumps and additional natural roof lighting.

## New design tools for steel sector

Two new design tools have been made available from the steel sector to aid engineers with efficient and economic design of steel framed structures.

A design software tool is now available that calculates the design resistance of beams, columns and hollow sections, to axial compression. The design resistance is calculated in accordance with BS EN 1993-1-1 and the UK National Annex 2.

A similar tool that calculates the design resistance of beams and columns to bending against the major axis is also now available.

The new member design tools are freely available via the *www.steelconstruction.info* website.

To make full use of the tools, the user must select the steel grade, member type, section type, buckling length and choose the shape of the bending moment diagram by selecting an appropriate C1 factor.

# Diary

For SCI events contact Jane Burrell, tel: 01344 636500 email: *education@steel-sci.com*
For BCSA/Tata Steel events register online at *www.steelconstruction.info/Fire_Seminars_2013*

**Thursday 6 June**
**Steel Connection Design**
1 day Bristol

**Tuesday 11 June**
**Fire Engineering**
Beardmore Hotel, Glasgow

**Tuesday 11 June**
**Steel Frame Stability**
1 hour webinar

**Thursday 20 June**
**Fire Engineering**
Novotel Bristol Centre

**Tuesday 9 July**
**Steel and Sustainable Construction**
1 hour webinar

# Stonehenge a sustainability monument

The UK's most famous ancient monument is being transformed by new and improved visitor facilities, with steelwork taking centre stage at the World Heritage site.

Construction work at Stonehenge is progressing apace and by the end of the year a new visitor centre and exhibition gallery will open to the public.

Located at Airman's Corner, 1.5 miles to the west of the current facilities and out of view of the world famous Stones, the new buildings have been sensitively designed to have minimal impact on the World Heritage site.

*Temporary works must remain in place until the entire roof is complete*

Loraine Knowles, Stonehenge Director at English Heritage says: "The construction of the visitor building is just one aspect in transforming what is widely agreed to be an unsatisfactory tourist and cultural experience."

By moving facilities away from the Stones the visitor experience will be improved, as the setting will be more tranquil and dignified. At the same time general views of the site will be enhanced as a section of the nearby A344 road will be closed to traffic and grassed over; traffic being diverted away from the Stones via a new roundabout at Airman's Corner.

> "The centre needed to be light and built on raft foundations so as not to disturb the historic site…"

The overall scheme comprises the visitor centre structures, an ancillary building for staff and back of house operations, a coach park, a car park and the embarkation point for the visitor shuttle to the Stones.

Designed by architectural firm Denton Corker Marshall, the visitor centre will accommodate galleries, a café, a shop, education space and toilets all housed in a pair of single-storey pods sitting beneath a feature undulating canopy roof.

The centre's design is said to be a considered response to a brief that called for a functional and high quality structure which is universally accessible, environmentally sensitive, and at the same time appears light and unimposing.

"The centre needed to be light and built on raft foundations so as not to disturb the historic site, a steel frame was the best solution for this brief," says Angela Dapper, Denton Corker Marshall Project Architect.

"Another consideration was to reduce the mass of the footprint, so we have two pods separated by outdoor circulation areas."

The two 35m × 35m pods have been formed with a steel frame of beams and columns. One of these structures, housing the café and shop, is fully glazed, while the other is clad with SIPS (structural insulated panels).

The glazed north pod gains its structural stability from discreetly positioned cross bracing. No bracing is required in the south pod as the SIPS panels provide the lateral stability, acting as stressed skin diaphragms to transfer lateral loads at roof level to the foundation.

As the south pod will accommodate the centre's exhibition space, a large open column free zone was required; the steel frame has provided this structure with a 17.5m span in places.

Above and sheltering the pods and circulation routes is a gently undulating 35m wide x 80m long canopy roof formed by a grillage of curved and straight 200mm × 100mm box sections supporting curved deck and soffit plywood sheeting. It is supported by more than 300 raking columns fabricated from 100mm × 100mm box sections.

The columns are spaced around a predominantly 7.5m × 5.5m grid, but as Ian Mitchell, S H Structures Design Manager says: "The pattern does look a bit random, but they are in fact set out and tilt to meet the canopy at the point where the soffit tiles meet."

Approximately 100 of these columns are shorter than the others as they are located on the pods' roofs.

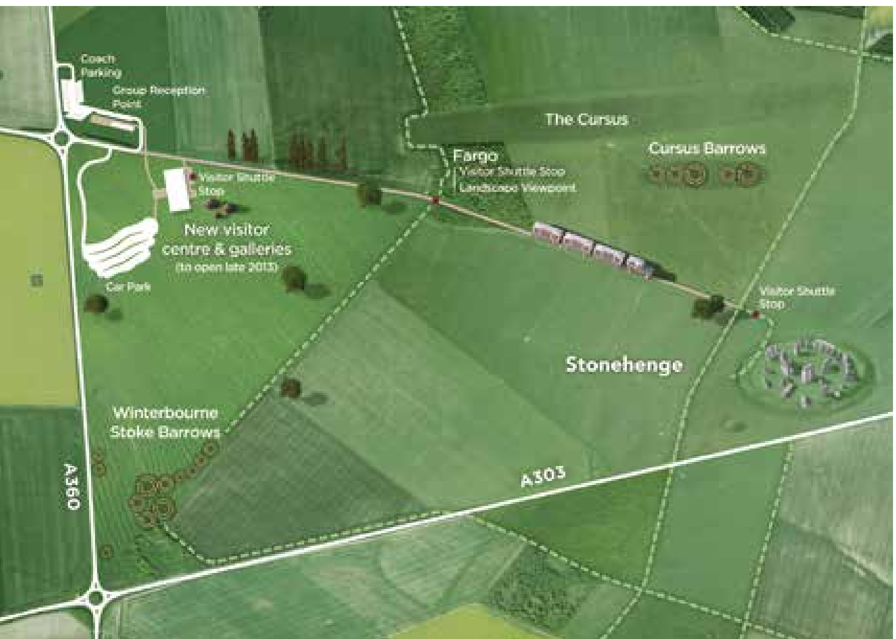
## Sustainability

The visitor centre will have a low carbon footprint and a high BREEAM rating for its sustainable design and construction. It has been built with sensitivity in mind and sits lightly in the landscape. Reversibility – the ability to return the site to its current state - was a fundamental design concept and one in which steel has played an important role. The building will last as long as it needs to but could, if necessary, be dismantled leaving little permanent impact on the historic landscape.

A number of features will be installed to maximise energy efficiency, minimise carbon emissions and pollution, and reduce water consumption. For instance, an open loop ground source heating system will pump water from underground through a heat pump unit which extracts heat energy from it before it is put back into the ground. This will enable the building to be heated and provides some cooling without the need for fossil fuels.

*Ladder sections for the roof are lifted into place*

“These shorter columns provide the canopy with its stability,” says Clare Statton, SKM Project Structural Engineer. “They act as inverted cantilevers, which is achieved by fully welded moment resisting connections to the canopy grillage and pinned connections to the pod roof beams. The perimeter columns, which spring from the foundation, provide minimal contribution to the sway stiffness.”




Erecting the canopy roof has been the most challenging aspect of the steel programme. Because of its size and the fact that it is self supporting (once complete) a large amount of temporary works have been needed.

Scaffolding had been installed to temporarily support the canopy during erection. Once the entire roof and all of the columns were installed the scaffold system was dismantled.

The procedure for erecting the roof involved installing one complete grid line of raking columns, propping each one individually and then lifting the roof members into place.

Steelwork for the canopy roof arrived on site in ‘ladder’ sections formed from RHS boxes, each one measuring 17.5m long. The curved ladder sections were positioned in place on temporary supports which were adjusted to achieve the correct theoretically prescribed shape. Once this shape was achieved, the splices in the ladder trusses were welded together to create the canopy’s undulating form. Infilling between ladder sections was completed by welding small secondary steel pieces into place.

The steel canopy will have a perforated zinc soffit which will admit changing patterns of sun and shade according to the time of year, the idea being to let in more warmth in the winter and more shade in the summer.

The new visitor centre will open at the end of the year. Once up and running the old facilities will be removed and the restoration of the landscape near the Stones will commence, work which will be completed by the summer of 2014.

**FACT FILE**
**Stonehenge Visitor Centre**
**Main client:** English Heritage
**Architect:** Denton Corker Marshall
**Main contractor:** Vinci Construction
**Structural engineer:** Sinclair Knight Merz (SKM)
**Steelwork contractor:** S H Structures
**Steel tonnage:** 200t

# School work in the frame

Using steelwork as the framing material for a school project in south London has helped the team coordinate the programme around students and negotiate site constraints.

*The initial part of the scheme was completed in 2012*

The reconstruction of Prendergast Hilly Fields College forms part of the London Borough of Lewisham's Building Schools for the Future (BSF) programme. One of four schools Costain is building for the programme, this project will be delivered through an £18M design and build contract.

Prendergast Hilly Fields College is said to be one of the most successful community schools in the UK. It operates across two sites, one known as Park Site, which consists of a Grade II listed building (currently being renovated) and the nearby Adelaide Avenue site, which accommodates the majority of the educational facilities and is the location for the steel construction work.

The Adelaide Avenue site previously consisted of four blocks, three of which have now been demolished, making room for three new buildings. A fourth existing structure (block E), accommodating classrooms and a sports hall has been partially demolished, with the sports hall retained and incorporated into the new scheme.

Pupils continued to use block E throughout the construction programme, only ceasing to utilise the classrooms once new blocks were finished, which allowed the students to decamp.

This meant a phased demolition and construction process had to be employed, whereby the partial demolition of block E was only undertaken once two of the three new blocks were completed.

"Coordination around the school's activities was a key driver in choosing steel," says Eddie McKenna, Costain Project Manager. "Steelwork has played a crucial role in keeping the project on schedule.

"Its early procurement meant we were able to start on time, while Caunton's expertise, particularly on the interfaces with the existing structure, has allowed the steel frames to be erected to a strict methodology."

Known as blocks 1, 2 and 3 the new buildings are principally finished in blue brickwork with punched timber windows and curtain walling. They are structurally independent steel braced frames, featuring cross bracing – located in perimeter walls, stairwells and lift shafts - for stability.

Internally, the buildings are constructed from blockwork which is said to provide a robust facility capable of withstanding the heavy foot loads of pupils and staff.

Flexibility was another important consideration when choosing steel as the framing material.

"The teaching areas of the blocks could be reconfigured if the school's needs changed in the future. Partition block work walls and steel columns could easily be removed to create larger classrooms," says Barry Reynolds, HKR Project Architect.

Blocks 1 and 3 were erected in 2011,

*Block 2, the tallest part of the project, takes shape*

while the centrally located block 2 was erected either side of last Christmas. Block 2 wraps around the retained sports hall on two sides and part of this structure infills the space previously occupied by block E's teaching wing.

Block 2 is the highest structure with four levels and contains a single row of classrooms on the upper floors. The L-shaped building's front elevation facing Adelaide Avenue contains the new main entrance and two large dining room/assembly/drama spaces.

Containing slightly different grid patterns, due to their varying classroom sizes, blocks 1 and 3 both have three levels, including ground floor. Block 1 is wider and contains two rows of classrooms separated by a central corridor on every floor, while block 3 accommodates single rows of classes.

All three structural frames form independent standalone blocks, although block 2 does have access into the retained sports hall.

A movement joint across this entrance space means the new build structure is completely isolated from the older existing building.

"The sports hall was built on pad foundations while the new blocks are constructed on piles. Without isolating the structures we would have had a movement issue," explains Scott Lewis, Ramboll Project Engineer.

The overall project is due for completion this August, with the new premises fully open to students for the autumn term.

**FACT FILE**

**Prendergast Hilly Fields College, Lewisham, London**

**Main client:** Lewisham Council
**Architect:** HKR Architects
**Main contractor:** Costain
**Structural engineer:** Ramboll
**Steelwork contractor:** Caunton Engineering
**Steel tonnage:** 400t

*Block 2 and 3 contain a single row of classrooms on each floor and a corridor positioned along one elevation*

## Steel goes up

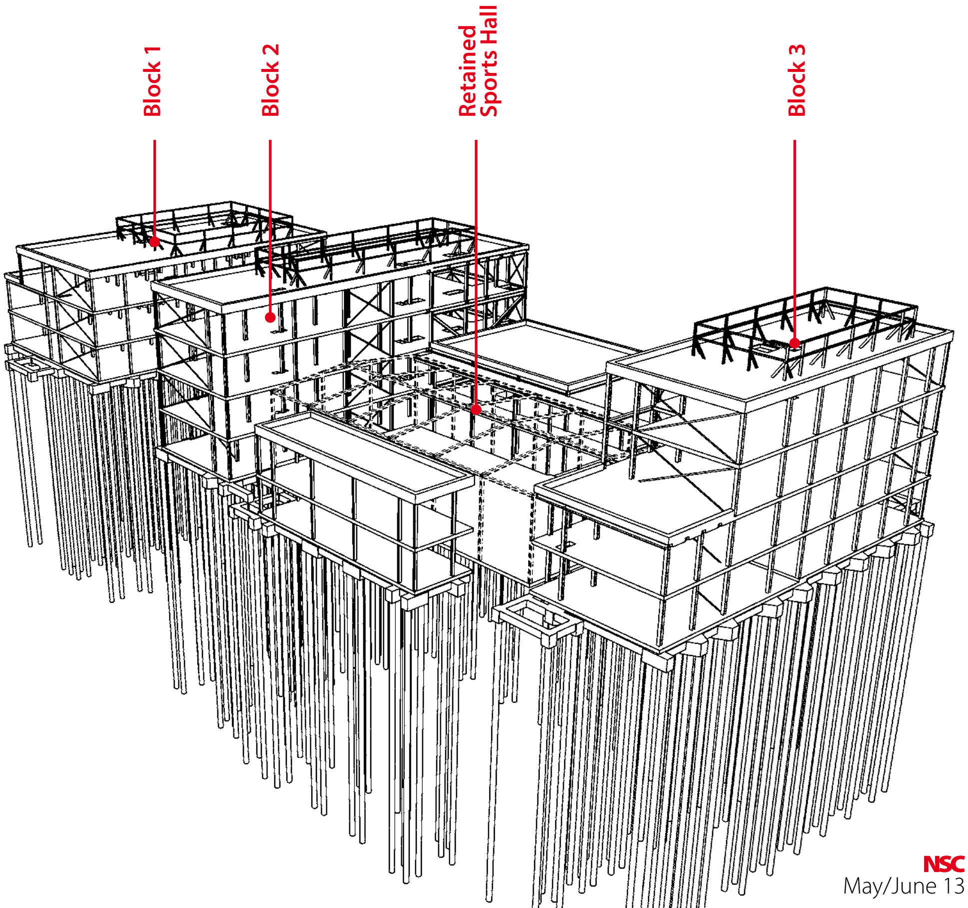
Caunton Engineering erected all of the steelwork using a 50t mobile crane. The company also installed the precast floor planks, a procedure which speeded up the construction programme.

"We erected a couple of grid lines at a time, installed the planks and then moved onto the next area," explains Adrian Downing, Caunton Engineering Project Manager. "The site is very confined with very little available space so it was much quicker for us to do both jobs."

The largest steel element to be erected was a 19m long × 3.8m deep truss (pictured) situated at first floor level in block 2. The large element helps create the open spaces for the halls and entrance area.

The truss was brought to site in small pieces, assembled on the ground and then lifted into place as one large element. "The site's lack of space meant this was the only practical way of installing the truss," adds Mr Downing.

Steelwork has also played its part in making the project cost efficient. Caunton suggested using RHS box section floor beams along all perimeters to support stainless steel angles onto which the cladding is fixed. This design not only proved to be cost efficient, it also helped the cladding contractor complete its installation more quickly.



