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NSC

Tram bridge launch

March/April 2013
Vol 21 No.2

Excellent headquarters

Longbridge regeneration

Steel saves Greenwich time

Holborn heritage reinstated

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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'.

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Company

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Email

Cover Image
Co-operative Group head office, Manchester
Client: Co-operative Group
Architect: 3DReid
Steelwork contractor: Fisher Engineering
Steel tonnage: 3,200t

NSC
March/April 2013 Vol 21 No 2

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

Time to level the playing field

Nick Barrett - Editor

UK construction has been waiting patiently to see something flow from the Government's construction pipeline of infrastructure and other projects. Despite frequent promises there has been little seen so far, and the new PF2 financing initiative, which a lot of hopes are pinned on, seems to have stalled. Better news was hoped for in the Budget, which was due as we went to press, but few were holding their breath.

When projects do eventually start to flow, as they one day must, it will be more than normally important for UK based suppliers to get a fair crack of the whip when bidding for them – an already battered construction sector could do without unfair competition from overseas suppliers who are not bound by the same regulatory imposed costs as UK companies.

The BCSA has launched a timely campaign to encourage government to consider more than just crude price when awarding public sector contracts. Rebuilding Britain has been launched as some key projects like the Mersey Gateway are coming up for award, and memories of the award of the steelwork contract for the central span of the Forth Replacement Crossing to a Chinese company are obviously fresh in the mind.

What BCSA, and supporters in the construction and other industries, are saying is that they have to produce their products under a much tighter regulatory framework than some overseas rivals do. In particular, there is the social aspect of sustainability to consider as health and safety is not always what it should be elsewhere.

BCSA's campaign calls for these factors to be considered during the procurement process, which they are convinced would often swing the calculations in favour of UK suppliers.

There are undoubted benefits of using UK and Ireland based steelwork contractors, including health and safety and environmental and quality control, which the BCSA wants to be recognised in the procurement process. BCSA also calls for the constructional steelwork supply chain on all government funded, endorsed or supported projects to be procured using a BCSA quality assurance scheme which the Highways Agency has done for bridges since 2001.

UK construction, especially the steel construction sector, is confident of providing value for money, sustainable products and projects to the highest international standards and is well able to hold its own against international competition – but not if the dice are loaded against them from the start.

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Call for level playing field

BCSA President Ivor Roberts addresses the National Dinner

Guest tables at the National Dinner

BCSA President Ivor Roberts criticised the award of the Forth Replacement Crossing steelwork contract to a Chinese company as a blow that must not be allowed to happen again. Speaking at the BCSA's National Dinner Mr Roberts said the award to an overseas company was completely unnecessary, causing taxpayer's money to flow out of the country.

BCSA Members have secured the steelwork contracts for the north and south approaches to the bridge, but he said this was too little and too late. Mr Roberts said the Forth Replacement Crossing contract award was one of the spurs for the recent launch of the BCSA's Rebuilding Britain Campaign, which calls for the Government to ensure that local supply chains are put first for the good of the economy and the industry.

UK companies were not competing on level playing fields when they faced the higher costs of quality assured production and health and safety and other regulations that overseas competitors did not bear.

The campaign calls for the economic benefits of using UK and Ireland-based companies to be written into procurement guidelines and for the benefits of using UK and Ireland constructional steelwork contractors to be recognised in procurement processes. Constructional steelwork on all government funded, endorsed or private finance infrastructure projects should be procured using a BCSA quality assurance scheme member.

News that the Government is supporting Chinese investment in UK infrastructure and construction poses an enormous risk to the whole construction supply chain, he said, adding:' This is one battle that I believe we can win - but only by working together to engage in a concerted and long term campaign.'

Mr Roberts urged Members not to engage in pricing below what is needed to earn a sustainable profit. He said: "As steelwork contractors we have to price our business to actually make a profit as well as insisting on fair and reasonable contractual terms, or we will run the whole industry into the ground. And as a steelwork contractor I know that it's possible to just say no to suicide pricing and unfair contracts, and continue to run a successful business."

Among the highlights of the year were the hard work by the BCSA's committees that supported the introduction of Project Bank Accounts on government funded contracts, work towards the introduction of CE Marking for construction products later this year and for fabricated structural steelwork in 2014. As part of the Joint Market Development Board partnership, Tata Steel and the BCSA have worked with the Steel Construction Institute to deliver an important new website - *www.steelconstruction.info* - that provides a new first stop for all steel construction related advice.

Members had continued to drive down accident rates with the help of the Health and Safety Committee.

London calling

Guest speaker Sir Edward Lister, Chief of Staff and Deputy Mayor for Planning for the Greater London Authority, said he was very optimistic for the future of London - the greatest City on earth, he claimed - and for the steel construction sector's role in continuing to help develop it.

Employment is rising in London, by a forecast 6.2%, and the booming insurance sector was only one of a number that demanded the large open spaces that steel framed buildings provide.

Cranes were rising in Docklands as development continues there he said, and City of London developments under way and planned 'radiated confidence' in the future.

London is growing faster than New York or anywhere in Europe. Population growth of 13 million by 2031 would need to be catered for with future developments, including places for these people to work and relax as well as live.

This meant a lot of development had to be successfully undertaken. 'We have the powers to ensure that it happens and we will do it,' he promised.

Guest speaker, Sir David Lister

CE Marking supplement with this issue

Copies of this issue of New Steel Construction (NSC) include an additional supplement on CE Marking and its impact on the steel construction sector.

The BCSA has made CE Marking compliance a condition of membership as from 1 July 2014.

Meanwhile, the Construction Products Regulation (CPR) requires CE Marking of all construction products from 1 July this year and the CE Marking of fabricated structural steelwork from 1 July 2014.

Readers of NSC, whether BCSA Members or not, will find the supplement contains all the relevant information needed for these imminent deadlines.

BCSA campaign urges government action for UK businesses

The British Constructional Steelwork Association (BCSA) has warned the Government that the country will lose out on economic growth and hundreds of thousands of jobs if major infrastructure work is not awarded to companies manufacturing in the UK.

This is the message from the Rebuilding Britain campaign, launched by the BCSA, which calls for procurement guidelines to be put in place that prioritise best value and recognise the economic, social, environmental and quality benefits that UK firms can offer.

"Last year, the UK's last remaining train factory bid for and lost out on a £1.4bn contract to build 1,200 carriages for Thameslink. Bombardier went on to cut 1,000 jobs and concerns still remain over the job security of the business' remaining 1,600 UK employees," said Sarah McCann-Bartlett, BCSA Director General.

"We need a fundamental shift in procurement guidelines to consider best value, not cost alone."

The BCSA says that for every £1 spent on British construction, £2.84 is generated for the wider economy. Just £1bn of investment spent with UK firms could create 32,000 new jobs.

Ms McCann-Bartlett said one of the first opportunities to deliver the Rebuilding Britain campaign's calls to actions will be on the forthcoming Mersey Gateway Bridge project.

Enterprise Minister praises steel contractor

The Scottish Energy and Enterprise Minister Fergus Ewing has praised Watson Towers, one of Scotland's leading independent heavy engineering firms and parent company of Cairnhill Structures, for its work during a visit to its Coatbridge facility.

Mr Ewing said: "It's really good to see an ambitious Scottish company like Watson Towers grasping every opportunity to win orders.

"They are very active in the energy sector, and I am encouraged to hear they have international orders bound for China.

"The Scottish Government has pledged to increase the value of international exports by up to 50% by 2017 and the success of businesses like Watson Towers will help us reach this target."

Watson Towers current contracts include the construction of a huge carousel floor for a North Sea cable laying barge and providing specialist engineered components for a Biomass conversion at Ironbridge in Shropshire.

L to R: Watson Towers executives Jack Sanderson and Neil Watson, Scottish Energy Minister Fergus Ewing, and Fraser Towers, also of Watson Towers standing in front of steelwork for a North Sea pipe laying barge.

Construction under way at Center Parcs

Steelwork is playing a crucial role in the construction of the latest Center Parcs leisure complex taking shape at Woburn Forest near Milton Keynes.

The £250M development, one of the UK's largest leisure projects, includes seven miles of new roads and is centred around a 17,000m^2 lake.

Working on behalf of contractor Bowmer & Kirkland, Hambleton Steel is erecting approximately 1,000t of steel in a programme scheduled to be completed in the summer.

The work consists of erecting a sports hall, eateries, a hotel, venues and an indoor swimming complex known as the Aqua Park (pictured).

Center Parcs Woburn Forest is due for completion in spring 2014.

NEWS IN BRIEF

The **SCI** has produced a guide to the design and installation of light gauge steel external wall systems. It highlights to clients and specifiers performance and product capability information that should be considered during design and installation. For further information visit: *http://shop.steel-sci.com*

A C Bacon Engineering has had its Royal Warrant renewed again. The company is 'by command of Her Majesty The Queen appointed into the place and quality of manufacturer of steel framed buildings to Her Majesty.'

Cleveland Bridge has been awarded the contract to fabricate, deliver and assemble the north and south approach viaducts for the new £790M Forth Replacement Crossing. Cleveland Bridge General Manager Andy Hall said: "We are delighted to have secured a significant contract which will provide a solid foundation for our Darlington facility for the next 18 months."

Specialist industrial coatings supplier, **Leighs Paints** is now trading as Sherwin- Williams Protective & Marine Coatings. The name change does not affect products and the company will continue to manufacture the Firetex range of passive fire protection.

SCI, in partnership with modular supplier **Futureform**, architects **HTA**, and five other European partners has been awarded a project by the European Commission under the Framework 7 programme. It will involve physical testing and structural modelling aimed at developing and extending the use of modular construction systems in the residential building sector.

Park House, a mixed use development in central London that required more than 3,300t of structural steelwork has won the 2012 Bentley Be Inspired Award. The project was recognised for use of generative design software to solve extremely difficult challenges. Steelwork contractor for the project was **Severfield-Watson Structures**.

Elastic Design of Single-Span Steel Portal Frame Buildings to Eurocode 3 (P397) is a new publication from the **SCI** offering guidance in accordance with the Eurocodes and UK National Annexes. It is available from: *http://shop.steel-sci.com*

AROUND THE PRESS

The Daily Telegraph
5 February 2013
£100bn of growth at risk' if British firms don't get infrastructure work
Britain's steel contractors have warned the Government that it risks more than £100bn of growth and hundreds of thousands of jobs if it does not give major infrastructure work to companies manufacturing in Britain.

Building Magazine
1 February 2013
Testing their metal
Alan Todd of the British Constructional Steelwork Association says: "Overseas competition may look very competitive on paper but checks need to be made to ensure there is a level playing field on health and safety, quality and environmental legislation."

New Civil Engineer
14 February 2013
Terminal velocity
[London Bridge Station redevelopment] There will be eight bridge deck structures. Each will carry two tracks and two platforms and consist of three or four simply supported spans of 22m to 26m, typically made up of six plate girders 970mm deep by 600mm wide.

Building Magazine
25 January 2013
The place to be
[The Place, London Bridge] - Squeezing a quart of a building into a pint pot of ground meant the pressure was on the steel frame. "This was one of the most complicated parts of the programme," says Jack Adams, WSP's technical director. The frame had to cantilever outward from the area of the building founded on solid ground by up to 12m.

Construction News
28 February 2013
City block recycles from foundations up
"There was never any question of using concrete for the frame," says Balfour Beatty project manager Andy Clarke. "It never got a look-in. Here we are creating an open floor plate on nine levels above the Holborn Viaduct. Reinforced concrete would have been just too heavy."

Port Talbot blast furnace restarted

Tata Steel has restarted its second blast furnace at the Port Talbot steelworks following the completion of a £185M rebuilding project.

Known as Blast Furnace No. 4, it was one of the UK's largest industrial engineering projects of last year (NSC Nov/Dec 2012). The furnace is more efficient than previous units and will allow Tata Steel to continue to meet the demanding requirements of UK and European manufacturing industries.

Karl Köhler, CEO of Tata Steel's European operations, said: "This rebuild has been a flagship investment, part of our strategy for long term competitiveness in UK, EU and worldwide markets. The efficiency and sustainability of the new furnace will also make a major contribution to our efforts to create an 'all-weather' company in Europe.

Blast Furnace No. 4 was decommissioned in July last year before being completely rebuilt, incorporating the latest technology to improve energy efficiency, environmental performance, safety standards and capacity.

Further energy and environmental benefits will be gained from the recently completed £55M energy-from-heat scheme at Port Talbot's steel plant which will save 10MW of energy – enough to power 20,000 homes.

Steel supports North Sea oil terminal

Structural steelwork is playing a significant role in the construction of Total's new gas processing plant on Shetland.

Located next to the Sullom Voe oil terminal, the new plant will process gas from the Laggan and Tormore gasfields, 90 miles northwest of Shetland.

Working on behalf of main infrastructure contractor Morrison Construction, BHC is fabricating, supplying and erecting more than 2,000t of steel for the construction of 34 buildings.

Three of the buildings are office and accommodation blocks with the remainder being industrial and plant buildings. The structures vary in size from large compressor storage facilities with a height of up to 15m to eaves, to small individual plant rooms requiring less than 10t of steelwork.

All of the steelwork is delivered to site by ship from Aberdeen and held at a local compound until it is required.

The biggest challenge for the steelwork contractor is the weather. Eddie Brown, BHC Project Manager said: "Severe wind and snow during the winter has meant there have been quite a few days when steel erection was not possible."

Even so, the project is on schedule and BHC will complete its work by the end of the year.

More power for Devon on the way

Construction work has begun at the UK's latest energy-from-waste facility (EfW), which once complete, will process 60,000t of household waste per annum for Devon County Council.

The project's entire steelwork, cladding, door and window package has been awarded to the Bourne Group, with the facility scheduled to be processing waste by summer 2014.

Steel erection began with the silo support frame which commenced at the beginning of last October. This was followed by the erection of the boiler support frame and access walkways.

Construction of the main EfW building has now started, with the structure's frame being built around the boiler support works. During the 39 week programme, Bourne will carry out the connection and cladding design and erect the structural steelwork to support the envelope and beams for the crane.

The scope of works also includes the cladding and installation of the plant's gutters, rainwater pipes, windows, louvres, mansafe roof systems in addition to the industrial and personnel doors.

The County Council's partner for the Exeter EfW is recycling and renewable energy company Viridor. The subcontractor building the plant is French company TIRU who are working on site with Chilworth Construction Management.

Work progresses on Stonehenge visitor centre

Facilities at Stonehenge, one of the world's most famous prehistoric sites, are being transformed by a number of improvements.

Central to the works is a new steel framed visitor centre being erected by S H Structures (SHS), working on behalf of main contractor Vinci Construction.

The centre will comprise of two braced 35m^2 pod structures housing an exhibition area, a café with indoor and outdoor seating, a shop and a dedicated education space.

Covering the pods will be a large undulating canopy roof, supported by a series of raking RHS columns.

S H Structures is currently erecting the columns and the roof, all of which has to be temporarily supported with props and scaffolding until the entire structure is complete.

The roof is being formed by a series of RHS ladder sections, which are transported to site in two pieces before being welded together.

"It is a time consuming job with a lot of on site welding," says Ian Mitchell, S H Structures Project Designer. "Infilling between each ladder section involves welding a number of individual pieces."

The overall project also includes a new car park and coach park, while a section of the A344, which runs next to the World Heritage Site, is due to be closed at the end of June and grassed over to improve the site's setting.

Designed by architect Denton Corker Marshall, the visitor centre is due to open later this year

Mosque shaped by bending experts

Barnshaw Section Benders has completed the contract to bend sections for the construction of the Al Emaan Mosque in Sheffield.

The company's work involved forming the main frame ribs and curving the support steelwork in two planes.

There was a total of 72 pieces forming the mosque's dome, with 12 main 200mm × 100mm RHS vertical ribs and a further 60 supporting 100mm × 60mm RHS ribs joining the structure horizontally.

New City monument takes shape

Construction work is nearing completion on 24 Monument Place, a nine-storey retail and commercial development in the City of London.

Located opposite the Monument, the famous London landmark which commemorates the Great Fire of 1666, the building will offer two lower levels of retail and approximately 7,600m^2 of office space.

The development is a steel framed structure with Portland stone cladding and full height glazed windows. Working on behalf of main contractor Mace, Severfield-Watson Structures has fabricated, supplied and erected the steelwork.

Architect for the project is David Walker Architects and structural engineer is WSP. The scheme is scheduled for completion in June.

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*

12 Mar 2013
Design of Structural Stainless Steel
1 hour webinar

14 Mar 2013
Light Steel Solutions for All Applications
½ day Seminar

21 Mar 2013
Steel Connection Design
1 day - London

23 Apr 2013
CE Marking
1 hour webinar

14 May 2013
Essential Steelwork Design (2 day course)
1 hour webinar

Tuesday 11 June
Fire Engineering
Beardmore Hotel, Glasgow

TATA STEEL

Thursday 20 June
Fire Engineering
Novotel Bristol Centre

TATA STEEL

Retail drives regeneration at former car plant

Steel is the material of choice for a project that will eventually deliver a large retail, commercial and residential scheme at Longbridge, once the world's largest car plant.

FACT FILE
Sainsbury's store, Longbridge Town Centre
Client: St. Modwen
Architect: Holder Mathias
Main contractor: Morgan Sindall
Structural engineer: Rodgers Leask
Steelwork contractor: James Killelea & Co
Steel tonnage: 1,000t

The Sainsbury's store anchors the development

One of the most integral elements of the multi-million pound regeneration of the world famous former Longbridge car plant site in Birmingham is the creation of a new town centre.

With a number of residential phases planned and some already under way at Longbridge, providing an area for people to shop, dine and relax is an important step.

The initial parts of the town centre development will open for business later this year, with a second construction phase kicking off soon.

A 7,900m² Sainsbury's store is one of the major anchor elements of the scheme and, along with the new Bourneville College, it sits on the corner of Longbridge Lane and the main thoroughfare into the new town centre.

Using steelwork for this large retail structure was always the way to go, as Rodger Leask Project Engineer Kully Toor explains: "There is undercroft car parking combined with the need for larger spans for the retail area above. Steel was the only material that could

Long spans are essential for the store and the car park situated below

Retail units take shape

efficiently provide these requirements."

The 475 space car park is situated below ground level with approximately half of it positioned beneath the retail structure. The entire car park was initially excavated and is now surrounded by retaining walls with a ramp connecting it to an adjacent street. Steelwork starts at the lower ground concrete slab and columns are positioned on a 16.5m × 7.5m grid.

"This is a typical car park grid, but above we've omitted alternate columns to get a much larger 16.5m × 15m open plan area for the store," adds Mr Toor

The car park has a standard height of 2.4m, but the store has a double floor to ceiling clearance. This is because the retail area has been designed to accommodate a future mezzanine level if required. This resulted in slightly heavier columns and larger piles than required initially, but has ensured that installation of the mezzanine floor will be straightforward.

Speed of construction is always a vital ingredient in any construction programme and here at Longbridge it is no different. As the Sainsbury's store forms an entrance to the development it is a flagship scheme and one designed to attract shoppers and tenants alike.

"Steel provides us with speed, flexibility, future-proofing, long spans and the continuity to work in some very inclement weather..."

"Sainsbury's and the other retail elements are all being constructed with steel," says Mark Batchelor, St. Modwen Construction Manager. "The material provides us with a number of benefits such as speed, flexibility, future-proofing, long spans and the continuity to work in some very inclement weather experienced this winter."

The structural form of the store is a braced frame, with large cross bracing elements located in the perimeter walls. The 1,000t steelwork total consists of 1,630 individual pieces of hot rolled steel that needed more than 20,000 bolts.

As the steel erection process had to start at a lower ground level, and as the site only has one entrance, site logistics played a major role.

The Town Centre scheme is designed around a new green area known as Austin Park

"We needed two erection gangs, each with their own 50t capacity mobile crane, to complete the project on programme," comments Bob Allan, James Killelea Project Manager. "With restricted access and all deliveries coming in at the same entrance we had to do a lot of coordination with the main contractor Morgan Sindall to make sure everything ran smoothly."

The big picture

The overall Longbridge regeneration project is vast and covers an area of 450 acres in south Birmingham. Formerly a large car manufacturing plant employing as many as 250,000, with a history incorporating many innovations in car production, the site was acquired by St. Modwen in 2003 from MG Rover. The car manufacturer then leased back a portion of the site, freeing up the rest of the land to be redeveloped. MG now has Chinese owners and retains a small research and development presence at Longbridge, but all around is changing fast.

Steel construction has played an important role in the majority of the development's completed projects. For example, at the Longbridge Technology Park, Hambleton Steel, working on behalf of John Sisk, erected two three-storey office blocks. An adjacent youth centre known as The Factory is also steel framed, while elsewhere at Longbridge two steel framed industrial units have been completed by McLaren Construction at Cofton Centre.

As well as a Sainsbury's store, phase one of the Town Centre scheme also includes smaller steel framed retail units and offices, while a steel podium supports a hotel. Phase two kicks off imminently with more retail zones and a multi-storey car park.

"We've had five bids for phase two and all of them favour a steel solution," says Mark Batchelor, St. Modwen Construction Manager.

"Steel offers flexibility of design and speed of construction which is important for retail dominated projects."

More industrial units are also planned, while residential schemes and a new two acre park are also taking shape next to the retail zones.

Industry solves technical challenge

Structural steelwork has played a prominent role in creating a technical college with an industrial identity.

A retained 1950s warehouse is incorporated into the scheme

A brownfield site in Woolwich south London is being converted into a new University Technical College (UTC) backed by the University of Greenwich, Transport for London, Wates and the local authority, the Royal Borough of Greenwich.

UTCs are said to be a new concept in education, offering 14-19 year olds a full time, technically orientated curriculum and clear route into higher education, apprenticeships and careers.

As well as technical subjects, specialising in engineering and construction, students will also study GCSE and A-level subjects, so a mixture of classrooms and workshops are required for a UTC.

To highlight this technically aligned educational format an industrial feel to the college design has been achieved, most notably through the use of exposed structural steelwork and the retention of a steel framed 1950s warehouse.

This existing structure has had its original steelwork strengthened and the building will house workshops and classrooms. An adjacent new steel building with three floors will accommodate more classrooms and will feature plenty of exposed steel, enhancing the premises' desired architectural feel.