# BIM needs boost from clients

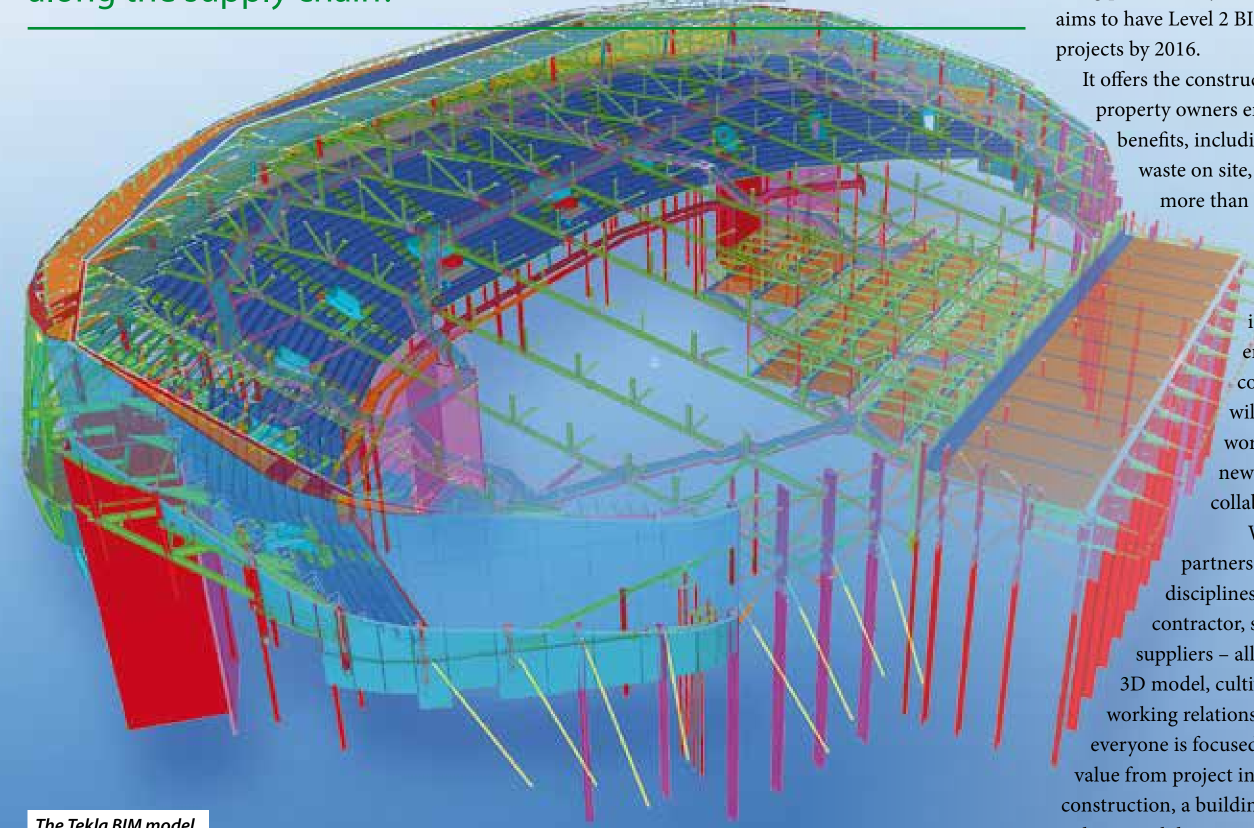
## The steel construction sector may be ahead of the game as far as BIM is concerned, but is the technology being fully utilised all along the supply chain?

BIM [Building Information Modelling] can be described as a data rich process of designing a building collaboratively using one coherent system of computer models that can be passed between the various parts of the supply chain, rather than everyone using their own separate software or drawings with little opportunity for interaction.

BIM is said to be a whole new way of doing things, involving a lot more data sharing among the design team, and it is being promoted by the government which aims to have Level 2 BIM used on all its projects by 2016.

It offers the construction industry and property owners enormous potential benefits, including saving time and waste on site, and involves much more than simply adopting new software. To achieve all the benefits BIM offers, everyone in the architecture, engineering and construction industries will have to learn to work in fundamentally new and more collaborative ways

With BIM, project partners – different design disciplines, the customer, contractor, specialists and suppliers – all use a single, shared 3D model, cultivating collaborative working relationships. This ensures everyone is focused on achieving best value from project inception, through construction, a building's operational life and eventual decommissioning.



*The Tekla BIM model created for the Leeds Arena project*

## The levels of BIM

**Level 0:** This is the use of 2D CAD flies for production information, a process that the majority of design firms have used for many years.

**Level 1:** The increased use of both 2D and 3D information on projects. In term of processes, this level embraces the need for management processes to sit alongside design processes.

**Level 2:** This level requires the production of 3D information models, by all key members of the integrated team. However, these models need not co-exist in a single model. By understanding and utilising BS 1192:2007, designers can ensure that each designer's model progresses in a logical manner before another designer or subcontractor uses it.

**Level 3:** The greatest BIM challenges arise when moving from Level 2 BIM to Level 3 BIM and the perceived 'holy grail' of the single project model. With level 2 resolving the methodology of all the designers working in 3D, the challenge with the single model will not be the collaborative use of the information: it will be harnessing the information in the model so that it is of greater use.

Thanks to early adoption of 3D computer aided design and CNC fabrication, the steel sector has long been ready to fully play its role in the construction industry's move to adoption of BIM. But is the wider industry fully embracing BIM?

Many architectural, structural engineering and steel construction firms have been sharing 3D models for some time, so the concept of BIM is not new.

"It is fair to say that some parts of the industry are more conversant with BIM than others," says Oliver Tyler, Director at Wilkinson Eyre. "We've been creating and sharing 3D models with engineers and steelwork contractors for a long time. However, other parts of the construction industry need to catch up."

A virtual model is the ideal tool for a design team on a construction project, but some parts of the construction supply chain are either still unsure of what BIM is, or are unwilling to invest the necessary time and money.

"Clients need to drive BIM forward," suggests Mr Tyler. "If they demanded a fully coordinated model then everyone would get on board. The model would not just help with the construction programme, it could also be used as a marketing tool for commercial jobs, used by agents to show prospective tenants."

This point of view has been backed up by a recent BIM survey by the Royal Institution of Chartered Surveyors (RICS). Its findings suggested limited demand from clients is standing in the way of BIM being fully implemented.

The results showed that half the industry is still at the thinking stage, with 46% claiming lack of demand from clients is the main obstacle in the way of actually adopting a BIM approach.

Alan Muse, Director of Built Environment Professional Groups at RICS, said: "As an industry, we should be encouraged by the growing traction that BIM is gaining as the route forward for the built environment, but also be prepared to embrace our responsibilities in overcoming identified barriers and issues.

"Education will be critical to initiating the cyclical change needed here – leading to increased practical implementation of BIM, greater recognition of the benefits it can bring, and ultimately heightened demand for its usage."

Less than half of the RICS survey respondents had actually worked on a project where BIM was used in the past 12 months. But over 50% were already investing in BIM training.

Muse said: "These results send a clear message to RICS, government and other industry bodies that collaborative action is required to support the industry in its adoption of BIM.

The call for more BIM awareness, whether that is from clients, contractors or agents, is undoubtedly growing.

Highlighting the importance of BIM, the government recently announced that it would require collaborative 3D BIM on its projects by 2016.

In response to this government announcement the British Constructional Steelwork Association has recently established a BIM working group.

The aim of the group is to develop a simple working definition for Level 2 BIM and identify the software, competence and systems needed to comply with this level.

***"It's fair to say that some parts of the industry are more conversant with BIM than others."***

"BIM is becoming increasingly important and we expect it to be a requirement for all projects within a few years," says Dr David Moore, BCSA Director of Engineering.

The good news for the steel construction industry is that most companies have been using BIM techniques and sharing 3D models for a number of years, putting the sector at the forefront of the BIM revolution.

"Clients will want all of their subcontractors to use the same interactive electronic model, " adds Dr Moore. "This will ultimately lead to a number of benefits. There is an important health and safety issue as there will be fewer opportunities for accidents if everyone is using the same model."

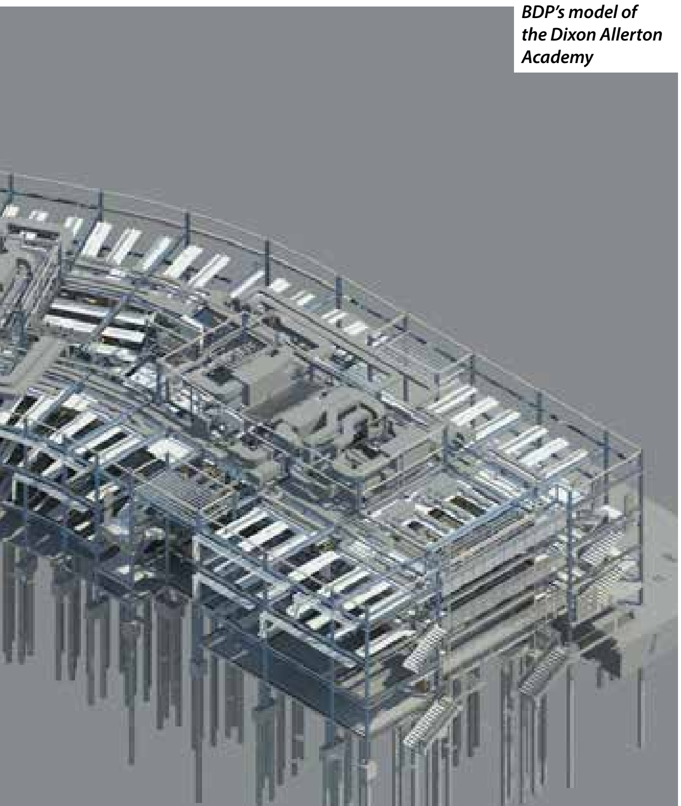
The BCSA group consists of representatives from clients, main contractors, consultants, steelwork contractors and software providers.

Andrew Bellerby, Managing Director of Tekla (UK), says the software required to achieve Level 2 BIM exists, but the main problems are seen as cultural and systems related.

"Although the software for BIM implementation is available, our job at Tekla is to make sure clients are using the software to its full capability.

"The BIM Group is an educational forum, it will also be a good way of promoting the steel industry's innovative ways of working."

BIM is making progress towards being the way to do things on UK projects, as the benefits derived are abundant. By using a ➔



*BDP's model of the Dixon Allerton Academy*

# School project provides BIM flagship

Utilising a BIM approach has paid dividends for the project team working on the new Dixons Allerton Academy in Bradford.

Jonathan Pye, BDP Project Director says that by providing a multi-disciplinary service coupled with a BIM workflow, BDP was able to play to its strengths on the project.

"At an early stage, the structural team in BDP took ownership of the architects' design intent model, which improved communication, and reduced re-draw time, in the translation from architect to engineer often experienced in a 'traditional' 2D CAD process."

As each profession developed its model, clash detection became an integral part of the design process in order to produce coordinated and accurate information in the handover to the various steelwork contractors.

All construction documentation was produced directly from these data rich 3D models; from the architects' planning submission drawings, through schedules and quantities, to detailed design.

Improved communication and co-ordination within the design team offered additional outputs visually, through 4D construction sequencing. The models elements were linked to the construction programme and the 'virtual build' used to aid logistics and safety on site.

"As the build looks towards completion this coming September, the design team is currently investigating the potential value of the model to the end user," sums up Mr Pye.

BIM coordinated set of processes, supported by technology, that add value by creating, managing and sharing the properties of an asset throughout its lifecycle, better outcomes can be guaranteed.

BIM makes possible swift and accurate comparison of different design options, enabling development of more efficient, cost-effective and sustainable solutions.

Projects can be visualised at an early stage, giving owners and operators a clear idea of design intent and allowing them to modify the design to achieve the outcomes they want. Time savings of up to 50%, can be achieved by agreeing the design concept early in project development, but more importantly design issues are detected and resolved sooner in the design process when their impact on programme and cost is less.

Further on in the process exact quantity take-offs mean that materials are not over-ordered, and the integrated 3D model gives great opportunities to increase off-site fabrication in other areas of the supply chain, such as the M&E installation.

BIM is the future for the construction industry and the steel construction sector is already there; it just remains to be seen when that future is fully embraced.

# Premier project

The design and detailing of Liverpool One's recently opened steel framed Premier Inn was developed with the aid of computer software.

Structural engineers Curtins used RAM Structural Systems software to design an economical frame that had the ability to accommodate the dimensional restrictions of featured glazing, finishes and M&E services. During the design development period, in order to provide high quality, visually aesthetic exposed steelwork connections to satisfy the architectural criteria, Curtins with the assistance of the steelwork contractor EvadX, produced full scale prototypes.

"Advantage was taken of our expertise in BIM during the tender and construction stage where we generated a 3D model using Revit to integrate the architectural package within the structural model. This accelerated the review and coordination process," explains Dave Jones, Curtins Consulting Engineer.

# BIM approach working at Walkie Talkie

The prestigious City of London project 20 Fenchurch Street (dubbed the Walkie Talkie) is said to be the first job in the UK to take the BIM approach a step further by using a 4D model.

Main contractor Canary Wharf Contractors (CWC) says the 4D model has allowed it to micro manage the job throughout and to continuously inform the project's design team and specialist contractors to make sure they were happy with the plan and the demanding programme.

"The complexity of the job warranted a 3D model and using BIM made it easier for contractors to understand the challenges," says Charlie Paul, CWC Associate Director.

"By upgrading to a 4D model we were able to tackle construction issues virtually, so that they did not arise on site. It also gave us an accurate timeline of interfaces. By studying historical weather patterns we have even predicted the entire project right up to completion – including the steel erection, the cladding and the fit out."

# ASD Westok Plate Beam...

new design software, developed & supported by CSC

Westok Plate Beam can now be specified along with Westok Cellular Beams + USFB's

ASD metal services
klöckner & co multi metal distribution

www.asdwestok.com

AD1278 09/12

Tel: 0113 205 5270 Fax: 0113 205 5271 Email: info@asdwestok.co.uk
ASD Westok, Valley Farm Way, Stourton, Leeds LS10 1SE

# Steel pumps new heart into Redcar

A steel framed leisure, business and civic complex will help to rejuvenate Redcar town centre. Martin Cooper reports from the town where steel still runs in the veins.

The northeastern coastal town of Redcar is in the midst of a £75M regeneration programme that will improve the quality of life and job opportunities for local people and businesses.

Redcar has a long association with steelmaking and is the location for one of the UK's remaining steelworks, so it is apt that steel construction is playing a pivotal role in most of the regeneration building schemes.

The overall programme includes the £8.3M Hub; a 3,200m² steel framed building that will provide offices, workshops, studios and public spaces for the town's burgeoning creative industries sector.

Recently opened and located along the revamped promenade is the steel framed vertical pier, an eye catching architectural tower with a viewing platform on top.

The most important part of the programme is known as the Redcar Leisure and Community Heart, a brand new multi use facility which will include a six lane, 25m long swimming pool, a fitness suite and gym, a dance hall and performance space, a sports hall, a business enterprise centre with offices and meeting rooms for both public and civic use, a council debating chamber, a registry office and a car park.

To construct a facility with so many uses, steelwork was the only serious option as the framing material.

"There are many elements with long spans, such as the pool, sports centre and even the marriage room; steel provided the best option for these areas with column free spaces," says Colin Riches, Buro Happold Project Engineer. "There is also a basement car park and consequently the grid patterns change above ground level; steel offered the most efficient way of managing the many changing column positions."

Although the complex is one large conjoined steel frame, structurally it has been divided into three parts by movement joints because the building is so long.

The largest of the three parts is the four-storey business/civic centre and the attached two-storey debating chamber and registry office. This section also includes the main entrance and atrium which is next to an outdoor public plaza accessed via a new pedestrian boulevard.

Sustainability and cost efficiency have played key roles in the design of the complex, particularly the business/civic area. Natural ventilation is achieved within this part of the project via a central lightwell and by utilising thermal mass.

The four-storey steel frame features Slimfor beams supporting precast planks. "The planks remain exposed, thereby helping to cool the building," says Mr Riches. "The bottom flanges of the beams are also left exposed as an architectural feature."

Architectural steelwork is in abundance around the plaza as a series of CHS columns rings the main entrance foyer. These steel members, along with the connected and supporting tie rod bracing, were chosen for their aesthetic value

A fairly regimented column grid exists in the office block, but elsewhere there are a number of changing patterns due to the amount of large open areas. The basement car park has a 12m × 7m grid, but above ground floor level a number of transfer structures have been incorporated into the steel frame to accommodate the changing layout.

The only area of the complex without a basement car park is the pool area, as here the basement is occupied by associated

*Long spans are essential for the swimming pool*

*Feature CHS columns separate the office zone from the main entrance foyer*

**FACT FILE**
**Redcar Leisure and Community Heart**
**Main client:** Redcar & Cleveland Borough Council
**Architect:** S & P Architects
**Main contractor:** Willmott Dixon
**Structural engineer:** Buro Happold
**Steelwork contractor:** Hambleton Steel
**Steel tonnage:** 1,250t
**Project value:** 31M

# Steel supports the local economy

Using local companies and locally sourced materials has been a key requirement for the project. Hambleton Steel, the steelwork contractor, is based a few miles south at Richmond in North Yorkshire, while much of the 1,250t of steel used on the job has been processed at Tata Steel's Teesside Beam Mill at Lackenby. The remaining circular section beams have been processed at the Tata Steel facility in Hartlepool.

"It fills me with pride to see Teesside steel helping the development to take shape," says Councillor Mark Hannon, Cabinet Member for Economic Development. "As well as supporting our local steel industry the Council is working closely with our contractor, Willmott Dixon, to support other local suppliers and jobs."

The steel frame consists of 4,500 steel beams and columns held in place with 41,000 bolts.

**Thermal mass is the ability of a building's internal fabric to absorb excess heat, store it and either expel it or use it at a later time.**

Did you know ...

- A steel frame can achieve thermal mass just as effectively as a concrete frame, as it's the concrete floor that provides the mass.
- It is only the first 75-100mm of exposed soffit that absorbs excess heat on a diurnal cycle. Exceeding this thickness has no value in mobilising thermal mass and will simply increase to the weight of the superstructure.
- The first 25mm of concrete does most of the work, with 100mm being the optimum thickness.

water treatment and plant.

"The swimming pool dictates the top end of the project," explains Chris Fenwick, Willmott Dixon Senior Construction Manager. "As well as having a smaller basement, this part of the complex is slightly higher as the site slopes."

Fabsec cellular beams span the 20m wide pool hall, which not only houses a 25m long pool, but also a smaller leisure pool with an adjustable floor and a surf simulator zone.

"Cellular beams were used not just to accommodate services, but also because they are efficient and cost effective solution," says Mike Dixon, Hambleton Steel Operations Director.

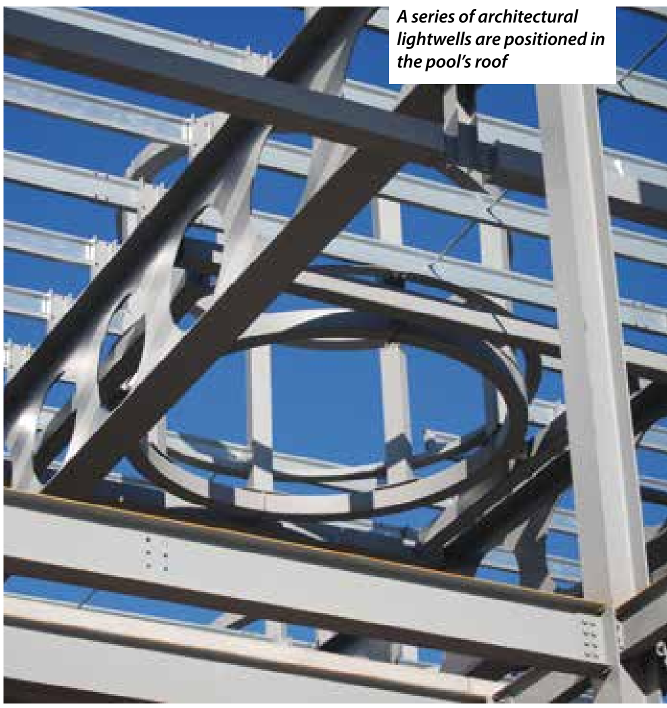
The roof of the pool hall incorporates a series of circular lightwells to allow natural light into the building. The lightwells are formed with RHS circular beams which were bent into shape by specialist steel bending firms Angle Ring and Barnshaw Section Benders.

The lightwells are also tilted towards the north and this added to the challenging detailing that was required at both Hambleton's fabrication yard and at the bending facility.

Because of the tight and confined site, Hambleton has erected the steelwork in a sequential manner, gradually using up the entire footprint. The final element of the job to be completed was the sports hall, which was erected with the aid of a mobile crane positioned on an area that will become the ramp into the underground car park.

To create the large 35m × 35m sports hall three trusses are positioned at roof level. The middle truss is 1500mm deep and supports a moveable partition which can divide the hall in half. Either side of this truss, two slightly shallower box section trusses are positioned at quarter points along the hall's length.

The Redcar Leisure and Community Heart is scheduled for completion in spring 2014.



*A series of architectural lightwells are positioned in the pool's roof*

# Steel creates access for all

Prefabricated steel elements have played a key role in a station access improvement programme that was successfully completed during a 51-hour weekend possession.

Part of Network Rail's £370M Access for All programme, steelwork installation has been successfully completed at Thornton Heath station in the London Borough of Croydon, south London.

Access for All is a major scheme to improve accessibility at 160 train stations around the UK and involves installing lifts, ramps and associated bridgeworks so passengers do not have to rely solely on stairs. Referred to as non-discriminatory access solutions, the programme also includes constructing longer platforms and more accessible toilets.

The works at Thornton Heath station involved Billington Structures, working on behalf of main contractor Spencer Group, installing three bridge spans, three lift shafts and two staircases during a continuous 51-hour weekend possession.

"With these sort of projects it's all about reducing the amount of time needed for rail possessions," says Derek Dowall, Spencer Group Project Manager. "Steelwork helps as it can be prefabricated into large elements that can be brought to site and quickly lifted and bolted into place."

Before the possession and steel erection process got under way, Spencer Group had been on site for four months completing the enabling works.

"We had everything set up on the Thursday so we were ready to go the moment we took possession of the track on Friday night at 9pm," adds Mr Dowall.

The entire erection procedure was completed using a single 500t capacity mobile crane, positioned in a car park adjacent to the station. All of the steel elements were prefabricated by Billington Structures and fitted out entirely. This meant they could be installed once on site as completed units with no follow-on trades required.

"Taking into consideration the time restraints we would be under during the possession we carried out a trial erection at our depot in Yate, Bristol," says Alan Dutton, Billington Structures Project Manager. "This was an ideal opportunity to identify any potential problem areas before the live installation and to familiarise the installation team with the varying steelwork elements."

Despite untimely weather conditions including strong winds and snow, the Billington Structures project team remained undeterred. When the weather abated the team continued unaffected for the rest of the possession.

*"We had everything set up on the Thursday so we were ready to go the moment we took possession of the track..."*

"The job was a significant undertaking but once the wind eventually dropped we were able to progress. However there were moments when I thought we were going to be beaten by the weather but the guys on site were excellent and showed their expertise," explains Mr Dowall.

Once supporting columns were in place, Billington Structures initially erected the two bridge elements that span the four railway lines. These two identical elements weighed 16t each and were 15.5m long.

Fabricated from box sections with crossbeam columns, the 3m wide bridge spans have curved cellular beams forming the roof. The bridge spans arrived on site as completed elements; glazed, clad, with steel flooring installed and fully painted.

Bringing in fully prefabricated steel sections not only led to a speedier construction programme but also eliminated the need for a number of other on site follow on trades, it most importantly meant that as soon as the 51-hour possession was over the bridges were open for passenger use.

The final steelwork to be erected on the Monday morning was the third bridge span. This section was slightly heavier (16t) and longer (16m long) than the other two spans, and connecting the main bridge with the station building, forming the upright part of an overall T-shaped bridge configuration.

Part of Billington's overall works contract involved the removal of two existing staircases. These could not be removed until the bridge was installed and deemed fit for passengers to use.

"Should we have encountered any problems with the final bridge span the existing stairs would have remained in place as passengers wouldn't have had any access to the platforms," says Mr Dutton. "However, as predicted, the final section fitted exactly and the lift and installation went as planned."

During the programme Billington also installed two prefabricated staircases, each one weighing 12t and connected these to the bridge spans.

Three steel framed lift shafts were also lifted into place. These arrived on site as 12m high lattice frames formed from box sections. The lift shafts were the only elements to be installed during the possession which were not ready for use on the Monday morning.

Once the shafts were erected they needed to be clad with brickwork before lifts were installed. The overall contract, which also includes lengthening the station platforms, is due to be completed in July.

**FACT FILE**
**Thornton Heath Station, London**
**Main client:** Network Rail
**Main contractor:** Spencer Group
**Structural engineer:** Spencer Group
**Steelwork contractor:** Billington Structures
**Steel tonnage:** 130t

*Steel members are craned into position over rail lines*

*Bolting steel elements*

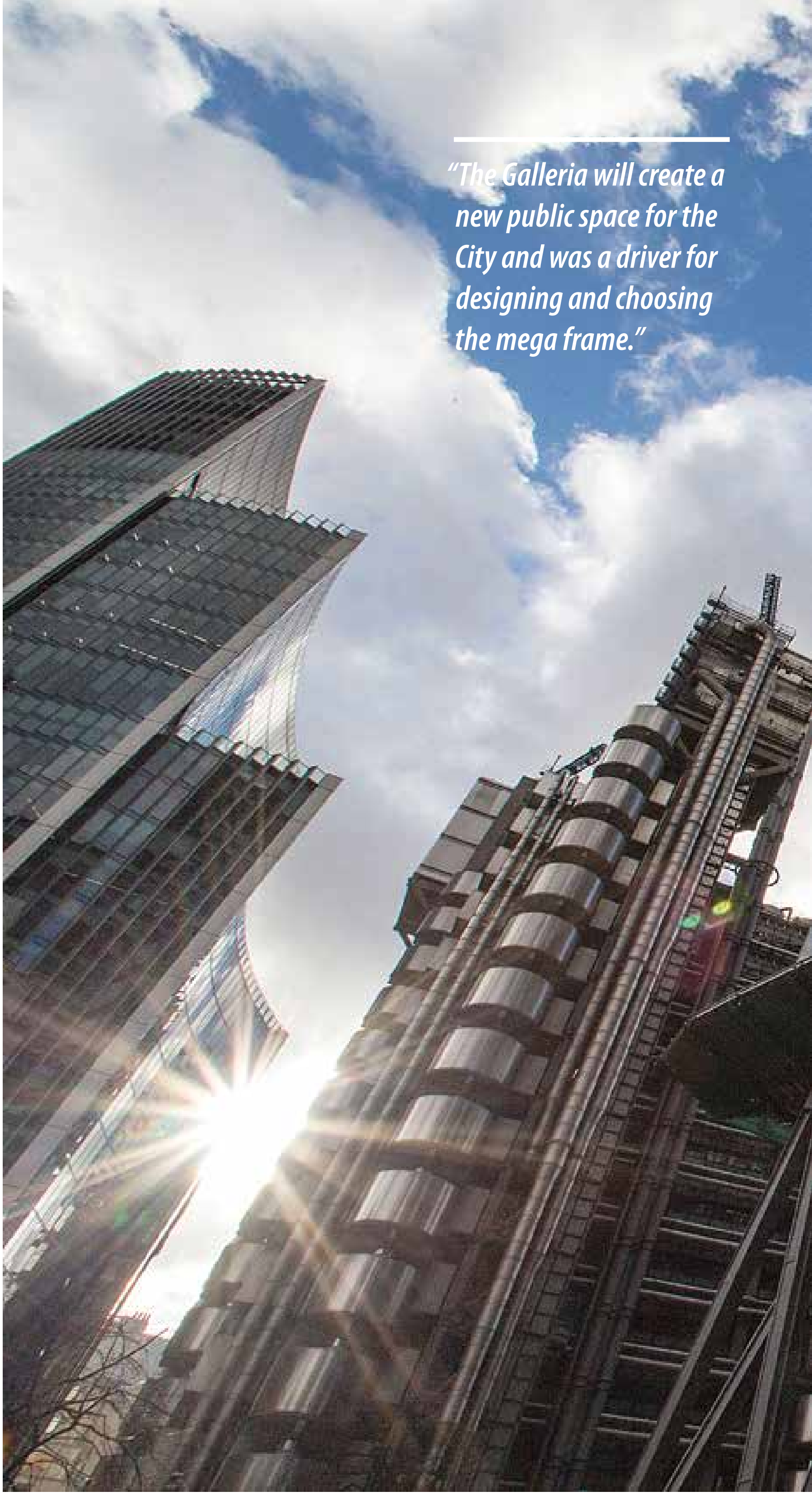

*Above: A large bridge section is lifted into place*

*Left: Using prefabricated steelwork ensured the job was completed on schedule*

# City icon showcases steel

With its unique shape and complex steel design, the Leadenhall Building is set to become a City of London landmark, reports Martin Cooper.

*The Leadenhall Building's stability is derived from the perimeter megaframe*




**FACT FILE**
Leadenhall Building, London
**Main Client:** British Land
**Architect:** Rogers Stirk Harbour + Partners
**Main contractor:** Laing O'Rourke
**Structural engineer:** Arup
**Steelwork contractor:** Severfield-Watson Structures
**Steel tonnage:** 18,000t

When it comes to tall iconic buildings the City of London and its environs may well have more than any other European capital. The 'square mile' has been evolving radically over the last few decades and plans are afoot for even more grandiose structures to enhance its skyline.

One of the most challenging structures to be undertaken so far is the Leadenhall Building, also known as the 'Cheesegrater'.

The 225m tall building will provide 56,000m$^2$ of prime office space over 42 floors, housed in a tapering, perimeter braced diagrid structure.

"The project is uniquely complex," comments Andy Butler, Laing O'Rourke Project Director. "Architecturally the structural steel frame is exposed, and because of the building's shape there are extremely tight tolerances to overcome."

Its distinctive triangular wedge shape was developed by architect Rogers Stirk Harbour + Partners in response to concerns about the position of the tower behind St Paul's Cathedral when viewed from Fleet Street.

As well as having a unique structural shape, the building features provision for highly flexible and open plan office space, and a steelwork design that incorporates architectural detailing of the highest quality.

Maximising the large 16m × 10.5m column grid, all of the lifts, stairs and toilets are housed in an adjoining north core structure (see box over page) that is connected to the offices by a relatively narrow linking section of floor.

For the offices this creates long span flexible spaces, as only six internal columns are needed on the largest lower levels.

Because of the building's shape each floor is 750mm narrower than the one below, and the typical build up within each 4m storey consists of a 150mm deep concrete slab over 700mm deep fabricated beams. For efficiency, the 2.75mm high structural void of the building is formed from cellular beams with openings to accept services.

## Prefabricated nodes

There are 11 different types of nodes with each type having various sub-variants according to the forces passing through the joint. Most nodes accommodate six members, although some have up to eight steel sections to connect.

Using prefabricated nodes has eliminated the need for any complex onsite welding as all of the challenging work was completed at Severfield-Watson's facility. Even so, some nodes took up to 600 man hours to fabricate.

Alex Harper, Severfield-Watson Structures' Project Director, says: "The nodes were delivered to site as complete pieces and then bolted into place, this was made complex by the massive scale of the components and the bolts together with the difficult access. However, using large prefabricated pieces with bolted splices was a quick and efficient method."

The nodes' bolts are high strength, threaded pre-tensioned bars up to 76mm in diameter. The connections are made within the profile of the members and transfer their pre stress to the members' ends via plated bolt boxes situated between the flanges of the main steelwork beams and columns.

*The yellow steelwork north core houses the lifts and service risers*

The building's triangulated geometry is formed by what is known as the mega frame. This expressed steelwork is positioned outside of the structure's cladding and is divided into eight mega levels. These are 28m high and each contains seven floors, with the exception of the first, which has five floors.

The middle six mega levels contain office floors, while the uppermost accommodates a four-storey plant and generator zone called the 'attic'.

The building's ground floor is known as the Galleria, a largely open and landscaped space which will be open to the public. Two hanging banks of escalators within the Galleria will connect Leadenhall Street to the building's main entrances and lift lobbies at the first and second floor levels.

The third and fourth floor levels are suspended within the space of the Galleria, below the level 5 structure, which is the first level that occupies the building's full floor plate.