As well as providing the project with the required aesthetic look, steelwork was chosen for its speed of construction. "The UTC will open in time for the autumn (2013) term," says Kevin Stoney, BAM Construction Project Manager. "We only have a 12 month on site programme, so a quick steel erection process is vital for keeping us on schedule."

Another important consideration was the poor ground conditions under the site. The new steel framed structure is supported on piled foundations and the lighter steel solution reduces the number and lengths of piles needed.

Bourne Special Projects completed the steel erection, which also included the installation of precast planks, in just six weeks.

"The site is quite constrained and having another contractor on site laying the precast planks would have meant us having to stop the steel erection programme intermittently," says Chris Page, Bourne Special Projects Senior Site Manager. "By doing both tasks we were able to erect one floor along with the planks, and then move on to the next level using the lower floor as a safe working platform."

In order to provide stability to the new three-storey high frame, Bourne initially installed a fully fabricated and braced lift shaft. Weighing 9.5t, the steel framed unit was brought to site in one piece and saved the overall programme nearly three days of assembly work. Once in place, the shaft -

Although two separate buildings, the workshop and teaching block form one connected facility

which is centrally positioned along one of the main elevations – allowed the rest of the steel frame to be erected around it.

The teaching block has a footprint of 58m × 18m and features a first floor entrance foyer leading onto the adjacent Woolwich Road. Steps will lead up to the main doors and then into the college. The first and second floors will accommodate classrooms, while the ground floor will house dining areas and a large open plan fitness suite.

Each of the three floors has a different wall alignment as the rooms on each level vary in size. This has made it difficult to align column positions within walls as grids vary between 3m and 9m throughout the structure. However the flexibility of a steel framed solution has worked successfully within these constraints.

In order to create a 17.2m × 19m ground floor fitness suite with no internal columns a transfer structure has been installed. This consists of two 16m long 1.11m-deep plate girders, and is positioned at roof level.

"Both the first and the second floors above the fitness suite are hung from these two girders, forming the open space at ground floor," says John Matthews, Associate at Clarke Nicholls Marcel. "Putting the transfer structure at roof level was the most efficient solution. The only alternative was to place deep transfer beams at the underside of the first floor. The first floor could not be raised due to the adjacent street level, so this would have meant lowering the ground floor level to maintain the required clear height. The additional excavation costs meant this wasn't an option."

Positioning of the vertical bracing was also a challenge says Mr Matthews: "On a long narrow building most of the walls and partitions have windows, doors or teaching boards, so areas for bracing are at a premium. The lift shaft is heavily braced making it a primary core, while cross bracing has also been installed beside the stairwells and moment resisting frames used to maintain structural stability."

Both the teaching block and the renovated workshop will form one large interlinked building, although each is structurally independent with a movement joint separating them.

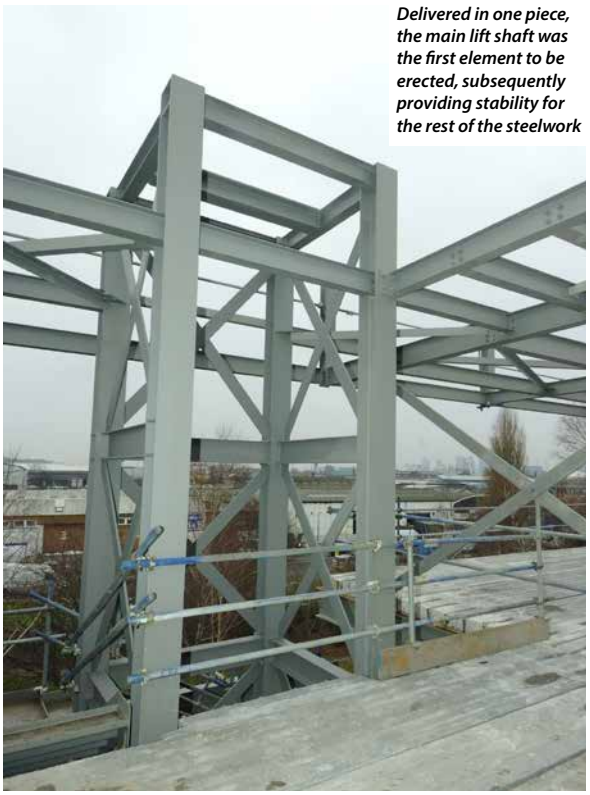
The original steelwork frame for the workshop dates from the 1950s. Visual surveys confirmed it was in good condition with very little corrosion. The structure has been re-checked based on the original steel section values and design stresses including additional loading from the new roof covering. It has also been stiffened with new vertical and horizontal bracing and horizontal tie beams to allow existing internal masonry shear walls to be removed.

A steel framed canopy has been added to the rear (interior) elevation of the workshop. It is 50m long, 6m wide and supported on 10 × 4.2m high columns at varying centres. As well as providing external protection for students from inclement weather, it is another steel architectural feature adding to the overall industrial look.

FACT FILE

Royal Greenwich University Technical College

Main client: Royal Borough of Greenwich
Architect: Walters & Cohen
Main contractor: BAM Construction
Structural engineer: Clarke Nicholls Marcel
Steelwork contractor: Bourne Special Projects (part of Bourne Group)
Steel tonnage: 234t
Project value: £9.5M



Delivered in one piece, the main lift shaft was the first element to be erected, subsequently providing stability for the rest of the steelwork

A steel frame supporting precast planks was the quickest construction option for the teaching block

Appraisal and reuse of existing buildings

Proposed changes in the planning system under current consultation are intended to promote sustainable development by making the best use of existing buildings. Changes of use between industry and warehouse classes to business/ office use are expected to occur more often, leading to a greater need for structural appraisal of steel buildings

Amongst the available publications assisting in this process are the following:

- *Historical Structural Steelwork Handbook,* W Bates, BCSA Ltd, 1984;
- *Appraisal of existing iron and steel structures,* M Bussel, SCI Publication 138, 1997;
- *Appraisal of existing structures (Second Edition),* Institution of Structural Engineers, 1996.

The principal technical challenges in converting the workshop building for use by the Royal Greenwich UTC flowed from the slightly increased loads from the new roof and the change to the lateral stability system for the building.

Architectural requirements imposed limits on the width of bracing elements such that tension-compression bracing formed from tubes was too wide. New steel tension-only cross bracing in the form of 150mm x 30mm flats was therefore provided where allowed by the architectural layout. The bracing elements chosen are axially stiff to minimise the change in stiffness from the internal masonry walls. The lever arm of the braced panels is such that the uplift from the overturning moment is overcome by the column vertical load and work to the foundations has been avoided.

It is common for demolition and opening-up work to reveal unforeseen complications. It was discovered that on one grid intersection, the expected steel column was not present: the roof steelwork was supported on a brick pier. A new steel column was required to complete the bracing panel in this location.

The structure was re-analysed using proprietary software for vertical loads from the new roof and wind loads determined using BS6399 Part 2. Elements were hand-checked to BS 5950-1: 2000 using original section properties taken from the Historical Structural Steelwork Handbook. Existing elements were found to be adequate except for transfer beams supporting alternate trusses. The installation of pv panels was restricted to reduce the loading on the transfer beams to an acceptable level.

Checking the structural adequacy of steel elements using limit-state design codes is satisfactory; however this is not always so. The approach is unsuitable for the assessment of cast iron because failure in tension is always brittle and sudden. Cast iron elements should therefore be assessed using elastic section properties, service loads and permissible stresses.

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Swan friendly steel on signature Thames crossing

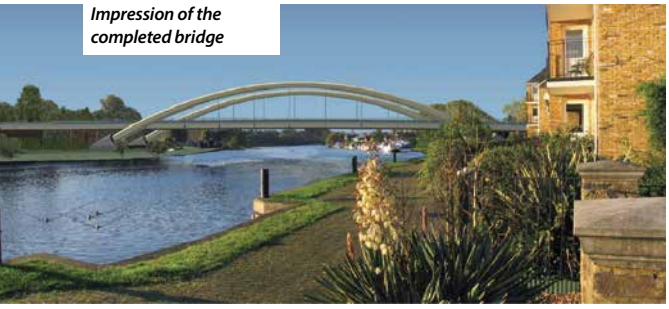
A slim, sleek and arched steel bridge will help keep traffic flowing across the River Thames and aid safer navigation along the waterway. Martin Cooper reports.

The bridge will be painted cream, a colour that is said to be swan friendly

The first new vehicle crossing of the River Thames since the Queen Elizabeth II bridge at Dartford opened in 1991 is taking shape at Walton-on-Thames.

This area of suburban Surrey has had a river crossing since 1750; the new replacement structure is the fifth to span the Thames at this location linking Walton-on-Thames with Shepperton.

Located between Chertsey Bridge and Hampton Court Bridge, both of which are Grade ll listed structures unlikely ever to get planning permission to increase their capacities, a signature structure with a long term capacity provision was essential.



Impression of the completed bridge

A steel composite thrust arch, one that transfers its loads partially into a horizontal thrust restrained by the abutments, was chosen by Surrey County Council as the best and most economical way to achieve these goals.

"The client wanted an arch and steel was the best option to construct this type of bridge," says Andy Bannister, Costain Project Manager.

Walton Bridge will have a clear central span created by a 96m wide arch (the entire bridge is 148m long including back spans), and with no piers positioned in the water it will improve river views and navigational safety.

The bridge is being built adjacent to two temporary bridges that it will supersede upon opening later this year. The oldest of these, built in the 1950s to replace a bomb damaged structure, now only carries pedestrians and cyclists, while the other temporary bridge – which carries all road traffic – opened in 1999.

"The newest temporary crossing has a limited period of planning permission that expires in 2014," explains Andrew Woodward, Surrey County Council Project Manager. "Consequently, we've been planning for this new bridge for some time and the selected thrust arch structure was chosen for a host of environmental and programme reasons."

Constructing the bridge within metres of the existing structures will allow the project team to reap some programme benefits, as minimal road adjustments are necessary on either riverbank.

Building a structure across a river, even one that is usually quite benign at this upriver stretch, always brings with it a host of unique challenges. A temporary trestle was initially erected mid-stream to aid the bridge erection, while the latter part of the steel programme has relied on a floating pontoon to support a mobile elevating work platform (MEWP).

"A lot of our work has been dependent on the river speed," adds Mr Bannister. "The

FACT FILE
Walton Bridge, Walton-on-Thames
Main client: Surrey County Council
Main contractor: Costain
Structural engineer: Atkins
Steelwork contractor: Mabey Bridge
Steel tonnage: 1,100t

The arch was erected with the aid of a trestle positioned in the river

Thames looks fairly sedate most of the time, but we've lost a few days when it's been too dangerous to ferry workers out into the river."

Luckily the winter weather has not been that bad, except for a bit of snow. The steel erection was completed this February and the bridge is on schedule to open to traffic in July 2013.

Work started in January 2012 with the installation of foundations for the two abutments and for the midstream temporary trestle.

Steelwork contractor Mabey Bridge was then able to begin its erection work which kicked off with the setting up of the trestle, lifted into place by a 500t capacity mobile crane.

The structure's signature arch needed to be built first as this would then allow the remainder of the bridge to be suspended from it.

The two hexagonally shaped arches were fabricated from plate and have a depth that tapers from 2.5m to a minimum of 1.5m at the crown. The arches are also hollow to allow for maintenance inspections.

Initially the two arches were fabricated into eight pieces. They were transported to site and welded into four larger 140t sections, each one a half of an arch, and these were then individually lifted into place.

Using a large 600t capacity crawler crane the two western halves (Shepperton bank) were lifted into place first. They were connected onto concrete abutments on the riverbank and temporarily supported at midpoint on specially made cradles on top of the trestle.

"We then had a week long operation of dismantling the crane and reassembling it on the east bank, so we could erect the other two halves," says Gareth Day, Mabey Bridge Project Manager.

Once the four arch sections were all in place they were welded in situ, stressed and then released from the supporting trestle. The arches were now self supporting, so the trestle was dismantled and the team was able to begin installing the bridge hangers and installing the deck.

Workers in MEWPs, positioned on the pontoon, connected the solid steel hangers to the arches. The moveable raft was then used to aid the installation of the deck sections.

The deck steelwork was sent to site in numerous pieces and assembled into 10 ladder sections. These varied in length with the longest being 22m. Each section consisted of two outer 600mm deep J-shaped girders, with all connecting 13m long crossbeams bolted into position.

The girders were chosen as their profile allows the bottom flange to be hidden, aiding the desired sleek signature appearance. "On top of the steelwork there will only be a 250mm deck, meaning the bridge will have a shallow and thin appearance, which was a client wish," says Robert Wheatley, Atkins Project Engineer.

Each deck section weighed up to 60t and was lifted into place with formwork already installed, meaning there would be less work to be undertaken over the river.

Eight of the deck sections was erected from the eastern bank of the river. The final two deck sections were out of the crawler crane's reach and were erected from the western bank, once the crane had been moved and reassembled once again.

Having erected the steelwork, Mabey Bridge will shortly be returning to site to complete the painting. The steel will be a cream colour, a hue that is said to be swan friendly, easy for them to see and avoid when flying.

Once complete Walton Bridge will provide Surrey with a bridge that not only helps to maintain traffic flows across this busy part of the Thames, but also provides the local community with a signature structure to be proud of.

Welding enclosures were positioned at the top of the trestle

Trams running on steel

The construction and launching of steel composite bridges are an essential element of a citywide tram extension project. Martin Cooper reports.

The City of Nottingham is extending its NET tram network with the addition of two new lines to the southern and southwestern suburbs of Clifton and Chilwell.

With a combined length of 17.5km, the lines which are due to be operational in late 2014, will link directly into the existing network near Nottingham's main railway station. The new tramlines will actually pass right over the Edwardian Grade II listed station on a new bridge, while the project as a whole will require a number of other bridges to span railways, roads and the River Trent.

Steel construction is playing an important role on the project, as five major bridges are all reliant on the material. The biggest and most iconic of these is known as the Karlsruhe Friendship Bridge, a 104m-long structure that will span the main station and Station Street.

The bridge is being assembled in two separate segments at a dedicated yard. Both of these segments require highly precise launching procedures, the first of which was completed in February (see box) to get the bridge into its first stage erected position.

The bridge is a two span warren truss structure formed with large trusses made from 711mm diameter × 40mm thick jumbo circular hollow sections (CHS).

To ensure they can be transported by road, Cleveland Bridge is fabricating the trusses in half sections measuring 25m-long × 3.5m wide and weighing 30t. On site they are welded up (four for each half segment of the bridge) to form a section ready to be launched.

Connecting the two sides of the truss together is a series of large cross girders spaced at 2.6m intervals. These are a mixture of fabricated plate girders and rolled sections all of which have bolted connections.

Completing the steelwork is a 1m-high × 20mm thick steel shutter plate to support the edge of the deck, which is added to both sides of the bridge prior to the launch.

"Steel was the best option for the bridges, and construction in any other material would have made the structure much heavier to launch and would have needed more supports," says Martin Carroll, Taylor Woodrow Alstom Project Director.

"A steel warren truss bridge also lends itself to the overall design of the station which is currently being renovated."

Once the launches have been completed work will then begin on the 70m-long Queens Road Bridge. This structure will be connected to the southern end of the Karlsruhe Bridge to form a continuation of the city centre overpass.

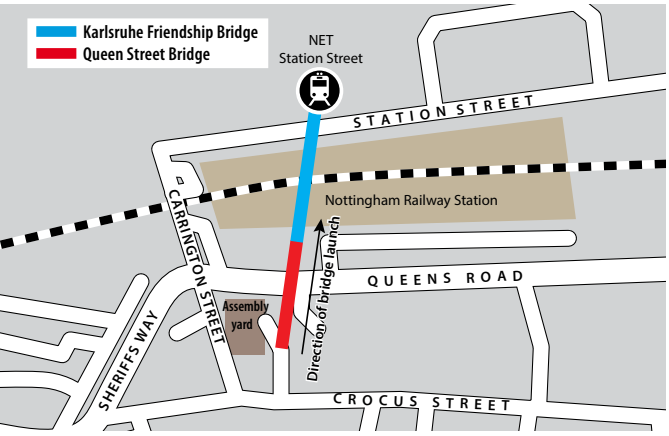
Queens Road Bridge is a trapezoidal open top box girder structure with two spans requiring 263t of structural steelwork.

"In the same yard we will be assembling the box girders into two 35m-long sections," says Stephen Osbourne, Cleveland Bridge Operations Manager. "We will then lift them onto their supporting piers with a large mobile crane during a weekend night road closure."

"We have a vast amount of experience of fabricating and erecting box girder bridges of this form having recently completed the M74 Glasgow project."

Away from the city centre three other bridges are relying on steel construction. Work has recently been completed on Wilford Toll Bridge, an existing steel composite bridge that spans the River Trent. It was originally built as a railway bridge, but recently it has solely been used by pedestrians. In order to accommodate twin tramlines for the Clifton branch extension, the structure is being widened with the aid of additional plate girders braced to the side of the original steel deck.

After three weeks of preparatory strength-



The Wilford Toll Bridge has been widened to accommodate twin tram lines

The first section of the Karlsruhe Friendship Bridge ready to be launched

Bridge launched

Work to start launching the first part of the iconic bridge that will carry trams over Nottingham Station began on Monday 11 February. A team of up to 30 people ensured the 410t steel structure was pushed from its compound 50m over Queens Road towards the railway station.

The precise engineering process involved slowly sliding the structure in 2.6m cycles, between 8pm and 6am on five consecutive nights, using a series of hydraulic ram jacks positioned on supporting temporary towers. The bridge was moved up to 13m every night.

During the launch the bridge was continually monitored from the end of the existing tramline using targets fixed to a specially designed temporary steel nose.

Now that the first half has been installed, there is room in the compound to assemble the second half of the bridge. Once complete the second half will be joined to the first and the entire 1,100t structure will then be positioned over the station, in a similar week long night time procedure, onto final permanent supports.

Explaining why this method of bridge positioning is being used, Martin Carroll, Taylor Woodrow Alsthom Project Director says: "Launching is very safe and causes minimal disruption, Queens Road was open to traffic during the first process and the station will also remain open during the second launch."

ening works, Cleveland Bridge erected the steelwork over four midweek nights. A 500t capacity mobile crane positioned on the riverbank erected six pre-assembled 33m-long steel plate girders (three for each side of the bridge) which weighed up to 28t each.

"We undertook the lifts during nights to avoid disruption to local school routes across the bridge and not to obstruct river traffic," says Mr Osbourne.

Carrying the new Chilwell extension over the mainline railway southwest of the city centre, the Lenton South Junction Bridge is also currently on site.

The 45m-long skewed bridge was assembled offline with its concrete deck. Last month it was jacked up and moved by self propelled mobile transporters (SPMTs) to its final position on abutments during a weekend rail possession.

The bridge is formed from two 30m-long and two 25m-long plate girders, welded together on site. A series of 12m long cross beams with bolted connections join the two halves together.

Site work for the fifth steel bridge on the project is due to start soon. The 61m-long Clifton Boulevard Bridge is a bowstring arch structure spanning the busy A52.

Once assembled the bridge will be positioned by SPMTs during an extended night time road closure. This is due to take place later this summer.

FACT FILE
Nottingham Express Transit (NET) extension bridges
Main client: Nottingham City Council
PFI concessionaire: Tramlink Nottingham
Main contractor: Taylor Woodrow Alstom
Structural engineer: Mott MacDonald
Steelwork contractor: Cleveland Bridge
Steel tonnage: 1,623t

The Lenton South Junction Bridge is assembled on site before being moved into position

Historic design incorporated

A new commercial development on central London's Holborn Viaduct includes a rebuilt Victorian gatehouse helping to restore the historic overpass. Martin Cooper reports.

The project occupies a prominent site on a busy City junction

The Portland stone clad gatehouse will help restore Holborn Viaduct to its original design

The eye catching commercial development at 60 Holborn Viaduct will provide 20,000m² of energy efficient office and retail space over 13 levels. The building replaces Bath House, a former mixed use development that previously stood on the site and had become an outmoded structure in this fast changing district adjacent to the City.

60 Holborn Viaduct is a steel framed structure designed to achieve a BREEAM 'Excellent' rating with features such as solar hot water, use of low nitrogen oxide boilers and lighting control systems.

In keeping with its neighbours, a highly visual modern curving façade with a light glazed curtain walling has been chosen for the structure's exterior.

Sightlines of St Paul's Cathedral and rights to light had to be taken into consideration and explain why the structure tapers. Views of St Paul's have to be maintained, while nearby buildings must not have their natural daylight blacked out. The building therefore is designed with a number of architecturally driven steps and terraces, the largest of which is located on the topmost ninth floor.

Planning stipulations also dictated that the new building could not exceed 53.15m above ground level. To make best use of the planning envelope and maximise the floor to ceiling heights on the office floors we have designed 465mm deep cellular steel beams. With 300mm deep cells for services distribution this provides an integrated structure-services zone and minimises the overall floor zone," explains Scott Edgar, Ramboll Associate.

Terraces occur at levels 4, 5, 7, 8 and 9 and to support these areas a number of large transfer structures, formed with plate girders, have been erected. The deepest of these is 595mm deep and it had to be

Transfer structures support the building's many terraces

FACT FILE
60 Holborn Viaduct, London
Main Client: Axa Real Estate Investments
Architect: Kohn Pedersen Fox Associates
Main contractor: Balfour Beatty
Structural engineer: Ramboll
Steelwork contractor: Severfield-Watson Structures
Steel tonnage: 2,200t

The return of historic gatehouses

A key component of the project is the construction of the gatehouse that will reintroduce staircase access at the northeast corner of the junction between the higher level Holborn Viaduct and the lower level Farringdon Street.

Stipulated by the City of London, rebuilding the gatehouse was a major requirement for the new development. The structure will mean that once again the junction has a gatehouse in each corner.

Originally there were four of these ornate Portland stone buildings; two were demolished last century, with one of these later replaced when the northwest corner was redeveloped in the 1990s.

The new gatehouse is part of the same steel frame as the main building, but as it will be clad with Portland Stone, it will look very distinct and separate.

In order to replicate the original gatehouse design, the internal steel frame is encased in reinforced concrete which provides vertical support and lateral restraint to the stone façade.

"Because of the intricate nature of the stone and the historic alignment of the windows between levels the steel frame to the gatehouse is complex. A twin column configuration was adopted at the lowest level to minimise the depth and maximise the useable area within the stairwell," says Scott Edgar, Ramboll Associate.