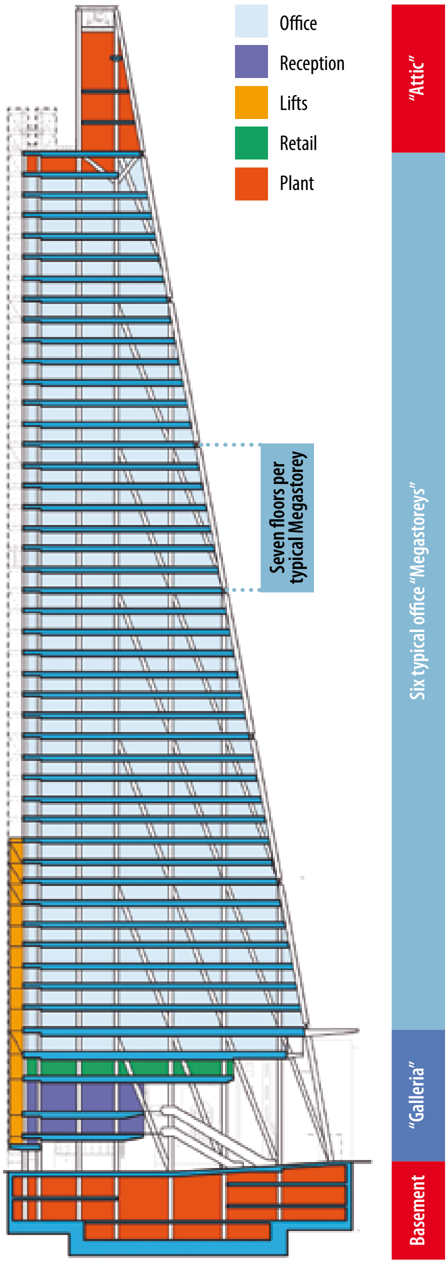
Level 5 also projects through the south side of the building to become a 10m cantilevering wind canopy over Leadenhall Street.

"The Galleria will create a new public space for the City and was a driver for designing and choosing the mega frame," explains Damian Eley, Arup Associate Director.

The mega frame allows the structure to have a large open ground floor, but to compensate for the lack of lateral support the steel columns have been stiffened in this area.

"The columns landing at ground floor are twin webbed which has been done very subtly as they're architectural feature elements," says Mr Eley. "The webs taper outwards in the middle of the section and then back to accommodate the bolted connection,"

All of the steelwork erection has been completed via the project's four tower cranes, with the exception of the 23m high Galleria columns which had to be installed by a mobile crane.





*The completed building will be a new City icon*

Design wise the greatest challenge for the team was how to connect the steel members in a practical way that also worked aesthetically, as all the steelwork will remain in full view.

Typically, six elements come together at each joint in a variety of angles within the mega frame, and the connections transfer forces of up to 6,000t in at least three different directions simultaneously.

The solution was to design large 16-20t nodes (see box, previous page), typically measuring 6m × 3m, which connect straight mega frame members via pre-stressed bolted connections. The nodes provide the geometrically complex transitions between the different elements through welded joints between carefully orientated plates.

Stability for the mega frame presented another structural challenge. Because the seven storey mega frame modules are so big the columns require a secondary stability system. This has taken the form of chevron or K-bracing panels, located in the northernmost bays of the east and west faces, the end bays of the north faces and around the smaller fire fighting cores which are positioned in the office zones.

The steel erection programme also encountered a stability challenge. With no central core to provide the steel frame with support during the construction phase, a steel braced core (called the 'strong box') was erected in the middle of the frame. This had to resist not only wind loads but the huge loads from the tower cranes.

This temporary structure allowed the steelwork to be constructed around it, and provided stability before each level was self-supporting via the external mega frame columns. The temporary works extend to a height of 14 levels and were dismantled and reused several times during the construction programme.

Because of the building's shape it has an inherent tendency to lean towards the north by as much as 160mm at the top.

This has been corrected during the erection by a process dubbed 'active alignment' in which the diagonal mega frame members on two elevations are subsequently shortened so as to bring the building back into its correct position.

The readjusting of the structure is done three mega levels below the erectors and involves the removal of sacrificial shims that were added during the erection process.

The Leadenhall Building is currently on schedule to meet its May 2014 completion date.

## North core

Distinguishable by its yellow painted steelwork, the north core structure contains the passenger lifts, toilets and most of the service risers as well as on-floor plant in a slender frame which connects back to the main mega frame on every floor level.

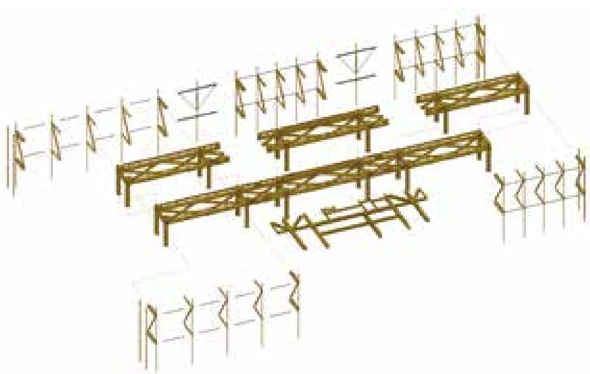
For speed and ease of construction most of the components for the core were prefabricated into 'tables', three for each level.

Steelwork for each 'table ' consists of a floor level and attached columns. Once on site the tables were craned into position and fitted together like Lego bricks.

To speed up the construction programme the tables consisted of much more than just steelwork "Once fabricated they were transported to one of our factories where they were fitted with primary M&E components and precast concrete floors," explains Andy Butler, Laing O'Rourke Project Director. "Each table then weighed 40t when it arrived on site to be lifted into place.

"This eliminated the need for many follow on trades to work at height later in the programme."

On the north elevation, the primary beams, columns and cladding of the core form a backdrop to the 20 passenger lifts and two goods lifts, which travel up to 200m-high within cantilevered suspended glass shafts.



# The use of nodes in the Leadenhall Building

Dr Richard Henderson (SCI)

The arrangement of the nodes is driven by the basic geometry of the frame (the width of the members and the angles between them) and by the architectural requirement to make the connections within the envelope of the members. Some of the heaviest columns are in the tapering side elevation where the columns extend over the full-height of the building and carry over 50 MN. These elements are in section a box with inset webs. The inclined members, some of which are in tension because of the massing of the building, carry much lighter loads than the vertical members. They are an I section with the web plate aligned with the outer web of the column (See figure 1).

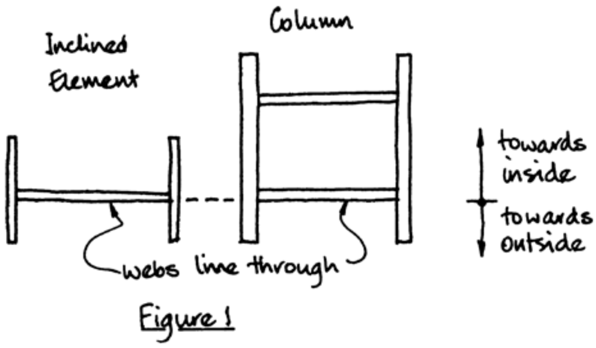


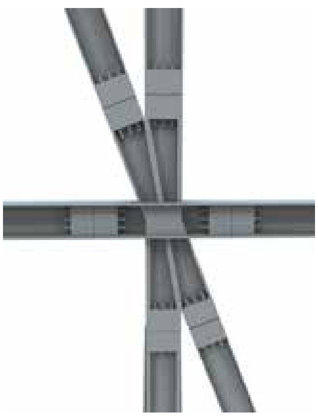

Figure 1

Within the nodes the web plate is effectively a continuous plate. Out of plane forces at changes in direction of the flanges are carried by stiffeners and cover plates welded to the toes of the flanges. These also form the bolt boxes at the ends of the legs of the nodes.

The mega frame is designed as rigid-jointed and, to assure the columns have continuity of stiffness through the joint, the mating faces of the end-plates are required always to be in positive contact over their full area. Thus, there is no reduction of stiffness under applied bending moment as a result of loss of contact over part of the end plate due to opening of the joint. The end plates are machined to ensure the surfaces mate effectively. Bolts were tensioned simultaneously using hydraulic bolt tensioners. The bolts are Grade 10.9 bars threaded at each end with a maximum tension in some of 2MN.

The joints were checked by producing an interaction diagram for biaxial moment and axial force similar to that for a concrete column. For the given bolt pre-stress, points representing any design combination of axial force and bending moments were shown always to lie inside the "failure" envelope, indicating no joint opening would occur.

To remove the shims in the active alignment process, the joint in an inclined element was opened by slackening off the bolts, or by jacking apart where the element was in compression. In this case, two pairs of angles were bolted to the inclined column on either side of the mating end plates. Four jacks were positioned between the projecting angles outside the envelope of the members. When the force between the mating surfaces was relieved, comb packs could be removed to shorten the member by the required amount.



# Steel shines in 'Granite City'

Criteria such as the size, shape, multiple uses and a constrained site all lead to a steel framed solution for a community health centre in Aberdeen.

*The facility will centralise many of Aberdeen's healthcare services*

**FACT FILE**
**Aberdeen Community Health and Care Village**
**Main client:** Hub North Scotland
**Architect:** JM Architects
**Main contractor:** Miller Construction
**Structural engineer:** Fairhurst
**Steelwork contractor:** BHC
**Steel tonnage:** 850t

A wide range of health care services in Aberdeen are being brought together within one large city centre building. Known as the Community Health and Care Village, it will accommodate a range of services in an accessible location to support people who will be able to remain independent within their own communities.

Described as a hospital without beds, the centre will include departments for minor surgery, dentistry, radiology, sexual health services, physiotherapy, dietetics, speech and language therapy, as well as careers advice and information.

With such a variety of uses to be accommodated within a single highly flexible, three level 17,251m$^2$ structure, steelwork was always going to be the framing material of choice.

"The structural grid pattern is very irregular because of the different sized surgeries and waiting rooms," explains Jim Hanna, Miller Construction Senior Project Manager. "While in the basement there is a car park which has a unique grid layout."

Framing the building with any other material would have been problematical, not just because of the structure's complicated internal layout, but also because the external elevations feature a number of architectural curves.

The construction site is also surrounded by busy roads and has very little space for materials storage. Deliveries to the project have to be made on a just in time basis, which is something ideally suited to steelwork which can be unloaded and erected immediately. Access to the site is also restricted, and delivery loads are limited to a maximum length of 12m.

"As well as the design issues which pointed us towards the use of structural steelwork, the material seems to be the framing material of choice across Aberdeen. Contractors prefer it and have a lot of experience with it," explains Kieron Browne, Fairhurst Project Engineer.

Because of the nature of the intended usages within the structure, such as clinical operations, vibration was an important design consideration and the stringent vibration standard required for hospitals had to be met. Compliance of the steel floor plate was demonstrated using the methodology to calculate vibration response given in SCI's guide P354.

Construction started on site during the summer of 2012. Main contractor Miller Construction had some demolition work to carry out, although most of the site had previously been cleared and was being used as a car park.

The site was piled and the basement car park, which occupies approximately half of the building's footprint, was excavated to a depth of 5m. A large concrete retaining wall was also installed across the site, separating the deeper car park zone from the half of the building without a subterranean level.

Successful coordination between various trades is crucial to project delivery, and steelwork contractor BHC liaised closely with the groundworks team during the initial stages of the steel erection programme.

"Work on the basement was on-going when we started the steel programme," says Bobby McCormick, BHC Project Manager. "This tied up half the site and meant we had to phase our work around the groundworks."

As steel erection progressed the available onsite space quickly disappeared, and this meant only one mobile crane could be

*North elevation*

The steel structure wraps around a retained building once used as a granary

accommodated. Early in the programme BHC used a 25t capacity unit to erect the steel. This had to be upgraded to an 80 tonner later in the programme when a longer reach and capacity was needed for off loading and erection.

"Early on we had the crane positioned on ground level, but for the second half of our programme a bigger crane was needed as it had to be located in the basement," says Mr McCormick.

As well as the steelwork BHC also installed steel framed lift cores, precast stairs and metal decking.

The initial part of the steel erection involved the construction of a ground floor and first floor accommodating consultation rooms and a second floor which consists of office space and plant areas.

This segment of the health village wraps around and connects to a retained Nineteenth Century granary building. Having been renovated, the building is currently being used as the project site office and has been earmarked as a possible extension for the health facility.

Works for the project are due for completion by the end of 2013.

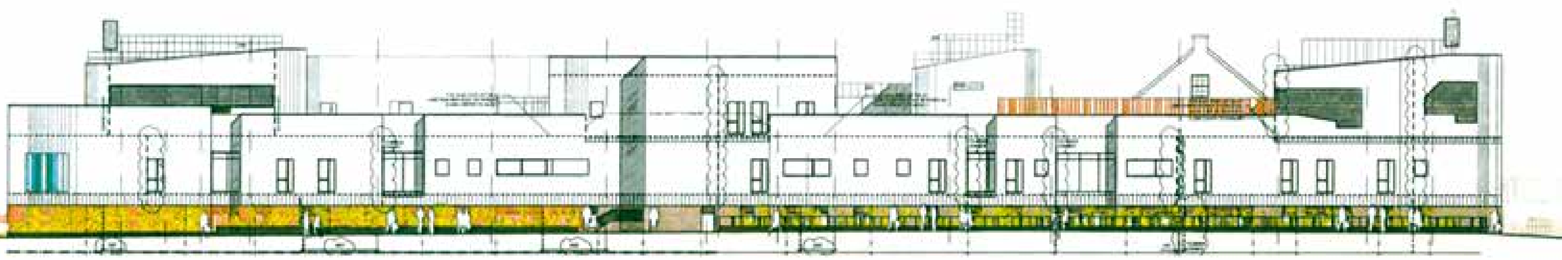
## Transparent design in the frame

The centre is formed with a steel frame which gains its stability from braced lift cores and K-bracing located in partition walls and above perimeter windows.

The grid is highly irregular, based loosely around a 7.5m × 10m pattern in the basement car park, and then changing above to 7m x 6m for the surgeries and offices. A number of transfer structures are located above the car park to accommodate the larger open plan courtyards and atrium.

"Steelwork helps create the shape and the various complex elements and areas within the building," says Graham Miller, JM Architects Project Architect. "The concept behind the project is for a village scenario, with the different services arranged around open courtyards and a large main entrance with an atrium."

Four internal courtyards act as large lightwells, allowing natural daylight to penetrate the middle of the building. Transparency within the centre is achieved with an abundant use of glazed partitions and fully glazed footbridges which span the open courtyards.



South elevation

# Crane factory lifts Killarney economy

Extremely tight deflections are being accommodated within a large portal framed structure designed for a world renowned manufacturing company in Ireland's County Kerry, as Martin Cooper reports.

*The facility is 168m long*

**FACT FILE**
**Liebherr Container Cranes factory, Killarney, Republic of Ireland**
**Main client:** Liebherr Group
**Architect:** Gottstein Architects
**Main contractor:** Walls Construction
**Structural engineer:** Brunner Consulting Engineers
**Steelwork contractor:** SIAC Butlers Steel
**Steel tonnage:** 3,000t

Since 1958 the German engineering company Liebherr has been manufacturing cranes at its Killarney facility in the south west of Ireland.

Employing more than 600 people, it has become an essential cog in the local economy and the firm is believed to be the longest established multinational in the Republic of Ireland.

Today the factory specialises in the manufacture and worldwide distribution of container cranes, producing a range that includes rail mounted quayside cranes, rubber tyre gantry cranes and straddle carriers.

Innovation and development are the lifeblood of any successful company and Liebherr is no exception. In order to stay ahead of the game and remain competitive the company has decided that it must increase capacity and to facilitate this a new 16,500m$^2$ production building will be completed this summer.

Work on the project started last year on a plot that is adjacent to an existing fabrication hall. Most of the site's footprint was formerly part of a golf course and early works included levelling the ground, dewatering and installing pad foundations with sockets for portal columns.

Fabrication of the steelwork commenced at SIAC Butlers Steel's workshop in Portarlington in late October 2012 and, in order to facilitate the tight construction schedule, was completed within 12 weeks.