A lot of design time was spent on co-ordinating the gatehouse layout with that of the office block. At second floor level the new floor construction is stepped by 650mm to the rear of the historic windows to avoid obstructing the elevation while avoiding any loss of lettable area.

The brickwork of the viaduct supported the original gatehouse, but as this structure is now listed, and to control differential settlements between the Farringdon Road and Holborn Viaduct elevations a cantilevering steel structure has been provided to support the stonework.

"To limit the potential for differential settlements the new steel frame cantilevers over the viaduct by 1.5m separating the new building from the viaduct," says Mr Edgar.

60 Holborn Viaduct is a steel framed structure designed to achieve a BREEAM 'Excellent' rating.

lifted into place in two pieces to suit the capability of the on-site tower crane.

In contrast to its predominantly contemporary style, 60 Holborn Viaduct incorporates a gatehouse, a structure built with traditional Portland stonework (see box) and erected to replace the site's original gatehouse which was demolished more than 40 years ago.

As well as the reinstatement of an historic structure, the site's topography has also been a challenge. The basement box is constructed in concrete and extends over the full footprint of the site with a higher ground slab to the east (Holborn Viaduct) where the external ground level is at its highest. The steel frame is constructed off that slab with an additional lower ground retail mezzanine constructed in steel to the west where the ground level is lower.

A rounded 'bullnose' feature protrudes from the western elevation, bounding Snow Hill and Farringdon Street. This feature is also the most complex part of the structural steel frame as a myriad of beams converge at one point. This meant a concentrated number of individual steel pieces were erected here to form the faceted perimeter, and steelwork contractor Severfield-Watson found this to be the most time consuming part of the job.

In order to achieve the desired long-span, column-free spaces within the offices the structure is predominantly arranged in a 12m x 9m grid pattern. One exception to this standard grid is the double height main entrance foyer positioned along the Holborn Viaduct frontage where a number of columns have been avoided by hanging the curved atrium slab edge from the steel structure above.

Two slip formed cores were erected prior to the steelwork package commencing. The cores had embedment plates cast into them during construction to form the connection with the steel beams, and this enabled Severfield-Watson to erect steelwork quickly and efficiently.

"Coordination is important on a site like this," explains Andy Clarke, Balfour Beatty Project Director. "There's no room for material storage so all of the steel had to be delivered on a just in time basis."

Steelwork erection was completed towards the end of 2012, the project team is now racing towards this summer's completion date.

A twin column configuration was adopted for the gatehouse design

Sustainability takes wing at Angel Square

Steel paid outstanding sustainability dividends for the Co-operative Group when it developed a new headquarters in Manchester. In the latest of our Project Revisited series Nick Barrett praises One Angel Square which has become the first office building to earn BREAAM's highest rating.

The building forms the initial stage of a much larger development

FACT FILE
Co-operative Group head office, Manchester
Main client: Co-operative Group
Architect: 3DReid
Main contractor: BAM Construction
Structural engineer: Buro Happold
Steelwork contractor: Fisher Engineering
Steel tonnage: 3,200t

Maximising internal flexibility and future-proofing against climate change were some of the key requirements for the Co-op when it planned to provide 3,500 staff with a high quality base in a new HQ building in Manchester. A steel framed solution always looked like it would pay dividends on those scores, and others, but steel's sustainability credentials also became a major attraction when the Co-op decided that it wanted the £100 million building on a landmark site to also be a sustainability landmark.

One Angel Square, as the 16 storey building providing 30,000m^2 of open plan offices is now called, is said by the Co-op to be the single biggest embodiment of its brand. The Co-op's success in achieving its hopes for the building is being hailed as a beacon to others with ambitions to express core brand principles like commitment to sustainability in the architecture that they commission.

The success of the Co-op and its entire project team - which included main contractor BAM Construction, Buro Happold, 3DReid and steelwork contractor Fisher Engineering - was recognised with the BREAAM Outstanding award, the first granted to a UK office building. One Angel Square's score of 95.3% is the highest BREAAM Outstanding rating achieved to date; it also has an A+Energy Performance Certificate and a Display Energy Certificate A for operational standards, making it the first office building in the UK to achieve all three key environmental standards.

The design team set out from the start to create a building that would merit these accolades, but eschewing the sort of 'bling' that sometimes pays lip service to sustainability, incorporating a range of energy efficiency measures into the design. A combined heat power energy system for example is powered by rapeseed oil grown on the Co-op's own land, a possibly unique component of the carbon reducing measures employed. The building façade is double skinned and three giant geothermal earth tubes bring cooling fresh air into the building.

As Paul Richardson, Buro Happold Project Engineer, said when NSC previously visited the site (NCS October 2011): "It's very much a bespoke design chosen to achieve the highest BREEAM rating, with the large atrium allowing natural daylight to penetrate the floorplates and an exposed soffit maximising the thermal mass." Steel was the natural choice for the framing material, Mr Richardson said, as it gives the required large column free floor spaces and the option for future flexibility within the building.

Thermal mass was a key consideration so the design has an exposed soffit and passive chilled beams. Although the standard composite floored steel framed buildings provide all the thermal mass properties required in a modern building, the issue for designers is increasingly how to cool buildings down. Forecasts of temperature rises of between 3% and 5% in summer and reductions of 30% during winter by 2050

Ready for climate change

A range of energy efficient features has been incorporated into the design, ensuring that the building can deal with the existing temperature ranges and forecast rising temperatures.

The three earth tubes can draw some 50,000 litres of air into the building every second. A stack system distributes this air through displacement vents, taking advantage of the thermal mass of the concrete. The atrium also plays a role in keeping the office environment pleasant by allowing rising warm air to be extracted.

The double skin façade also insulates the building in the winter and provides solar shading in the summer. There is a gap between the single-glazed outer skin and the inner skin that is open at the bottom and with louvres at the top allowing warm air to be trapped in winter and free flowing cool air in the summer to pass through the space.

Solar coating on the glass and anodised bronze mullions on the inner face of the outer skin that act as blinds, and are placed in relation to the orientation of the building to the sun, also help keep the sun's heat at bay.

There is relatively little sunlight in Manchester most of the time so the building faces south to maximise heat recovery through a system located in the atrium.

Other energy efficiency measures include low energy LED lighting in the atrium and a cogeneration CHP biofuel boiler that runs on rapeseed grown on Co-op owned farmlands. Absorption chillers and chilled beams are powered by surplus heat from the boiler, providing cost-effective cooling.

KEY FACTS

- 320,000 ft² high-quality office space
- BREEAM Outstanding
- Restaurant at 8th floor level with panoramic views over city
- 320 person auditorium at lower ground level
- 151 basement car parking
- 105 bicycle spaces
- Combined Heat Power Energy System using Co-op grown rapeseed oil
- DEC and EPC 'A' rating

Earth tubes draw air into the building

were taken into account in the building's design and it has been 'future-proofed' against these changes.

Externally the building certainly provides an imposing landmark. It is a glazed three sided structure, each corner having a core, two of which rise to the ninth floor and the third rising all the way to the 16th floor. The upper levels are terraced from floors nine to 16. A rectangular atrium rises from ground floor level to the sloping roof, providing a hollow centre.

Internally the building impresses from the outset, with the atrium soaring from ground floor to the full height of the building, allowing full advantage to be taken of natural daylight and helping air move up through the building. Light comes in from the glass roof and spills over the balconies that surround the atrium space. The office spaces themselves take advantage of 16.5 metre span steel sections, achieving the client's wish for maximising flexibility should its own requirements change or should a future occupier have different needs. All desks are said to be within seven metres of a window and the glazed exterior gives views from desks across the city

Steel construction made the large column free open plan office spaces possible, allowing the Co-operative to have an interior with an informal and communal feel, echoing the organisation's original mutual society brand values.

Summing up the construction team's achievement, 3DReid Project Architect Mike Hitchmough says: "The building sets a new benchmark for commercial office design, achieving a balance of sustainability, operational efficiency, space flexibility and high quality. The project succeeds in translating the client's ethical approach to society and the environment in their business through their commitment to deliver a truly outstanding building."

Last word to the satisfied client - the Co-op's Chief Executive Peter Marks says in the group's sustainability report that the new HQ is more than a building; "It is a demonstration of confidence and deep rooted commitment to a sustainable future."

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.

Good time for developers to build

Outside the Westminster venue of the BCSA's National Meeting on the last day of February the Capital showed signs of the first buds of spring, but the green shoots of construction market recovery remain elusive, delegates heard.

The subject of the meeting was 'The Construction Market – The Future'. BCSA Deputy President Ian Hoppé chaired the meeting, and said market conditions remained challenging with BCSA Members seeing their output fall from 1.4M tonnes in 2007 to under 800,000 tonnes in 2012. The end of the decline in the overall construction market would not start until 2014 according to forecasts from the Construction Products Association, which was not the worst of the forecasts being made.

Former Institution of Civil Engineers President Peter Hansford took over the Government Chief Construction Adviser role in December, the second incumbent since the role was created in 2009 to promote cross-departmental coordination and leadership on government's construction industry policy.

Mr Hansford explained that he was not a government spokesman, or a lobbyist for the construction industry. "The aim is to improve the conversation between the Government and the industry," he explained. There were two programmes on the Government's construction agenda, the Government Construction Strategy and a push for a cost reduction of 15% to 20% by the end of the current Parliament, in 2015. Delegates later pointed out that this had already been achieved by recent falls in tender prices.

One success of the Government's construction strategy had been the introduction of Project Bank Accounts which speeded up payments to the supply chain and were being used on projects worth £1,100M in 2012, with a target of £2,000M. New procurement models were cutting down on time consuming bureaucratic processes, through using standard prequalification questionnaires.

Peter Fordham of Davis Langdon spelled out why the industry was concerned about its future with a downbeat assessment of prospects for the next few years in some key sectors of the industry, including industrial buildings, offices, and the retail and leisure sectors.

Since 2010 the industry had flatlined – so at least the fall had stopped, he said. Factories and warehouses had been major markets for the sector in 2007 but since then there had been a big fall in demand for warehouses and the sector was still flat in 2012. The trend for the sector though was 'gently positive'

Industrial building rents were expected to rise by 2% a year or so up until 2017 which could encourage some developers.

The City market showed some recovery in 2010 but had been falling since then, with rents showing the same pattern. Towers recently built in London were finding tenants slowly. Several were on hold for the foreseeable future.

There was a big development pipeline waiting for the go ahead and although 2013 to 2014 could see some projects go ahead, schemes that could have gone ahead in 2015 to 2016 were likely to be delayed. Retail was still falling off a cliff as it has been since 2010.

The picture in the regions was not good and there was little development under way with capital values halved since the 2007 peak. There were no completions of commercial premises in some cities in 2012. Desk sharing and hot desking were being adopted as companies tried to stay put rather than undergo the expense and uncertainty of moving.

The office market faced headwinds from a lack of business confidence, weak demand,

Market share remains robust

Alan Todd, Tata Steel General Manager Construction

Alan Todd, Tata Steel General Manager Construction, revealed the main findings of the 2012 UK Steel Construction Market Share Survey, the latest in an independently produced series that goes back to the 1980's. Mr Todd pointed out that as bad as the forecasts from Experian, the CPA and others might sound, the sectors of most importance to steelwork contractors looked like they might perform a bit better than others, or at least better than some forecasts implied.

Those key sectors are private industrial, private commercial, public non residential and infrastructure. The market survey, from Construction Markets, showed that the total market for multi storey non residential buildings fell 18% in 2012, which was a 42% fall from the 2008 peak. Steel's market share remained high at 67.1% over the year.

That overall market share figure conceals varying demand patterns for different sectors. For example, steel framed offices showed a rise in market share to 70.4%, from 69.4% the previous year.

a tendency to stay put, a flat financial sector, lack of finance and a preference for refurbishment rather than rebuilding.

On the positive side, the Eurozone showed signs of having stabilised, some important property leases were due to expire and tenants would be looking for new premises, there was a shortage of Grade A office space and most markets would see rental growth from 2014. Retail parks with an attached leisure activity like restaurants, cinemas and gyms were a rare growth area. Commercial building would start a slow recovery from a low base in 2015.

Mr Fordham warned that construction tender prices would 'jump sharply' at some point, so now was a good time for developers to move.

Kier Construction Managing Director Steve Bowcott said the market was now at the bottom and his company was seeing more work for the next year, with 70% of the following year's work already secured at the start of its financial year. He said: "A flat market is OK if you perform. You can take market share by being better."

Kier had instituted its own testing standards for suppliers in key areas like steelwork, concrete, earthworks and cladding. So by July this year Kier would not allow any welder to work on its projects, including those on which it is a joint venture partner, without up-to-date welding certification. Mr Bowcott said: "Our building guys always try and go for a steel frame. I think you are a great industry, I really do." Top contractors were trying to push prices up so get your quality right and your price will follow, he promised.

Ian Hoppé, BCSA Deputy President

Steve Bowcott, Managing Director, Kier Construction

Peter Hansford, Government Chief Construction Adviser

Steel had also increased its market share for larger multi storey projects, those of over 5,000m^2, to 71.7%, but had given up some ground for smaller projects.

The shed market was down 47% in 2012 from its peak in 2007 and the agriculture sector had taken on a new significance, growing to represent 20% of the market. Steel's market share for all single storey buildings overall was unchanged in 2012 compared to 2011 at almost 85%.

Mr Todd argued that the forecasts like Experian and the CPA's used the Office of National Statistics value based figures, which are collated using a changed methodology since 2010 that has been questioned by most industry commentators. Their overall forecasts include residential and repair and maintenance sectors. The key structural steel consuming sectors however – industrial, commercial, public non residential and infrastructure – constitute some 45% of total output.

Of these key sectors, the private industrial sector - which is at historically low levels - is expected to show some growth in 2013 driven by warehousing and distribution space for online retailing. This will be largely offset by contraction in factories and other non industrial sheds.

It will be 2014 before some small signs of growth are seen in the private commercial sector, with the London office market subdued and other cities virtually dormant, resulting in a further small fall in the offices market this year. Further declines are also expected in leisure and retail in 2013.

The public non residential buildings sector – which includes education, health and some prisons, defence and leisure – was down 27% from the peak in 2012 and further falls are expected up to 2015 when they will be 50% of the 2010 peak. Education has been dominating this sector, accounting for up to 60% of demand.

Infrastructure, which includes bridges and other transport and power and other services fell 15% in 2010 but is a rare growth sector for the next few years when it is expected to rise by at least 7% a year to 2016. New gas powered stations are in the pipeline although the future of nuclear is uncertain; and the Forth and Mersey Gateway bridges were boosting demand already.

Using the value based statistics it appeared that steel construction is forecast to perform even worse than the overall construction market, and there was a significant variance between forecasters, such as Experian and the CPA. But, Mr Todd said, floor area is a better proxy for structural steel demand than values. It was more meaningful to consider also the relative value of sectors to steel – for example, the industrial sector is 4% of the market by value, but accounts for 40% of constructional steel consumption.

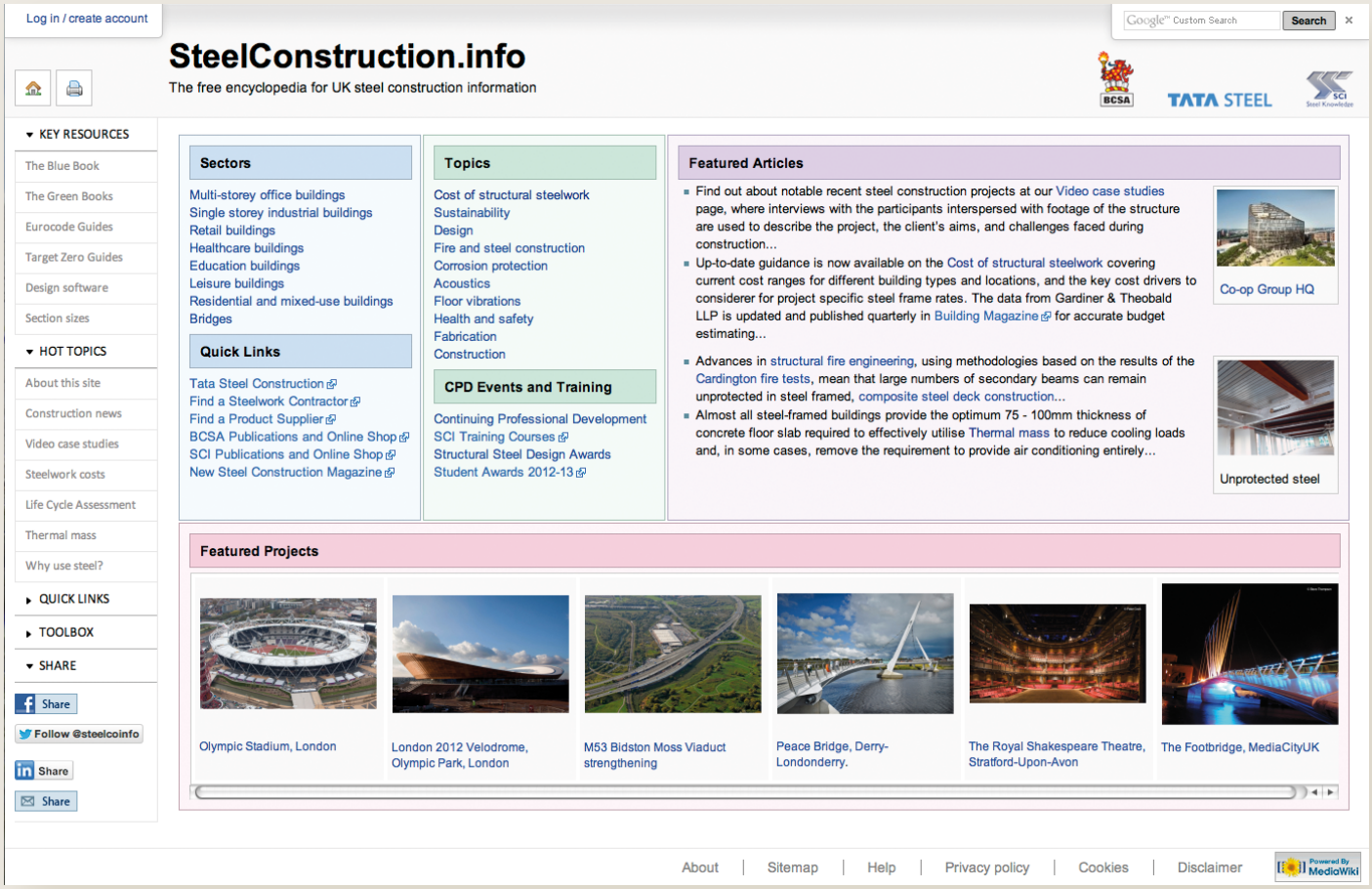
So some growth was likely in the key industrial buildings sector but not enough to prevent a fall of 1.6% in demand for steel construction in 2013 to 769,000 tonnes from the 1.4M tonne peak in 2007, an overall fall of 45%. Better news is expected in 2014, a 4.4% rise followed by 3.1% in 2015 and 2% in 2016. Mr Todd said: "The statistics are forever shifting but our longer term forecast perhaps gives a little bit more hope than others."

Updated steel encyclopædia

www.steelconstruction.info has undertaken major upgrades to give it a new look and feel, following feedback from architects and engineers.

Major upgrade

The main page of *www.steelconstruction.info* has been redesigned to make it much easier to navigate and more user friendly. The updates and improvements, including the addition of colour, images and new sections, have all been incorporated following valuable feedback from architects and engineers, who also wanted a better search engine. The website now uses Google Enterprise Search which is already familiar with most users. All videos on the site now stream from a YouTube channel which means they can be viewed on a wider range of browsers and mobile devices – in fact anything that supports YouTube.



Updates and Improvements

A number of important updates have been made to *www.steelconstruction.info* These include the latest cost comparison figures, and BIS location factors. A comprehensive site map has been added to help with navigation, while all of the sector case studies have been converted from pdf files to fully integrated hyperlinked page content, making it easier for readers to find other relevant articles.

New Articles

A host of new page links have been added to *www.steelconstruction.info* Within 'Construction news' you will find all recent press articles and supplements relevant to the steel sector. Within 'Video case studies' you will find interviews and footage of recent projects, while 'Design software and tools' brings together all of the design tools available from the steel sector. New guidance on cost planning for both Education and Industrial buildings has been added, along with a link to steel section size data as a key resource.

Leisure spurs redevelopment

Steel's speed and ease of erection have been crucial to the project

The Northumbrian town of Cramlington is getting a makeover with a revamped shopping centre and a new nine screen cinema.

FACT FILE
Manor Walks Shopping Centre redevelopment, Cramlington, Northumberland
Main client: Hammerson
Architect: 3DReid
Main contractor: Tolent Construction
Structural engineer: Cundall
Steelwork contractor: EvadX
Steel tonnage: 520t

A multi million pound scheme to transform the centre of Cramlington is relying on steel construction to deliver a new frontage to the existing Manor Walks Shopping Centre and a new nine screen Vue cinema complex.

The works are being carried out around a redeveloped and enlarged public car park. The new shopping centre frontage will accommodate an array of family orientated restaurants, outlets chosen to complement the adjacent cinema.

The centrepiece of the scheme is a new 1,800 seat nine screen Vue cinema and this is where the majority (400t) of the project's structural steelwork has been used.

"Steel was the best option for the cinema's frame because of the required spans, the height of the building and the site's logistics," says Paul Hards, Cundall Senior Associate.

The shopping centre, its car park and local roads surround the site. As the majority of the mall is open during the works the car park is in constant use and the nearby roads are busy, so deliveries of materials have needed to be kept to an absolute minimum to avoid disruption.

Steelwork was delivered on a just in time basis, which usually meant one or two deliveries a day, and this also helped to avoid congestion on site. Using an alternative framing method would have resulted in more frequent deliveries and more traffic on the local roads.

The cinema is on the site of a former garage which was demolished by the main contractor Tolent early in 2012. Reminders of Cramlington's once thriving coal mining industry were then discovered during site investigations. A number of

A confined site means all deliveries are made on a just in time basis

Mall revamp

Revamping the existing Manor Walks Shopping Centre involves the erection of a new steel frontage, new internal steelwork to accommodate a reconfigured shop layout and plant rooms added to the roof.

"The new steelwork is bolted onto an existing steel frame," says Andy Dagnall, EvadX Project Manager. "Most of the steel consists of light architectural sections and some will be left exposed in the completed job."