The erection of the main steel frame of the building began in January, and saw 3,000t of structural steelwork lifted and bolted into place in just 11 weeks by SIAC Butlers Steel.

"The first week of the steel erection programme was virtually wiped out due to the windy weather," says Cathal Healy, Walls Construction Project Manager. "However, SIAC worked extremely diligently and made up for the lost time, completing the steelwork on schedule."

The three span portal framed production hall measures 168m long × 98m wide × 21m high.

"This is a large open plan production facility constructed along similar lines to a distribution warehouse, the difference however is the frame needs to accommodate large internal working cranes," explains Mr Healy. "A steel frame is the best solution for this type of structure."

Constructed in 12m bays, the steel frames' columns weigh in at a hefty 11t each, except the ends of the structure where columns, weighing 16t each were required. These heavier sections provide sway stability to the portal frame building.

The heavy column sections are required to resist crane loadings and limit deflection at eaves to acceptable levels. The columns are founded in 1.6m deep sockets, which were later infilled with concrete and each socket sits on a pad foundation measuring 7m × 6m × 1,200mm deep.

This methodology of using column sockets is the usual way Liebherr factories are constructed all over the world. The project design team also utilised this technique as a way of increasing efficiency.

"This method gives the structural frame a partial moment connection at the base, a similar connection using a pin or holding down bolts would have required much


*Each span accommodates a double row of crane beams*

larger steel members and connection sizes," says Peter Brunner of Brunner Consulting Engineers.

Each of the three portal spans has to support an overhead gantry crane, with the mid span having a 100t crane capacity and the outer spans having 90t capacities. Adding to the loading exerted on the steel frame, each span also has to support wall travelling cranes.

"This is a very robust and heavyweight frame," says David Delaney, SIAC Butlers Steel Project Manager. "Consequently the steelwork requires large heavy sections."

Carrying the cranes in each span are a double row of crane beams, one located 18m above ground level for the overhead gantries and another row, 3m lower, for the smaller wall cranes. All of the crane beams were brought to site in 24m long lengths, with the upper beams weighing 14t and the lower crane beams weighing 11t each.

"Deflection on the frame was very stringent and we had to consider 117 different load cases, both for wind and crane movements," explains Mr Brunner. "In order to guarantee the cranes would all run smoothly and correctly within the completed building, tolerances for the columns and the crane beams were extremely tight."

> ***"... tolerances for the crane beams and the columns were extremely tight."***

To ensure the crane beams were correctly aligned they were initially installed so that adjustments could be made.

"In each portal span one side of the crane beams was not welded up during erection, but left pinned and adjustable," explains Tony Callanan, SIAC Butlers Steel Contract Manager. "Once the frame was completed we checked alignment prior to site welding the sides of the track beams."

Steel deliveries to site were undertaken everyday and varied in size from 21t up to a maximum of 40t. SIAC Butlers Steel erected three loads a day as the piece count for the job was fairly low, consisting mainly of large heavy sections.

The majority of the steel frame was erected using a solitary 120t capacity mobile crane, with a smaller 60t machine used as a back-up unit for lifting tie beams and infilling the roof.

The main roof rafters were brought to site in 16m lengths and then bolted into 32m sections on the ground before being lifted into place.

Before steelwork erection was completed in April, the cladding contractors had already started on site, ensuring the project completes on time. To match the existing production facilities, the new structure will have precast walls up to a height of 2.5m, with a combination of polycarbonate glazing and Kingspan cladding above, and a composite roof, incorporating roof lights.

The new Liebherr production hall is scheduled to be fully up and running later this summer, ensuring the company maintains its highly visible presence in Killarney and giving the local economy a timely boost.


# Engineered fire safety

## The British Constructional Steelwork Association and Tata Steel will bring together some of the UK's leading experts on fire safety engineering in two seminars.

To be held in June the series of two fire safety engineering seminars is aimed at engineers and designers. The seminars are half day morning sessions with a great line up of leading specialists including John Dowling, the BCSA's own fire specialist; Wilf Butcher, Director of the Association for Specialist Fire Protection; Professor Roger Plank, former President of the Institution of Structural Engineers; Neal Butterworth of Arup Fire; Dr. Florian Block from Buro Happold and Dr. Mark O'Connor from WSP.

**The confirmed dates are:**
**Tuesday 11 June at The Beardmore Hotel, Glasgow**
**Thursday 20 June at the Novotel Bristol Centre, Bristol**

Issues to be discussed will include fire and provision of precautions to prevent fire spread and collapse in buildings. Some years ago, a published study found that the provision of fire precautions can account for up to 8% or 9% of the total construction costs in some buildings such as shopping centres and hospitals. Even in medium sized office blocks that figure was typically 4% or 5%. It is important therefore that the solutions adopted for fire precautions in buildings are the best and most cost-effective available.

In England and Wales, most fire precautions in buildings are designed according to a Government published document, Approved Document B. North of the border, the Scottish Government publishes Technical Handbook 2 for the same purpose. However, both documents state that it is not necessary to use them if alternatives can be found which will demonstrate that the buildings in question will still meet the requirements of the Building Regulations as far as fire precautions are concerned. Indeed, both documents cite that increasing innovation in design, construction and usage of modern buildings has created a situation where it is sometimes difficult to satisfy the functional requirements of the Building Regulations by the use only of the provisions given in the Approved Document and Technical Handbook.

This has opened the door for engineered, or performance based, approaches to the design of fire precautions in buildings and this country can now lay claim to many of the world's leading consultancies in this field. As a consequence, the majority of tall and complex buildings now benefit from an engineered approach to fire rather than relying on the prescriptive provisions of Approved Document B or similar. This has proved beneficial to the construction industry as a whole, but particularly to the steel construction sector, which has carried out most of the research and whose structures consequently offer the greatest potential for improved solutions using fire engineering.

Fire safety engineering can be seen as an integrated package of measures designed to achieve the maximum benefit from the available methods of preventing, controlling or limiting the consequences of fire. The Institution of Structural Engineers says of structural fire engineering: "By adopting a performance based approach to structural fire engineering… more economic designs can be achieved and more innovative and complex buildings can be constructed."

To register to attend one of the free seminars visit *www.steelconstruction.info/Fire_Seminars_2013*

T: 029 2089 5260
F: 029 2049 3400
e: uksales@cmc.com

www.commercialmetals.co.uk
www.cmc.com

S275JR & S355JR
BEAMS, COLUMNS,
PFCs, HEAVY ANGLES,
FLATS, ROUNDS,
SQUARES, SHEET, PLATE,
OPEN STEEL FLOORING,
GALVANIZED TUBE,
STOCK AND PROCESSED

**DELIVERY NATIONWIDE**

CMC UK Ltd.

**STRUCTURAL HOLLOW SECTIONS**

HOT 50D BSEN 10210 S355J2H
COLD 50D BSEN 10219 S355J2H

BCSA

ISO 9001 UKAS MANAGEMENT SYSTEMS



# RAINHAM STEEL

Steel stockholders and suppliers of structural sections and structural hollow sections

We stock over 80,000 tonnes of structural steel products, servicing the UK, European and world markets. Our large modern fleet of heavy goods vehicles enables us to deliver throughout the UK normally within 24 hours. We can tailor the configuration of your deliveries enabling various products to arrive in one vehicle.

Our sales team has years of experience in the steel industry enabling them to match your requirements with the most cost effective products available.

## Call us on 01708 522311

**Rainham Steel Company Ltd**
Kathryn House, Manor Way, Rainham, Essex, RM13 8RE

## www.rainhamsteel.co.uk

**RAINHAM STEEL** Proud sponsors of BOXNATION Channel of Champions

# The future of live load reduction – part one

Although EN 1991-1-1:2002's recommendations for live load reduction are somewhat neutered by its UK National Annex, there remain subtle differences from BS 6399-1. In Part One Alastair Hughes examines how the new regime operates today for a UK building designed to the Eurocodes. Part Two will propose a way forward.

## Introduction

Live load reduction (LLR) is familiar to all UK structural designers. It's an acknowledgement that prescribed occupancy loads per square metre ($q_k$), which need to represent dense local gravity loading imposed on a short span slab or beam, are well in excess of the truly characteristic loading averaged over a large extent of floor. The very densest concentrations are represented by separately applied roving point loads ($Q_k$) but in practice nearly all steel frame members are sized to resist the effects of $q_k$. This represents the combined action of feet, furniture, equipment and everything else that is imposed on a floor, treated as if uniformly distributed.

Currently designers can choose either storey-based LLR, which can generate up to 50% reduction (for a member or foundation supporting 11 or more storeys), or area-based LLR, which allows a relatively modest reduction, up to 25% (for a member supporting 250 m² or more) – but not both. And there is always the option of ignoring LLR completely, either for simplicity (if the benefits are not worth pursuing) or because it is judged prudent for the particular building or floor in question.

Virtually all tall building designs take advantage of storey-based LLR, but use of area-based LLR is much less routine. It can, nevertheless, deliver worthwhile reductions for long span beams and the columns which support them.

Eurocode 1 retains both these approaches. Its reduction factors are Nationally Determined Parameters (NDPs) for which it offers Recommended Values (RVs). For the time being, the UK National Annex (UKNA) declines the RVs. Familiar formulae still prevail, therefore, but all is not as before.

## European background

A comparison between the pre-existing national formulae for LLR might be said to present the European harmonization challenge in microcosm. Figures 1 and 2, extracted from *http://eurocodes.jrc.ec.europa.eu/doc/WS2008/EN1991_2_Malakatas.pdf*, graphically portray the variety of national practice. In these graphs $n$ = number of qualifying stories supported, $A$ = area supported, in m², and the reduction factor $\alpha = 1 - [\%LLR]/100$. Some countries made a distinction between occupancy categories A/B and C/D, treating the latter much less generously.

At this point a summary of the occupancy categories may be helpful: (see table at bottom of page)

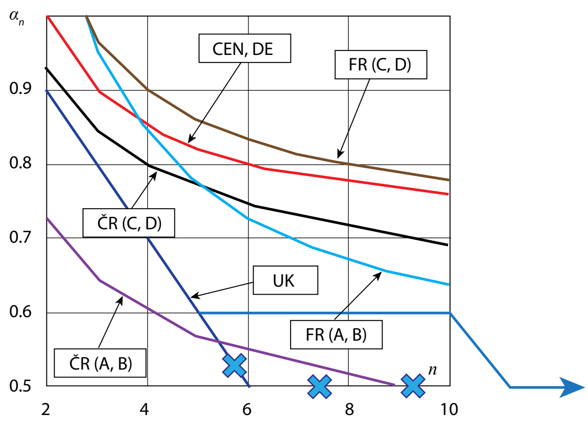



***Figure 1 Storey-based LLR***

Note the correction to the lowest part of Figure 1's blue line; for the UK $\alpha_n$ remains at 0.6 for n = 5 to 10, only dropping to 0.5 for $n$ = 11+, beyond the right hand edge of the original graph. Even with this correction the UK looks relatively generous with storey-based LLR, but quite the opposite where area-based LLR is concerned. Figure 2 is a little deceptive in this respect, as it does not extend beyond 60 m² of supported area. In practice, many members collect load from a greater floor area.

| | CATEGORY | OCCUPANCY | QUALIFYING FOR AREA-BASED LLR? | QUALIFYING FOR STOREY-BASED LLR? |
|---|---|---|---|---|
| FLOORS | A | Residential | Yes | |
| | B | Office | Yes | |
| | C | Assembly | Yes* | Yes |
| | D | Retail | Yes* | Yes |
| FLOORS AND ROOFS | E | Storage, industry, plant | No | |
| | F | Parking (cars) | No mention | No |
| | G | Fire appliances etc | No mention | No |
| ROOFS | H | (maintenance and repair only) | No | |
| | I | As A, B, C or D above | Yes (* if C or D) | No |
| | K | Helicopters | N/A (point loads) | |

* EN 1991-1-1 (RV) restricts area-based LLR to 40% (instead of 50%) for these categories; UKNA limit is 25% regardless.

# Jamestown

- Automated Welding of Plate Girders and Box Girders
- Fully certified to ISO 9001 standard
- Full Penetration Butt Welding
- Fillet Welding
- Submerged Arc Welding
- Proven track record with major projects


www.jamestownprofiling.com

UK Mobile: +44 7432 738124

Tel: +353 45434288 Fax: +353 45434308 Email: plategirder@jamestownprofiling.com

EVERYTHING YOU NEED TO KNOW ABOUT UK STEEL CONSTRUCTION

www.steelconstruction.info

# ANY QUESTIONS?

**SteelConstruction.info** is the new online encyclopaedia for UK steel design and construction information.

Developed and maintained by the British Constructional Steelwork Association, Tata Steel and the Steel Construction Institute, the site brings together a wealth of information in an easy to use, fully searchable format that is constantly updated.

At its heart lies over 100 interlinked and freely downloadable articles from industry experts, covering all the topics that civil and structural engineers need to have at their fingertips. These core articles then act as a roadmap with multiple links to other detailed sources of information. A number of online CPD presentations are also included, which enable the user to take a test and download a certificate for their records.

Whether you need information on design to the Eurocodes, fire engineering, guidance on costs or the key issues involved in the design of schools, hospitals, commercial buildings or bridges, **www.steelconstruction.info** is the new go to resource.

Follow us on:
Twitter **@steelcoinfo**
LinkedIn: **steelconstruction.info**
Facebook: **steelconstruction.info**

BCSA TATA STEEL SCI Steel Knowledge

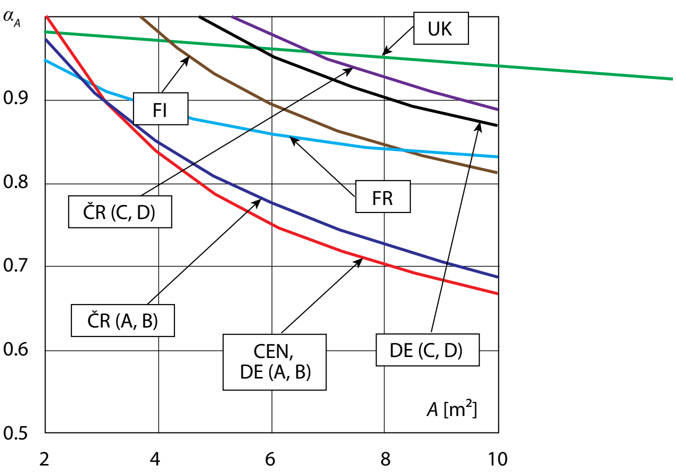



***Figure 2   Area-based LLR***

The UK's lower limit to $\alpha_A$ of 0.75 (a maximum reduction of 25%) ensures that storey-based LLR is advantageous if $n > 3$. For $n = 3$, area-based LLR becomes advantageous if the area at each level exceeds 67 m$^2$; for $n = 2$, area-based LLR becomes advantageous with 50 m2 at each level. For $n = 1$, and for beams, only area-based LLR is available.

## European recommendations

The European committee's own formulae, which can be found in notes to EN 1991-1-1 6.3.1.2, look rather obscure at first sight because they involve the combination factor $\psi_0$. However $\psi_0$ (found in EN 1990 Table A1.1) is equal to 0.7 for occupancy categories other than E. For the categories to which LLR may apply, the formulae can therefore be simplified as follows. [NB If referring to EN 1991-1-1, make sure you have the 2009 version to hand. Its predecessor is seriously incorrect.]

For storey-based LLR:

$\alpha_n = 0.7 + 0.6/n$ (for $n > 2$)

This is the red line labelled CEN in Figure 1.

Under this regime, only 20% LLR is available 6 stories down, and only 29% 60 stories down. However area-based LLR is likely to be more advantageous:

$\alpha_A = 0.5 + 10/A$  ($A$ in m$^2$)

$\geq 0.6$ for categories C and D

This is the red line labelled CEN in Figure 2, which seems remarkably generous: for example 30% LLR for a beam supporting 50 m$^2$, compared with 5% (probably ignored) in UK practice. Restricting LLR at 40% for categories C and D presumably recognizes the potential for crowd loading in assembly and retail areas.

There is no rule against using area-based LLR for columns, so if a column supports 84 m$^2$ of offices per level the reduction available 6 stories down is 48%, and even directly below the top floor 38% can be taken. Given these RVs, it would be difficult to see a future for storey-based LLR, and this may be a deliberate policy; it is arguable that the total area matters more than the number of levels it is distributed over. However we need to remind ourselves that the RVs have not been adopted in the UK, where our relatively unproductive area-based LLR formula remains just as in BS 6399-1:1966:

$\alpha_A = 1 - A/1000$ ($A$ in m$^2$)

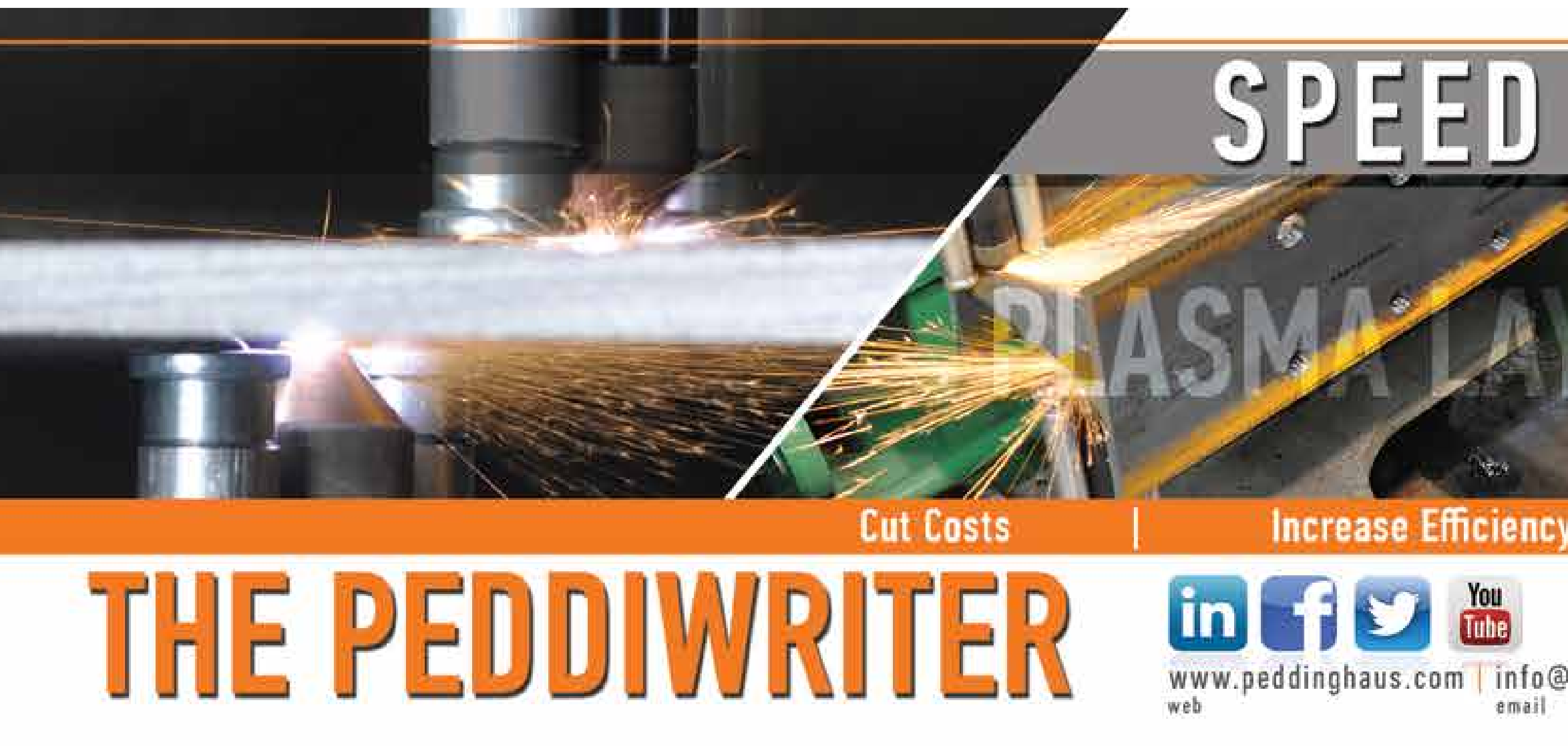
$\geq 0.75$

This is the green line labelled UK in Figure 2.

## Some questionable provisions and interpretations

There is a further provision in EN 1991-1-1 3.3.2 (2) which is hostile to storey-based LLR: $\psi$ must be taken as 1 when taking advantage of $\alpha_n$. That is to say: no combination factor on floor loads that have been reduced by αn in design situations where wind or snow is the #1 variable action. It is difficult to fathom what this rule is intended to guard against, or why it should apply to αn but not to $\alpha_A$. But there it stands, not just an application rule but a 'Principle', anointed with a special kind of immutability! Leaving aside this subtlety, readers might (or might not) appreciate a reminder that this tedious and easily overlooked requirement is normative, not for national choice, and therefore applies already to Eurocode design for buildings in the UK.

Could it have been the intention of the European committee that both αn and $\alpha_A$ can apply simultaneously to (e g) a column supporting 60 stories

(which might then enjoy over 60% LLR)? Surely not, but the only stipulation to the contrary is in the UKNA.

[It might be argued, by connoisseurs of Eurocode clause headings, that $\alpha_A$ is for beams and $\alpha_n$ is for columns, exclusively, but that interpretation would deny columns the reductions available to the beams they support – illogical, and contradicted by the UKNA's explicit permission to use $\alpha_A$ for columns.]

For mixed use buildings (such as 20 stories of hotel over 40 of offices) code literalists will note that EN 1991-1-1 6.2.1 (4) states that imposed loads '**from a single category** may be reduced … by $\alpha_A$'. Some might infer that the LLR calculation has to start afresh downwards of level 40, or even that you cannot reduce the office component if you have reduced the hotel. Both these interpretations seem unduly cautious. Perhaps the European committee had in mind storage or plant zones within office floors, whose areas (and loads) should be excluded from the LLR calculation. The corresponding words '…**from the same category**' under the $\alpha_n$ formula are even more definite, but as they appear in a NOTE they are non-normative and common sense may be applied; helpfully, the UKNA redefines *n* with those words conspicuously absent.

## Exclusions

No LLR is taken for storage occupancy, for the obvious reason that a warehouse floor can be expected to receive something close to its declared payload over its full area. Indeed the UKNA excludes all loads that have been 'specifically determined from knowledge of the proposed use of the structure', which would also apply to many industrial and plant occupancies. Presumably the word 'specifically' implies that the actual weights, or weight limits, have been added up, or will be controlled, for the floor in question. Might it now, therefore, be permissible for a plant floor with an 'allowance' of 7.5 kPa or more to participate in LLR (which would have been ruled out by BS 6399)? Maybe - but many will opt out of debate by continuing to leave plant levels out of the calculation.

A similar simplifying view could be taken for roofs, which don't qualify for LLR unless in category I, 'accessible with occupancy according to categories A to G'. If so, the roof is treated as if it were a floor of the relevant category – but only for **area**-based LLR. No roof (or plant floor) can ever **actually** be categorized A to D, and EN 1991-1-1 6.3.1.2 (11) stipulates that only categories A to D qualify for storey-based LLR. So where storey-based LLR is concerned the roof must always be disregarded (as with BS 6399 post-1996). It doesn't even count towards *n*, defined in the UKNA as 'the number of storeys with loads qualifying for reduction'.

For area-based LLR the question that now arises is whether $\alpha_A$ may be applied to $q_k$ values not in Table 6.2. This table is for categories A to D and, by extension, category I. Would it be correct to interpret this as disqualifying all other categories? If so the exclusions would be as for $\alpha_n$ with the one exception that was discussed above: an occupied roof is allowed to participate in area-based but not in storey-based LLR.

But where does this leave multi-storey car parks? It seems almost as if category F has been overlooked. EN 1991 introduces $\alpha_A$ and $\alpha_n$ in clause 6.2 under the general heading of 'Load arrangements' but its numerical formulae come under 6.3.1: 'Residential, social, commercial and administration areas'. Does this mean that only loads in Table 6.2 qualify? There is no great desire to apply LLR to category E, but it does seem reasonable to pursue properly considered LLR for category F. That would have to be **area**-based, as 6.3.1.2(11)'s restriction is unambiguous and normative, but it could include the top deck of the car park as an 'accessible' roof. However there is a lack of positive guidance, without which some designers might prefer not to proceed. Category G, for example a podium designed for 10 kPa because it is accessible to fire appliances in emergency, is in a similar predicament.

The UKNA cannot fill the vacuum, as NAs are only allowed to pronounce on matters referred to them by the Code. In this uncomfortable territory between what is ruled in and what is ruled out, the SCI view is that responsible designers should feel free to exercise judgement. That might mean applying LLR in the design of the columns and foundations of a multi-storey car park; equally it might mean forgoing LLR in a category C assembly building.

*In the next issue: Part Two will break the mould of technical articles for NSC by putting forward an evolutionary proposal which seeks to influence, rather than interpret.*

# AD 374
# Design of gusset plate connections

Following a failure, in 2012, of a relatively long gusset plate connection, the SCI has looked into the performance of the behaviour of gusset plates subject to compression. The interim results from this investigation show that for bolted gusset plates connected on one edge only subject to compression (shown in Fig 1) the modelling assumptions are particularly crucial.

It should be noted that the advice given in the publication 'Joints in steel construction - Simple Joints to Eurocode 3' states:

*'Preferably, gusset plates in compression should be supported on two edges and be reasonable compact.'*

*'Where the gusset plate is supported on one edge only, the detail is only recommended for light loads. For heavier loads, an extended end plate and gusset plate supported on two edges wherever possible is recommended.'*

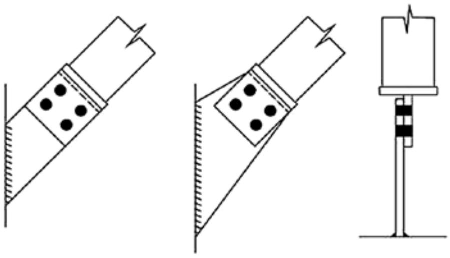


***Figure 1 Gusset plates supported on one edge only***

In the case of gusset plates as connections in a bracing system (which consists of a bracing member, spade end and gusset plate) the following issues may be important when deciding how to model the whole system:

- Is the connected bracing member stubby or slender and what are the implications for the likelihood of the gusset plate and spade end arrangements being subjected to a direct compression load (held in alignment by the stiffness of the brace) as opposed to bending from the brace moving out of alignment?
- Is the spade end on the brace itself stiffened (e.g. being made from an angle) or not?
- Even if the spade end on the brace itself is an unstiffened plate, is it relatively thicker, more compact and more securely welded than the gusset plate?
- Considering the bolt group connecting the gusset plate to the spade end of the brace, how effective is this in clamping the two elements together to restrain rotation?
- Considering the behaviour of the gusset plate itself, what is its likely mode of behaviour in terms of bending or buckling?
- Is the lapped connection to the gusset plate likely to fold with a hinge at each end of the connection?

As noted in the existing guidance for the gusset plate detail itself there are two specific issues to consider:

- What effective length should be used?
- Is the actual or equivalent eccentricity of the applied load significant?

If the gusset plate is connected by a bolt group that provides good clamping action to a relatively stubby brace with a relatively stiff spade end, then the simple model assumed in the existing guidance may be appropriate, provided a suitably conservative value is chosen for the effective length. For a gusset plate connected on the skew it is not conservative to take the shortest distance between the last bolt row and the nearest weld attachment point.

The existing guidance shows the effective length to be the same as the system length for the gusset plate itself. In simple structural mechanical terms, this is equivalent to a model with the plate being assumed as fully restrained in position and direction at one end and being fully restrained in direction but not held in position at the other end.

In practice, a gusset plate supported on one edge would be welded all round at one end and clamped by the bolt group at its other end. If the clamping action of the bolt group is considered to provide only partial restraint in direction, then the effective length would need to be increased above the system length. In case of doubt, the conservative value for the effective length would be twice the system length for the gusset plate itself unless a small value can be justified.

In addition, the spade end on the brace itself may lack stiffness or the brace itself may exhibit curvature under load that results in an imposed bending moment on the plate. The effect of these would be equivalent to an eccentrically-applied load such that the simple assumption to ignore the eccentricity would be invalid.

The designer would need to consider the points above in deciding whether the simple model is appropriate. Some designers may have been tempted to use overlong single-sided gusset plates with minimum thickness without looking at the system modelling issues such as the behaviour of the brace, the behaviour of the spade end, the behaviour of the gusset plate and the interaction between these components and the effect this may have on the propensity of the gusset plate to bend or buckle.

Further guidance funded by BCSA and Tata Steel is on its way. In the meantime designers are reminded that the use of single-sided gusset plates should only be used for light loads and stiffened if necessary if a double sided attachment is not possible. The length of the gusset plate should be kept to a minimum and the effective length should be chosen on the most conservative basis. Furthermore, the effect of ignoring the eccentricity of the connected plates should be reviewed against the modelling assumptions for the behaviour of the whole bracing system.

Contact: **Dr D. B. Moore,**
**Director of Engineering BCSA**
Tel: **0207 747 8122**
Email: **david.moore@steelconstruction.org**

# AD 375
# BS 2853:2011 Steel overhead runway beams

For over 50 years, steel overhead runway beams for hoists have been designed to BS 2853:1957, *Specification for the design and testing of steel overhead runway beams*. Last amended in 1970, BS 2853:1957 remained largely unchanged since 1967, when it was updated to take account of the replacement of RSJs by UBs. It remained in Imperial units and Allowable Stress format, whilst continuing to refer to numerous outdated British Standards.

The publication of BS EN 1993-6: 2007, *Eurocode 3: Design of steel structures. Crane supporting structures* has, since 2007, provided an alternative design standard for crane supporting structures. In April 2010 it came fully into force, along with the rest of the Eurocode Parts, when the former national structural design standards were withdrawn. However, BS 2853 has not been withdrawn – instead, a new version, BS 2853:2011 *Specification for the testing of steel overhead runway beams for hoist blocks* was published in October 2011. The Advisory Desk has been asked why, with the Eurocodes already in force, a new edition has been published and what its continued relevance is for structural designers.

There are two answers – test loads and serviceability criteria – and these are discussed below.

### Test loads

The original 1957 edition of BS 2853 covered both design and testing. With the requirement for BSI to withdraw all national standards conflicting with Eurocodes, structural design has been removed from the scope of BS 2853. However, in design to BS EN 1993-6: 2007, runway beams need to be checked under test loading if the hoist they support needs to be tested. Details of the relevant test loads are specified in BS 2853:2011 and these will govern the design of the bottom flange of the runway beam to resist local wheel loads. BS 2853:2011 is thus "non-contradictory complementary information" (NCCI) that should be used in association with BS EN 1993-6: 2007.

### Serviceability criteria

The 2011 edition of BS 2853 has retained and amplified general serviceability requirements for the design of runway beams. The criteria now include:

- deflection;
- slope;
- suitability.

#### *Deflection*

The wording now clarifies that the deflection of a runway beam due to the safe working load is to be measured relative to its supports. In the past, some inspectors erroneously measured the absolute deflection. The deflection limit in BS 2853:2011 now corresponds with the design requirement in BS EN 1993-6.

Requiring a loaded runway beam to have a sufficiently large "moment of inertia" (second moment of area) to limit its deflection relative to its supports, also limits its slope due to the loaded trolley. This is an indirect way to avoid subjecting a trolley to an excessive slope. The deflections of the supports are not relevant unless they increase the maximum slope to which the trolley is subjected.

#### *Slope*

A new requirement has also been added, limiting the unintended slope of an unloaded runway beam, again to avoid subjecting a trolley to an excessive slope.

Unintended differences in the levels of runway beam supports can arise from three sources:

- Erection tolerances;
- Differences between the deflections of each support due to static loads on the supporting structure;
- Differences between the deflections of each support due to other moving loads on the supporting structure.

Some design modification will be needed if the deflections of the supporting structure are such that the total slope of an unloaded runway beam from these three causes could exceed the limiting value. As an alternative to modifying the supporting structure, the runway beam could be treated as intentionally sloping and the trolley designed accordingly.