Some areas of the existing steelwork have had to be strengthened with additional tubular cross bracing. This has enabled plant areas to be installed on the roof of the mall.

old mine workings deep beneath the site had to be grouted prior to the installation of reinforced concrete pad and strip foundations.

Steelwork was erected onto these foundations using a combination of mobile cranes and mobile elevating work platforms (MEWPs).

"It's a very complex steel design as there is no regular pattern," says Andy Dagnall, EvadX Project Manager. "Each of the nine auditoriums is slightly different in shape and size, while the overall building has a number of steps along one elevation, meaning it gets narrower from north to south."

The cinema has an overall footprint of 2,900m^2 and the auditoriums vary in size from Screen 1 which has a seating capacity of 404 down to the smallest, Screen 7 that has a capacity of 71.

Consequently, there are a variety of spans that the steelwork design had to cope with. The longest span is in the cinema's entrance area where a 21m-long × 1.8m deep fabricated beam supports a terraced seating area and a mezzanine level circulation space.

Brought to site in one piece, the beam weighs 22t and was the heaviest single element of the entire steel erection programme.

"A fabricated section was needed as it has the required capacity to limit the deflection which were set at 5mm along the 21m length," explains Mr Hards. "This beam also supports a projection room which is why deflection was so important on this occasion."

The internal layout of the cinema basically consists of the nine auditoriums which slope down to ground floor level and a mezzanine floor that accommodates the circulation areas.

The positioning as well as the size of the auditoriums contributes to the irregular grid pattern. Another factor are the four steps, where the building reduces in width by one structural bay, along the eastern elevation.

These four steps are mirrored at roof level, as the height of the structure also reduced in each location, with the lowest end furthest away from the shopping mall.

The exterior of the cinema complex is a composite aluminium cladding, with an additional architectural stainless steel mesh wrapped around the structure.

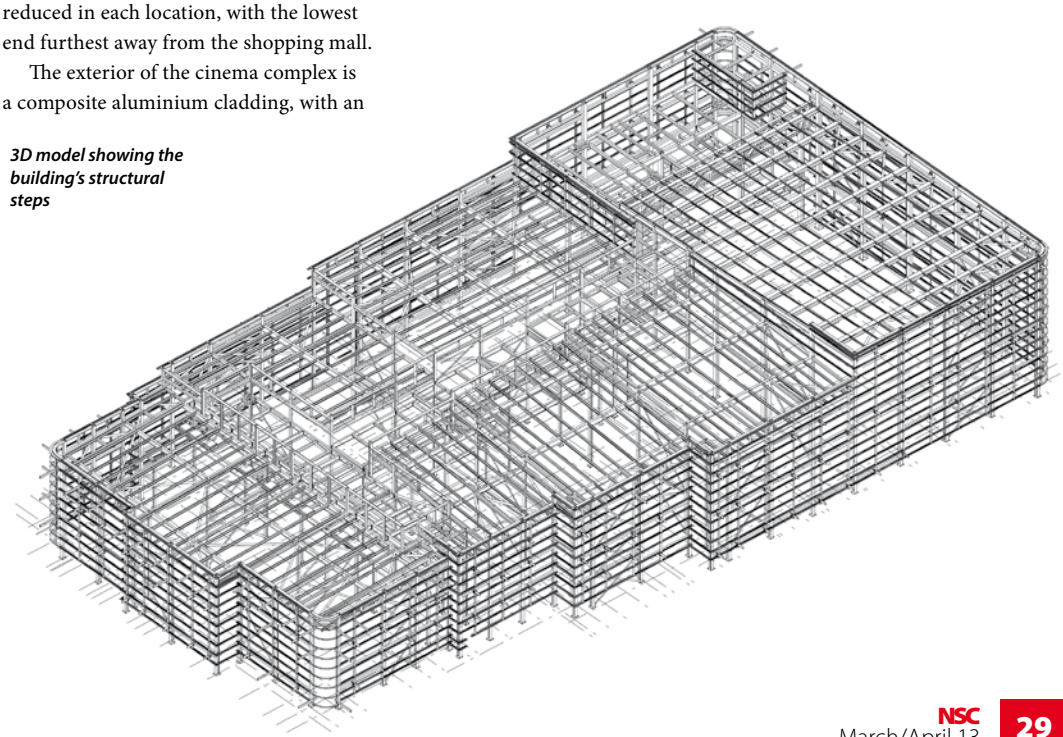
A 21m long fabricated beam has been installed within the cinema's entrance area

The mesh is supported on rows of tubular steel connected via brackets to the structural main frame. EvadX installed these brackets at the same time as the main steelwork.

The mesh and its supporting steel form a bullnose feature at the lowest part of the structure, creating an architectural signpost to the development.

The cinema is due to open in autumn 2013.

The bullnose feature creates a signpost to the development



3D model showing the building's structural steps

A maintenance gantry is supported by a central row of columns

BIM proves value for Sainsbury's

A new portal framed Sainsbury's distribution centre is being built in three phases to allow the company to continue operating from the site.

FACT FILE
Sainsbury's Distribution Centre, Basingstoke
Main client: Sainsbury's
Architect: Chetwood
Main contractor: Bowmer & Kirkland
Structural engineer: RPS
Steelwork contractor: Atlas Ward Structures
Steel tonnage: 2,000t

A large multi million pound distribution centre for Sainsbury's is under construction at Basingstoke in Hampshire. Located on a 36-acre site near the town centre, the warehouse complex will include over 51,000m^2 of chilled and ambient storage as well as 4,000m^2 of office space.

The steel portal framed structure is being built in three phases to allow Sainsbury's to supply its stores from an existing smaller depot on the site during construction.

In order to expand operations, Sainsbury's bought the land adjacent to its depot and cleared the site early last year paving the way for the entire site to be redeveloped.

Bowmer & Kirkland started work on phase one in March 2012, and as well as demolition the company also needed to complete a cut and fill operation involving the removal of some 50,000m^3 of overburden.

"Phase three of the job involves infilling the plot to create an even site for the entire structure," explains Stuart Goss, Bowmer & Kirkland Project Manager.

The overall distribution centre is 392m long × 132m wide, incorporating four internal spans of 33m each. Perimeter columns are spaced at 8m centres with 15m clear height at the eaves.

Phase one will house the complex's chilled goods section, phase two the produce section and phase three will accommodate an ambient section along with an attached three-storey office block.

Steelwork contractor Atlas Ward Structures has recently completed the erection of phase one which required 750t of steel. This section of the building will eventually house a large chiller unit and for future maintenance of the equipment a walkway gantry has been installed at roof level.

Installed along with the main frame steelwork, the gantry walkway consists of two support beams which are cantilevered off a central line of valley columns. The beams have handrails attached and also support metal mesh flooring.

"Because of the extra loads exerted by the gantry all of the internal valley columns are plated sections," says Michael Bryars, Atlas Ward Structures Project Manager. "At 3.5t each, these are

A first for BIM

"This is the first time we've used Building Information Modelling (BIM) on a distribution centre and it is also the first time our client Sainsbury's has used it on this kind of project," says Steve Baldwin, Bowmer & Kirkland Design Manager.

There are a number of benefits derived from using BIM one of which is the client gets to see a complete model of the finished building, even before construction has started.

"Sainsbury's are currently involved in a number of other BIM projects and they like the fact they can view the entire building and basically see what they will ultimately get," adds Mr Baldwin. "This ensures that none of the services clash."

BIM also offers complete coordination between all of the project's team members. The steel frame is one of the first elements of any 3D model's construction and this job was no exception. Once the frame is designed and modelled by the engineer and steelwork contractor it is then over to the rest of the team to add their bits.

"Using 3D modelling is nothing new to us, it's now a case of the rest of the industry catching up," says Michael Bryars, Atlas Ward Structures Project Manager. "By using BIM it means everyone in the project team is coordinated and this speeds things up."

the heaviest sections on the job."

Fabricating bespoke plated sections was the most economical solution for the additional deflection and loading according to Ian Marriott, RPS Project Engineer. "Plate girders were more economical in this case as we could achieve the optimum depth of section and flange thickness required by the design."

An attached energy centre and a goods delivery unit have also been erected as part of phase one. The energy centre is slightly smaller than the main building at 12.5m high and has a length of 29m (four structural bays).

One of the main challenges for the project team is a live substation located within the footprint of phase one. The live facility means there is an off limits corridor within the construction area until the station is decommissioned.

"The substation is due to be removed shortly," says Mr Goss. "We've had to build the steel frame over and around it and leave sections of the cladding unfinished."

Sainsbury's is due to decamp its chilled goods section into the completed phase one in June. This will then allow Bowmer & Kirkland to demolish part of the existing depot to make room for the erection of phase two.

Atlas Ward will erect the 500t of steelwork needed for the second phase towards the end of this year, while the third and final phase is due to be completed in May 2015.

"The structure has been modelled and designed as one large building," says Mr Marriott. "Phase one has bracing located at either end to create a braced box with sufficient stability. Phase two will be bolted onto the first phase which will provide temporary stability until additional bracing is installed, likewise with phase three."

A phased construction programme is allowing the client to continue operating on site

Cladding Interfaces with Structure

Dr Richard Henderson of the SCI highlights the effects of structural frame movements on curtain walling and shows why standard live load deflection limits are too relaxed for edge beams.

Introduction

The principal function of cladding on a building is to separate the external and internal environments. It is also used by the architect and the building owner to create a visual statement. The accuracy of manufacture and installation of cladding panels is clearly seen at the joints which must be to true line and level. Building movements also become obvious at the joints and must be controlled.

There are different generic types of cladding and many different materials used. Office buildings commonly feature curtain walling, so-called because the original concept involved elements suspended from the top of a building elevation like a curtain. Cladding often involves brittle materials (glass, stone), onerous manufacturing and installation tolerances and is of high value. The building envelope cost can be two or three times that of the frame.

Curtain Walling Systems

There are two generic types of curtain wall systems commonly in use: "stick" and "unitised". Stick systems are built up on site from components to make up the curtain wall: vertical mullions and horizontal transoms are used to form a rectangular grid. Glazed vision panels formed of double or triple glazed units and solid insulated panels fill in the grid to form the remainder of the curtain wall. Solid panels concealing the floor structure and ceiling void are referred to as spandrel panels.

Stick curtain wall is frequently used on low-rise buildings (eg two to five storeys) in limited quantities, where the area required does not justify the investment in a bespoke design. The mullions may extend over two or three storeys. Several stick curtain wall systems are commercially available.

Unitised curtain walling consists of factory-made, interlocking storey-height panels which are delivered to site and installed progressively. The manufacturing tolerances are to 1 or 2 mm. The components may be designed for a specific building and may involve the design of new structural shapes for the mullions and transoms to provide the desired architectural features. Mullions and transoms are made from aluminium extrusions because complicated shapes can be easily and accurately formed. The extrusions on the vertical edges of the panel interlock to form a split mullion at the panel joint. Interlocking transoms form the horizontal edges. Weathertightness depends on accurate interlocking of the elements and proper functioning of gaskets in the joints.

Interfaces with the Structural Frame

Curtain walling is usually suspended so the weight of the wall is applied to the building frame at the top of the mullion. In a stick system, this may not be at every floor level. A unitised system will usually apply gravity loads to the frame at each level. The geometry of both stick and unitised systems is usually based on a 300mm planning grid. Unitised panels may be 1.2 or 1.5m wide or multiples of these with sizes and weights determined by transportability and ease of handling.