#### *Suitability*

The retained non-contradictory wording on general aspects of runway beam design requires the design and layout of the supporting structure to be appropriate.

Provided that the supporting structure doesn't oscillate, its deflections due to the load on a simply supported runway beam are not normally a problem, even if some supports deflect more than others. With a simply supported beam, the slope at the trolley location will reach its maximum when the trolley is closer to one of its supports than to the other. At this point, the slope of a runway beam due to the load from the trolley is relatively insensitive to the deflection of the other support, so it is sufficient to limit the deflection of the runway beam under the load from the trolley, relative to the mean of the deflections of its supports, with the trolley at mid-span. The same is true in the case of a continuous runway beam.

However, in the case of a load on a cantilevered runway beam, it is necessary to allow for the resulting deflections of its supports, because when the trolley is on a cantilever, the remote support of the anchor arm will deflect upwards. The deflection of the cantilever relative to the mean of the deflections at its supports will thus be more than its deflection relative to the adjacent support, because the resulting slope of the anchor arm will increase the slope of the cantilever. (This is in addition to the downward deflection of the cantilever due to the upward curvature of the anchor arm.)

Accordingly, the calculated deflection of the cantilever at the trolley location needs to include its deflection due to the relative deflections of its supports.

Contact: **Abdul Malik**
Tel: **01344 636525**
Email: **abdul.malik@steelconstruction.org**

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

# New and revised codes & standards

**From BSI Updates April and May 2013**

### BS IMPLEMENTATIONS

**BS ISO 14346:2013**
Static design procedure for welded hollow-section joints. Recommendations
*No current standard is superseded*

### CORRIGENDA TO BRITISH STANDARDS

**BS EN 1991-1-2:2002**
Eurocode 1: Actions on structures. General actions. Actions on structures exposed to fire
CORRIGENDUM 3

**BS EN 1991-1-6:2005**
Eurocode 1. Actions on structures. General actions. Actions during execution
CORRIGENDUM 3

**BS EN 1991-3:2006**
Eurocode 1. Actions on structures. Actions induced by cranes and machinery
CORRIGENDUM 1

**BS EN 1991-3:2006**
Eurocode 1. Actions on structures. Actions induced by cranes and machinery
CORRIGENDUM 2

**BS EN 1991-4:2006**
Eurocode 1. Actions on structures. Silos and tanks
CORRIGENDUM 1

**PD 6695-2:2008+A1:2012**
Recommendations for the design of bridges to BS EN 1993
CORRIGENDUM 1

### BRITISH STANDARDS UNDER REVIEW

**BS EN ISO 10684:2004**
Fasteners. Hot dip galvanized coatings

**BS EN ISO 13918:2008**
Welding. Studs and ceramic ferrules for arc stud welding

**BS EN 24015:1992**
(ISO 4015:1979)
Hexagon head bolts. Product grade 8. Reduced shank (shank diameter pitch diameter)

### NEW WORK STARTED

**EN 10338**
Hot rolled and cold rolled non-coated flat products of multiphase steels for cold forming. Technical delivery conditions

**EN 10346**
Continuously hot-dip coated steel flat products. Technical delivery conditions
*Will supersede BS EN 10346:2009*

**EN ISO 9934-1**
Non-destructive testing. Magnetic particle testing. General principles
*Will supersede BS EN ISO 9934-1:2001*

**EN ISO 16810**
Non-destructive testing. Ultrasonic testing. General principles

**ISO 4759-3**
Tolerances for fasteners. Plain washers for bolts, screws and nuts. Product grades A and C
*Will supersede BS EN ISO 4759-3:2000*

**ISO 4998**
Continuous hot-dip zinc-coated carbon steel sheet of structural quality
*Will supersede BS ISO 4998:2011*

**ISO 16228**
Fasteners. Certificates. Test reports

→ *continued on p39*

# Interesting design of Rome Departmental Store

FROM BUILDING WITH STEEL MAY 1963


In recent years Italian architecture has attracted widespread attention. An interesting example of a contemporary steel building, architecturally imaginative and yet in harmony with surroundings of an earlier era, is the recently completed Rome department store of the La Rinascente group.

Situated at the corner of Rome's Via Salaria and Piazza Fiume, the seven storey department store building for the large Italian chain La Rinascente presented special architectural problems. Government decrees limit in a binding way the volume, shape and dimensions of such buildings; in addition, the building was to harmonise with existing structures on the Piazza Fiume and with the nearby Servian Wall.

The building as finally designed consists of a main block facing onto Via Salaria, with a secondary block facing Via Aniene; there are three basement levels and seven above-ground storeys. The third basement level containing the building's plant, equipment and warehouse space and the second basement - for services, employee's cloakrooms and further warehousing - are of reinforced concrete. The balance of the structure is of steel and consists of a supermarket on first basement level, sales area from ground floor to fifth floor and a recessed sixth storey containing office space, additional warehouse area and the air conditioning plant. The secondary block, forming the short leg of the 'L' shape contains goods storage space and public and employees' toilets for each storey.

Access between floors is provided by three means: double escalators on the west (rear) wall extend from the first basement to the forth floor; an elliptical staircase at the Via Salaria-Via Aniene corner of the building connects all floors from the supermarket in the first basement to the sixth floor; a large list near the staircase is also provided for the public. Additional stairways connect the first basement and ground floors and the fourth and fifth floors. Entry at ground floor level is through air-curtain doorways opening onto Via Salaria and Piazza Fiume. Two smoke-tight fire escape stairways are provided; one on the west side of the store and one on the Via Aniene side; the Via Aniene fire escape also serves as an employee's stairway.

The steel structural work is relatively straightforward. The main horizontal structure is longitudinal; concrete filled ribbed sheet steel flooring is carried on secondary framing perpendicular to the building front. To meet fire regulations the steelwork is cased in asbestos cement cladding.

What sets the La Rinascente building apart is the architectural treatment of its steel construction. The external steel framing, both vertical and horizontal, is exposed to view, with curtain walls of lightweight precast aggregate panels of granite and dark red marble grit. The principal utilities are carried in precast pilaster strips of the same material - ducts for the heating and air conditioning system, fall pipes, fire-fighting system etc. Horizontal conduits are carried in the exposed stringcourse. The visible steelwork is painted dark grey.

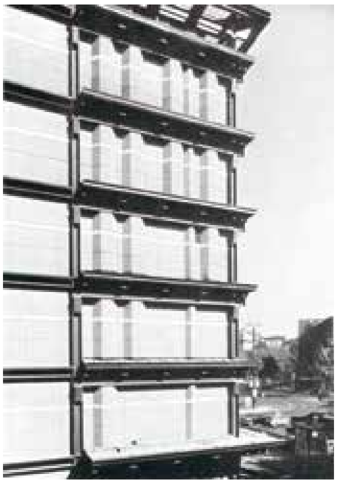
The recessed top floor leaves the outer portion of the roof structure exposed. Roofing is of asbestos cement slabs of an olive-green colour, having a profile like that of a traditional Roman roof tile. An I-beam rail around the entire roof structure carries a trolley used for cleaning the building face and windows.

The architects were Franco Albini and Franca Helg of Milan, and consulting engineer for the steel structure was Ing. Gino Cove.

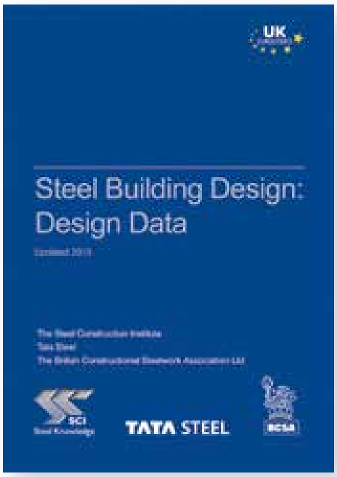
Outstanding feature of the building's interior is this helicoidal staircase, carried on welded box stringers.

Bold glass curtain walling is used facing the off street courtyard at the building's rear.

Architectural treatment of the exposed columns and stringcourses harmonizes with the surrounding 19th century masonry buildings without disguising the essential steel construction.



# Steel Building Design: Design Data Updated 2013




The "Blue Book" remains the essential aid for the design of structural steelwork, providing tabulated member resistances in accordance with the Eurocode 3 and the UK National Annex.

The new edition provides certain information in a more convenient format, particularly for unrestrained beams in bending. The two main changes in the updated version are:

- Lateral torsional buckling resistances are now quoted for convenient values of the factor C1, covering common design cases such as a UDL and a central point load. Previously, lateral torsional buckling resistances were quoted at fixed values of C1, and users had to interpolate for some of the common design cases. The values given in the earlier editions are entirely correct and appropriate for use. The 2013 update simply improves the convenience of the look-up tables.
- In previous editions the bearing resistances for bolts in clearance holes were calculated based on nominal dimensions of bolt group geometry (such as end distance, edge distance, etc), rather than the actual values quoted in the tables, and were slightly conservative in a few cases. The 2013 update presents bearing resistances based on the tabulated values of bolt geometry.

The Blue Book contains comprehensive information on steel members, including:

- Section property data for UB, UC, Joists, ASB sections, channels, and angles
- Section property data for hot-finished and cold-formed hollow sections, including oval cross sections
- Effective section properties.
- Compression, tension, and bending resistances
- Web resistances (under local loads)
- Resistances used in the verification of members subject to combined axial compression and bending
- Resistances for ordinary bolts, pre-loaded bolts and welds.

The new edition of the "Blue Book" will be available to purchase from the end of May 2013.

***Full Price £80 (BCSA and SCI Member price £60.00)***

***To purchase copies of this publication please visit the SCI shop at:***

***http://shop.steel-sci.com or contact publication sales on; +44 (0)1344 636505***

| | |
|---|---|
| Catalogue number | **P363** |
| ISBN Number | 978-1-85942-186-4 |
| Authors | The BCSA and The SCI |
| Pagination | 690 pp |
| Pages | A4 Paperback |
| Publication date | 2013 |

# New and revised codes & standards

*…continued from p37*

**DRAFTS FOR PUBLIC COMMENT**

**13/30264717 DC**

***BS ISO 4355*** Bases for design of structures. Determination of snow loads on roofs

*Comments for the above document are required by 6 May, 2013*

**DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – NATIONAL BRITISH STANDARDS**

**13/30262060 DC**

***BS 5502-22 A1*** Buildings and structures for agriculture. Code of practice for design, construction and loading

**CEN EUROPEAN STANDARDS**

**EN 1991-1-2:-**

Eurocode 1. Actions on structures. General actions. Actions on structures exposed to fire

*CORRIGENDUM 3: February 2013 to EN 1991-1-2:2002*

**EN 1991-1-6:-**

Eurocode 1. Actions on structures. General actions. Actions during execution

*CORRIGENDUM 3: February 2013 to EN 1991-1-6:2005*

**EN 1998-1:-**

Eurocode 8. Design of structures for earthquake resistance. General rules, seismic actions and rules for buildings

*AMENDMENT 1: February 2013 to EN 1998-1:2004*

**ISO PUBLICATIONS**

**ISO 15012-1:2013**

(Edition 2)

Health and safety in welding and allied processes. Equipment for capture and separation of welding fume. Requirements for testing and marking of separation efficiency.

*Will be implemented as an identical British Standard*

# 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 Director General, BCSA, 4 Whitehall Court, London SW1A 2ES
Tel: 020 7747 8121 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
- **SCM** Steel Construction Sustainability Charter (● = Gold, ● = Silver, ● = Member)

**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 | SCM | Guide Contract Value (1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A C Bacon Engineering Ltd | 01953 850611 | | | ● | ● | | ● | | | | | | | | | | | Up to £2,000,000 |
| Adey Steel Ltd | 01509 556677 | | | | ● | ● | ● | ● | | ● | ● | | | ● | ● | | Member | Up to £2,000,000 |
| Adstone Construction Ltd | 01905 794561 | | | ● | ● | ● | ● | | | | | | | | | ✓ | Silver | Up to £3,000,000 |
| Advanced Fabrications Poyle Ltd | 01753 531116 | | | | ● | ● | ● | ● | ● | ● | ● | | | | ● | | | Up to £800,000 |
| AJ Engineering & Construction Services Ltd | 01309 671919 | | | ● | ● | | | | | ● | ● | | | ● | ● | ✓ | | Up to £1,400,000 |
| Angle Ring Company Ltd | 0121 557 7241 | | | | | | | | | | | | ● | | | ✓ | | Up to £1,400,000 |
| Apex Steel Structures Ltd | 01268 660828 | | | | ● | | ● | | | ● | ● | | | | | | | Up to £800,000 |
| Arminhall Engineering Ltd | 01799 524510 | ● | | | ● | | | | | ● | ● | | | ● | ● | | | Up to £200,000 |
| Arromax Structures Ltd | 01623 747466 | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● | | | Up to £800,000 |
| ASA Steel Structures Ltd | 01782 566366 | | | ● | ● | ● | ● | | | ● | ● | | | ● | ● | | | Up to £800,000* |
| ASD Westok Ltd | 0113 205 5270 | | | | | | | | | | | | ● | | | ✓ | | Up to £6,000,000 |
| ASME Engineering Ltd | 020 8966 7150 | | | | ● | | | | | ● | ● | | | ● | ● | | Member | Up to £800,000* |
| Atlas Ward Structures Ltd | 01944 710421 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ✓ | Gold | Above £6,000,000 |
| Atlasco Constructional Engineers Ltd | 01782 564711 | | | ● | ● | ● | ● | | | | ● | | | ● | ● | | | Up to £1,400,000 |
| Austin-Divall Fabrications Ltd | 01903 721950 | | | ● | ● | | ● | ● | | ● | ● | | | ● | ● | | | Up to £400,000 |
| B D Structures Ltd | 01942 817770 | | | ● | ● | ● | ● | | | | ● | ● | | ● | | | | Up to £400,000 |
| Ballykine Structural Engineers Ltd | 028 9756 2560 | | | ● | ● | ● | ● | ● | | | | ● | | | | ✓ | | Up to £1,400,000 |
| Barnshaw Section Benders Ltd | 01902 880848 | | | | | | | | | | | | ● | | | ✓ | | Up to £800,000 |
| BHC Ltd | 01555 840006 | ● | ● | ● | ● | ● | ● | | | | ● | ● | | ● | ● | ✓ | | Above £6,000,000 |
| Billington Structures Ltd | 01226 340666 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | ✓ | Gold | Above £6,000,000 |
| Border Steelwork Structures Ltd | 01228 548744 | | | ● | ● | ● | ● | | | ● | ● | | | | ● | | | Up to £3,000,000 |
| Bourne Construction Engineering Ltd | 01202 746666 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ✓ | Gold | Above £6,000,000 |
| Briton Fabricators Ltd | 0115 963 2901 | ● | | ● | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ✓ | | Up to £3,000,000 |
| Cairnhill Structures Ltd | 01236 449393 | ● | | | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ✓ | Gold | Up to £2,000,000 |
| Caunton Engineering Ltd | 01773 531111 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ✓ | Gold | Up to £6,000,000 |
| Cleveland Bridge UK Ltd | 01325 381188 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | ✓ | Silver | 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 £800,000 |
| DGT Structures Ltd | 01603 308200 | | | ● | ● | ● | ● | | | | | ● | | ● | | ✓ | | Up to £2,000,000 |
| D H Structures Ltd | 01785 246269 | | | ● | ● | | ● | | | | ● | | | ● | | | | Up to £100,000 |
| Discain Project Services Ltd | 01604 787276 | | | | ● | | | | | ● | ● | | | | ● | ✓ | | Up to £1,400,000 |
| Duggan Steel Ltd | 00 353 29 70072 | | ● | ● | ● | ● | ● | ● | | | ● | | | | | ✓ | | Up to £4,000,000 |
| ECS Engineering Services Ltd | 01773 860001 | ● | | ● | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ✓ | | Up to £2,000,000 |
| Elland Steel Structures Ltd | 01422 380262 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | ✓ | Gold | Up to £6,000,000 |
| EvadX Ltd | 01745 336413 | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | ✓ | Gold | Up to £3,000,000 |
| Fisher Engineering Ltd | 028 6638 8521 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | ✓ | Gold | Above £6,000,000 |
| Fox Bros Engineering Ltd | 00 353 53 942 1677 | | | ● | ● | ● | ● | ● | | | ● | | | | | | | Up to £3,000,000 |
| Gorge Fabrications Ltd | 0121 522 5770 | | | | ● | ● | ● | ● | | ● | | | | ● | | | | Up to £800,000 |
| Graham Wood Structural Ltd | 01903 755991 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | ✓ | Silver | Up to £6,000,000 |
| Grays Engineering (Contracts) Ltd | 01375 372411 | ● | | | ● | | | | | ● | ● | | | ● | ● | | | Up to £100,000 |
| Gregg & Patterson (Engineers) Ltd | 028 9061 8131 | | | ● | ● | ● | ● | ● | | | | ● | | ● | | ✓ | | Up to £3,000,000 |
| H Young Structures Ltd | 01953 601881 | | | ● | ● | ● | ● | ● | | | | | | ● | | | Member | Up to £2,000,000 |
| Had Fab Ltd | 01875 611711 | | | | ● | | | | ● | ● | ● | | | | ● | ✓ | | Up to £2,000,000 |
| Hambleton Steel Ltd | 01748 810598 | | ● | ● | ● | ● | ● | ● | | | | ● | | ● | | ✓ | Silver | Up to £2,000,000 |
| Harry Marsh (Engineers) Ltd | 0191 510 9797 | | | ● | ● | ● | ● | | | | ● | ● | | | ● | ✓ | | Up to £1,400,000 |

Company name | Tel | C | D | E | F | G | H | J | K | L | M | N | Q | R | S | QM | SCM | Guide Contract Value (1)

| Company name | Tel | C | D | E | F | G | H | J | K | L | M | N | Q | R | S | QM | SCM | Guide Contract Value (1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Henry Smith (Constructional Engineers) Ltd | 01606 592121 | | | ● | ● | ● | ● | ● | | | | | | | | | | Up to £3,000,000 |
| Hescott Engineering Company Ltd | 01324 556610 | | | ● | ● | ● | ● | | | ● | | | | ● | ● | | | Up to £3,000,000 |
| Hills of Shoeburyness Ltd | 01702 296321 | | | | | | | | | ● | | | | ● | ● | | | Up to £1,400,000 |
| J Robertson & Co Ltd | 01255 672855 | | | | | | | | | ● | ● | | | | ● | | | Up to £200,000 |
| James Killelea & Co Ltd | 01706 229411 | | ● | ● | ● | ● | ● | | | | | ● | | ● | | | | Up to £6,000,000* |
| Kiernan Structural Steel Ltd | 00 353 43 334 1445 | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ✓ | ● (orange) | Up to £4,000,000 |
| Leach Structural Steelwork Ltd | 01995 640133 | | | ● | ● | ● | ● | ● | | | ● | | | | | | ● (green) | Up to £2,000,000 |
| 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 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ✓ | ● (orange) | Above £6,000,000 |
| Mackay Steelwork & Cladding Ltd | 01862 843910 | | | ● | ● | | ● | | | ● | ● | | | ● | ● | ✓ | | Up to £800,000 |
| 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 £100,000 |
| 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 | | | | | | | | ● | | ● | | | | ● | ✓ | ● (grey) | Up to £6,000,000 |
| Pencro Structural Engineering Ltd | 028 9335 2886 | | | ● | ● | ● | ● | ● | ● | | ● | | | ● | ● | ✓ | | Up to £2,000,000 |
| Peter Marshall (Steel Stairs) Ltd | 0113 307 6730 | | | | | | | | | ● | | | | | ● | | | Up to £800,000 |
| PMS Fabrications Ltd | 01228 599090 | | | ● | ● | ● | ● | | ● | ● | ● | | | ● | ● | | | Up to £1,400,000 |
| REIDsteel | 01202 483333 | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | | | Up to £6,000,000 |
| Remnant Plant Ltd | 01594 841160 | | | | ● | | ● | ● | ● | ● | ● | | | | ● | ✓ | | Up to £400,000 |
| Rippin Ltd | 01383 518610 | | | ● | ● | ● | ● | ● | | | | | | ● | ● | | | Up to £1,400,000 |
| S H Structures Ltd | 01977 681931 | | | | | | ● | ● | ● | ● | | ● | | | | ✓ | ● (grey) | Up to £3,000,000 |
| Severfield-Watson Structures Ltd | 01845 577896 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | ● (orange) | Above £6,000,000 |
| Shipley Fabrications Ltd | 01400 251480 | | | ● | ● | ● | ● | | ● | ● | ● | | | ● | ● | | | Up to £1,400,000 |
| SIAC Butlers Steel Ltd | 00 353 57 862 3305 | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | | | | ✓ | ● (green) | Above £6,000,000 |
| SIAC Tetbury Steel Ltd | 01666 502792 | | | ● | ● | ● | ● | | ● | | ● | ● | | ● | | | | Up to £400,000* |
| Snashall Steel Fabrications Co Ltd | 01300 345588 | | | ● | ● | ● | ● | ● | | | ● | | | | ● | | | Up to £1,400,000 |
| South Durham Structures Ltd | 01388 777350 | | | ● | ● | ● | | | | ● | ● | ● | | | ● | | | Up to £800,000 |
| Temple Mill Fabrications Ltd | 01623 741720 | | | ● | ● | ● | ● | | | | ● | | | ● | ● | | | Up to £200,000 |
| Traditional Structures Ltd | 01922 414172 | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | | ● | | ✓ | ● (grey) | Up to £2,000,000 |
| TSI Structures Ltd | 01603 720031 | | | ● | ● | ● | ● | | | | | | | | | | | Up to £1,400,000 |
| Tubecon | 01226 345261 | | | | | | ● | ● | ● | ● | | | | ● | ● | ✓ | ● (orange) | Above £6,000,000* |
| W & H Steel & Roofing Systems Ltd | 00 353 56 444 1855 | | | ● | ● | ● | ● | ● | | | | | | ● | ● | | | Up to £3,000,000 |
| W I G Engineering Ltd | 01869 320515 | | | | ● | | | | | ● | | | | | ● | | | Up to £200,000 |
| Walter Watson Ltd | 028 4377 8711 | | | ● | ● | ● | ● | ● | | | | ● | | | | ✓ | | Up to £6,000,000 |
| Westbury Park Engineering Ltd | 01373 825500 | ● | | | ● | | ● | ● | ● | ● | ● | | | | ● | ✓ | | Up to £800,000 |
| William Haley Engineering Ltd | 01278 760591 | | | ● | ● | ● | | | ● | ● | ● | | | | | ✓ | ● (grey) | Up to £2,000,000 |
| William Hare Ltd | 0161 609 0000 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | ✓ | ● (orange) | Above £6,000,000 |
| Company name | Tel | C | D | E | F | G | H | J | K | L | M | N | Q | R | S | QM | SCM | Guide 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 |
| Highways Agency | 08457 504030 |
| Kier Construction Ltd | 01767 640111 |
| Roger Pope Associates | 01752 263636 |
| Sandberg LLP | 020 7565 7000 |
| SUM Ltd | 0113 242 7390 |

# 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
**SCM** Steel Construction Sustainability Charter
(Gold) = Gold, (Silver) = Silver, (Member) = Member

| Company name | Tel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | SCM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 – South Wales | 01633 627890 | | | | | | | | ● | | |
| ArcelorMittal Distribution – Scunthorpe | 01724 810810 | | | | | | | | ● | | |
| ASD metal services | 0113 254 0711 | | | | | | | | ● | | |
| 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 | | | | | | | | ● | | |
| BW Industries Ltd | 01262 400088 | ● | | | | | | | | | |
| Cellbeam Ltd | 01937 840600 | ● | | | | | | | | | |
| Cellshield Ltd | 01937 840600 | | | | | | | ● | | | |
| CMC (UK) Ltd | 029 2089 5260 | | | | | | | | ● | | |
| 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 | ● | | | | | | | | | |
| Easi-edge Ltd | 01777 870901 | | | | | | | ● | | | Gold |
| Fabsec Ltd | 0845 094 2530 | ● | | | | | | | | | |
| FabTrol Systems UK Ltd | 01274 590865 | | ● | | | | | | | | |
| Ficep (UK) Ltd | 01924 223530 | | | | | ● | | | | | |
| FLI Structures | 01452 722200 | ● | | | | | | | | | Silver |
| Forward Protective Coatings Ltd | 01623 748323 | | | | | | ● | | | | |

# Steelwork contractors for bridgeworks

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
**SCM** Steel Construction Sustainability Charter (Gold = Gold, Silver = Silver, Member = Member)

**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 | NHSS 19A | NHSS 20 | SCM | Guide Contract Value (1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Access Design & Engineering | 01952 685162 | ● | | | | | | ● | ● | ✓ | | | | Up to £3,000,000 |
| Briton Fabricators Ltd | 0115 963 2901 | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | | ✓ | | Up to £3,000,000 |
| Cairnhill Structures Ltd | 01236 449393 | ● | ● | ● | ● | | | ● | ● | ✓ | | | Gold | Up to £2,000,000 |
| Cleveland Bridge UK Ltd | 01325 381188 | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | ✓ | ✓ | Silver | Above £6,000,000 |
| Four-Tees Engineers Ltd | 01489 885899 | ● | ● | ● | ● | | ● | ● | ● | ✓ | | ✓ | Member | Up to £2,000,000 |
| Kiernan Structural Steel Ltd | 00 353 43 334 1445 | ● | ● | ● | ● | | | ● | ● | ✓ | | | Gold | Up to £800,000 |
| Mabey Bridge Ltd | 01291 623801 | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | ✓ | ✓ | Gold | Above £6,000,000 |
| Nusteel Structures Ltd | 01303 268112 | ● | ● | ● | ● | ● | | ● | ● | ✓ | ✓ | ✓ | | Up to £4,000,000 |
| Painter Brothers Ltd | 01432 374400 | ● | | ● | | | | | ● | ✓ | | | Silver | Up to £6,000,000 |
| Remnant Plant Ltd | 01594 841160 | ● | ● | ● | | | | | ● | ✓ | | | | Up to £400,000 |
| S H Structures Ltd | 01977 681931 | ● | | ● | ● | ● | | | ● | ✓ | | ✓ | Silver | Up to £3,000,000 |
| Severfield-Watson Structures Ltd | 01204 699999 | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | | ✓ | Gold | Above £6,000,000 |
| SIAC Butlers Steel Ltd | 00 353 57 862 3305 | ● | ● | ● | ● | ● | | ● | ● | ✓ | | | Member | Above £6,000,000 |
| **Non-BCSA member** | | | | | | | | | | | | | | |
| Allerton Steel Ltd | 01609 774471 | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | | | | Up to £1,400,000 |
| Cimolai Spa | 01223 350876 | ● | ● | ● | ● | ● | ● | | | ✓ | | | | Above £6,000,000 |
| Concrete & Timber Services Ltd | 01484 606416 | ● | ● | ● | | ● | ● | | ● | ✓ | | | Member | Up to £800,000 |
| Donyal Engineering Ltd | 01207 270909 | ● | | | | | | ● | ● | ✓ | | ✓ | Member | Up to £1,400,000 |
| Francis & Lewis International Ltd | 01452 722200 | | | | | | | ● | ● | ✓ | | | Silver | Up to £2,000,000 |
| Harland & Wolff Heavy Industries Ltd | 028 9045 8456 | ● | ● | ● | ● | ● | | ● | ● | ✓ | | | | Up to £2,000,000 |
| Hollandia BV | 00 31 180 540540 | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | | | | Above £6,000,000 |
| Interserve Construction Ltd | 0121 344 4888 | | | | | | | ● | ● | ✓ | | | | Above £6,000,000* |
| Interserve Construction Ltd | 020 8311 5500 | ● | ● | ● | ● | | ● | ● | ● | ✓ | | | | Above £6,000,000* |
| Millar Callaghan Engineering Services Ltd | 01294 217711 | ● | | | | | | ● | | ✓ | | | | Up to £800,000 |
| P C Richardson & Co (Middlesbrough) Ltd | 01642 714791 | ● | | | | | | ● | ● | ✓ | | | | Up to £3,000,000 |
| The Lanarkshire Welding Company Ltd | 01698 264271 | ● | ● | ● | ● | ● | ● | ● | ● | ✓ | | | Member | Up to £2,000,000 |
| Varley & Gulliver Ltd | 0121 773 2441 | ● | | | | | | ● | ● | ✓ | | ✓ | | Up to £3,000,000 |

| Company name | Tel | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | SCM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Goodwin Steel Castings Ltd | 01782 220000 | ● | | | | | | | | | |
| Graitec UK Ltd | 0844 543 888 | | ● | | | | | | | | |
| Hadley Rolled Products Ltd | 0121 555 1342 | ● | | | | | | | | | ● (grey) |
| Hempel UK Ltd | 01633 874024 | | | | | | ● | | | | |
| Hi-Span Ltd | 01953 603081 | ● | | | | | | | | | ● (green) |
| Highland Metals Ltd | 01343 548855 | | | | | | ● | | | | |
| Hilti (GB) Ltd | 0800 886100 | | | | | | | | | ● | |
| International Paint Ltd | 0191 469 6111 | | | | | | ● | | | | ● (orange) |
| Jack Tighe Ltd | 01302 880360 | | | | | | ● | | | | |
| Jamestown Cladding and Profiling | 00 353 45 434288 | ● | | | | | | | | | |
| Jotun Paints (Europe) Ltd | 01724 400000 | | | | | | ● | | | | |
| Kaltenbach Ltd | 01234 213201 | | | | | ● | | | | | |
| Kingspan Structural Products | 01944 712000 | ● | | | | | | | | | ● (orange) |
| Lindapter International | 01274 521444 | | | | | | | | | ● | |
| Metsec plc | 0121 601 6000 | ● | | | | | | | | | ● (orange) |
| MSW | 0115 946 2316 | ● | | | | | | | | | |
| Murray Plate Group Ltd | 0161 866 0266 | | | | | | | | ● | | |
| National Tube Stockholders Ltd | 01845 577440 | | | | | | | | ● | | |
| John Parker & Sons Ltd | 01227 783200 | | | | | | | | ● | ● | |
| Peddinghaus Corporation UK Ltd | 01952 200377 | | | | | ● | | | | | |
| PPG Performance Coatings UK Ltd | 01773 814520 | | | | | | ● | | | | |
| Prodeck-Fixing Ltd | 01278 780586 | ● | | | | | | | | | |
| Rainham Steel Co Ltd | 01708 522311 | | | | | | | | ● | | |
| Sherwin-Williams Protective & Marine Coatings | 01204 521771 | | | | | | ● | | | | ● (grey) |
| Structural Metal Decks Ltd | 01202 718898 | ● | | | | | | | | | ● (orange) |
| Sika Ltd | 01707 394444 | | | | | | ● | | | | |
| 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 | | | | ● | | | | | | |
| Tata Steel UK Panels & Profiles | 0845 308 8330 | ● | | | | | | | | | |
| Tekla (UK) Ltd | 0113 307 1200 | | ● | | | | | | | | |
| Tension Control Bolts Ltd | 01948 667700 | | | | | | ● | | | ● | |
| Wedge Group Galvanizing Ltd | 01909 486384 | | | | | | ● | | | | |



**SCI's courses keep engineers up to date with the lastest developments in steel design and equip them to design competently, efficiently and safely.**

SCI (the Steel Construction Institute) has been a trusted, independent source of information and engineering expertise globally for 25 years, and remains the leading independent provider of technical expertise and disseminator of best practice to the steel construction sector.

Many of our training engineers are internationally recognised experts in their fields and known for their code development and research work. Our engineers are renowned for delivering training to designers in a real world context, helping designers to solve every day problems confidently.

SCI training is continuously reviewed and updated to deliver the latest Eurocode compliant and quality assured technical information.

### DURATION
- In depth training courses
- Half day seminars
- 1 hour webinars

### DELIVERY
- In house - any or all of your office locations
- On-line
- Public venue

### DETAILS
- CPD certified
- Flexible and cost effective training methods
- Bespoke training for all sizes of organisation
- Simultaneous delivery across multiple locations

e: education@steel-sci.com
t: +44 (0)1344 636 525
w: **www.steel-sci.com\courses**

Linked in  twitter