Gravity brackets are usually fixed to the top of the slab at the floor edge and hidden beneath a raised-access floor. Curtain walling manufacturers usually have their own bracket system which involves adjustability in three orthogonal directions. Adjustments perpendicular to the plane of the curtain wall and horizontal in-plane adjustments are achieved by cast-in channels and serrated brackets with slotted holes and serrated washers. The length of slots provides sufficient adjustment to achieve a true line. Gravity loads are transferred through vertical bolts with screw-adjustments to achieve vertical alignment. Restraint against out of plane loads is provided at gravity brackets by T-shaped slots or similar positive engagement (Figure 1). At the bottom of the mullion, a spigot fixed into a cavity in the extrusion engages with the extrusion below, thus providing a means of transferring shear force while allowing axial movement.

Figure 1 Bracket with serrated washers and T-bars in slots ©Yuanda Europe

The weight per linear metre of curtain walling depends on the floor to floor height of the building and on the materials of construction and features included in the design. The weight of a 4.0m x 1.5m unitised curtain wall panel with full-height glazing and a stone-faced spandrel panel could be 4.0 kN or more. Metal-faced insulated panels and double glazing from desk-height to ceiling could weigh as little as 2.0 kN.

Stick curtain walling mullions are supported at the top by gravity brackets in the same way as unitised panels. If mullions extend past more than one floor, the brackets at the intermediate floor levels provide restraint to horizontal loads but allow vertical movements to occur.

Installation

Curtain wall installation takes place after concrete floors have been poured so that cast-in channels are in place. Unitised curtain walling panels are lifted onto projecting landing platforms and stored on the floors. Gravity brackets are fixed to line and approximate level. Installation tolerances to line and plumb are within about 2 mm. The first panel is installed and levelled using the adjusting screws in the bracket fixing. Subsequent panels are erected so that the split-mullions engage with each other, and adjusted for level, progressively round the building. The closing panel is slid vertically down between the panels already erected on either side.

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Accommodation of movement after installation

After installation, the cladding has to be capable of accepting building movements and continuing to perform. Movements result from column shortening, beam deflection due to superimposed dead and live loads, thermal effects and the effects of sway due to wind loads. Estimated values of movements are given in the table. Columns are assumed to be of grade S355 steel with a 4.0m storey height on a 9m grid. Beam deflection figures are based on live load deflection limited to span/360.

During Construction	mm
Column shortening due to continuing construction above the installed cladding (will occur in tall buildings)	0.6
Column shortening due to installation of fit-out elements	0.3
Permanent deflection of floors due to installation of fit-out elements (services, raised floor, ceiling etc)	3.2
In Service	
Column shortening due to live load	2.2
Deflection of edge beams due to live load	25.0
Thermal movement of cladding due to temperature fluctuations	+3.8/-3.3
Thermal movement of frame due to temperature fluctuations (The temperature could change by 15 to 20 degrees on occupation and mothballing)	+1.4/-0.7
Building sway under wind loads	h/500 = 8.0

Both the interlocking transoms and the mullion joints are required to accommodate the in-service movements of the frame and maintain weathertightness. Where occupied floors are next to unoccupied floors, both opening and closing movements will occur (Figure 2). Excessive closing movements will result in the transfer of load through cladding elements not designed to sustain it; excessive opening movements could result in the weathertightness of transoms being compromised. Excessive sway could result in the edges of a glazed unit coming into contact with the mullion. Allowances in the curtain wall designed to deal with in-service movement must not be consumed by the accommodation of frame elements which are out of agreed tolerance.

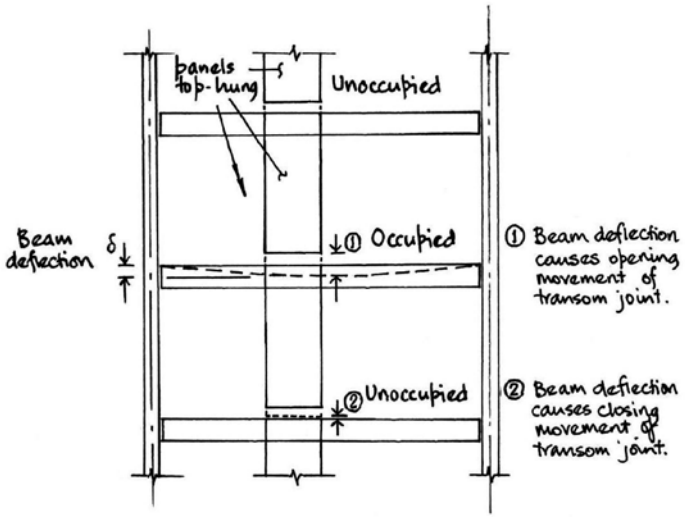


Figure 2 Maximum and minimum width of transom joint

Approximate magnitude of in-service movements

An example is given below for a change in tenancy involving new tenant fit-out on one floor of a building using the values tabulated above. Closing movements have been shown as positive; opening movements have been shown as negative. Beam deflections based on span/1000 have also been tabulated.

These movements occur on emptying and stripping-out the floor and are reversed on refitting and reoccupation. Closing movements due to column shortening of 2.5 mm will already have occurred. The cases shown occur if the maximum thermal movements coincide with the change in occupancy.

Movement	Opening		Closing	
	mm	mm	mm	mm
Beam deflection	L/360	L/1000	L/360	L/1000
Edge beam deflection (services, raised floor, ceiling)	-3.2	-1.2	3.2	1.2
Edge beam deflection (live load)	-25.0	-9.0	25.0	9.0
Thermal expansion/contraction of cladding	-3.3	-3.3	3.8	3.8
Total	-31.5	-13.5	32.0	14.0

The maximum closing movement relative to installation is 32.0 + 2.5 = 34.5 mm for 9m span beams with a deflection limit of span/360. As expected, the edge beam deflection is the dominant component, contributing up to about 82% of the movement for this case.

The maximum deflection that can be accommodated in typical unitised curtain walling panels installed to correct tolerances and clearances is about 15 mm (Figure 3) and in stick curtain walling systems it is even lower – about 8 mm. It is clear that a deflection limit of span/360 is inappropriate for edge beams supporting cladding. Lower deflections must be achieved eg as given by span/1000 for unitised curtain walling for a 9m span beam. SCI document P183 Design of Semi Continuous Braced Frames shows that in practice, nominally simply supported beams in conventional construction can achieve a degree of end-fixity which will be sufficient to reduce the edge beam deflection significantly. This fact is no-doubt the reason that there have been few reported occasions when excessive deflections of the supporting structure have caused problems with curtain walls.

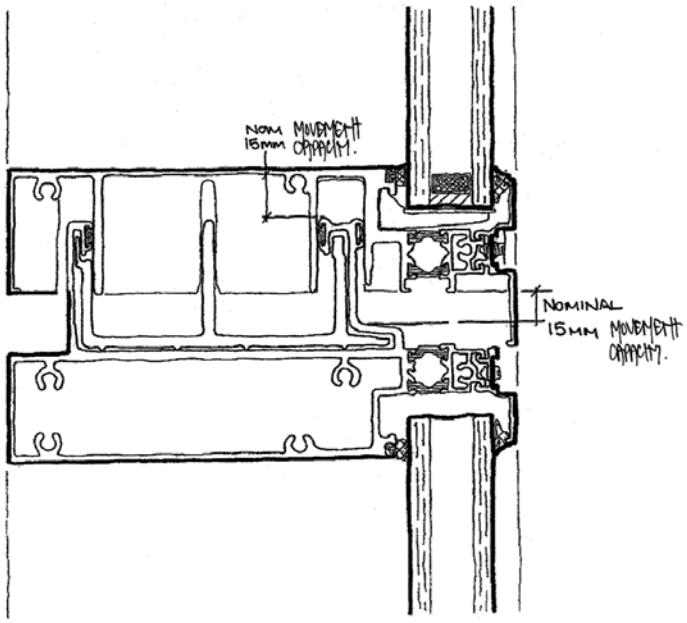


Figure 3 Vertical movement capacity at transom joint ©Arup

Conclusions

1. Cladding movements are dominated by the edge-beam deflection under live loads.
2. Significant movements can occur during the life of the building due to changes in occupancy.
3. The capacity of curtain walling to accommodate movements is about 15mm for unitised systems and 8mm for stick systems.
4. Excessive movements could either result in damage to a high-value building system due to inappropriate load transfer or leaks which are immediately obvious to the building occupants.
5. Deflections under live load of edge beams supporting curtain walling should be discussed early in the design process and special limits agreed. Absolute limits of about 8mm may be appropriate for unitised curtain wall systems. Economy can be achieved by taking advantage of connection stiffness to reduce the predicted beam deflection.

AD 373
Connections using preloaded bolts, subject to combined shear and tension

Queries have been raised regarding the verification of connections subject to combined shear and tension when using preloaded bolts, for connections designed in accordance with BS EN 1993 1 8:2005 (Amd 2010) and the UK National Annex.

This Advisory Desk note gives a summary of the checks required, where in BS EN 1993 1 8 the check is identified and where appropriate, provides guidance for such connections.

All the references are to BS EN 1993 1 8 unless otherwise stated.

All symbols are as defined in BS EN 1993-1-8 unless otherwise stated.

SLS refers to Serviceability Limit State (i.e. verify against SLS loads).

ULS refers to Ultimate Limit State (i.e. verify against ULS loads).

Combined shear and tension, slip-resistant at SLS

For shear:	**Category B: Slip resistant at SLS (3.4.1 (1) (b))**		
For tension:	**Category E (3.4.2 (1) (b))**		
$F_{v,Ed,ser} \le F_{s,Rd,ser}$	SLS		
$F_{v,Ed} \le F_{v,Rd}$	ULS		Table 3.2
$F_{v,Ed} \le F_{b,Rd}$	ULS		
$F_{t,Ed} \le F_{t,Rd}$	ULS	(*see comment below)	
$\frac{F_{v,Ed}}{F_{v,Rd}} + \frac{F_{t,Ed}}{1.4F_{t,Rd}} \le 1$	ULS	Table 3.4	

* The design tensile force, $F_{t,Ed}$, should include any force due to prying action. Alternatively in some cases, the design tensile force can be calculated by ignoring prying action, but in these cases the tensile resistance should be reduced. For more guidance, see Advisory Desk note AD354 (Resistance of bolted connections in tension for design to BS EN 1993 1 8), available at *www.steelbiz.org*.

Combined shear and tension, slip-resistant at ULS

For shear: Category C: Slip resistant at ULS (3.4.1 (1) (c))

For tension:	**Category E (3.4.2 (1) (b))**	
$F_{v,Ed} \le F_{s,Rd}$	ULS	Table 3.2
$F_{v,Ed} \le F_{b,Rd}$	ULS (**see comment below)	
$F_{v,Ed} \le N_{net,Rd}$	ULS	
$F_{t,Ed} \le F_{t,Rd}$	ULS (*see comment above)	
$\frac{F_{v,Ed}}{F_{v,Rd}} + \frac{F_{t,Ed}}{1.4F_{t,Rd}} \le 1$	ULS	Table 3.4

** The verification of bearing resistance is required as a fail safe in case slip does occur in the connection. No separate verification is required for bolt shear resistance as it will always exceed the slip resistance, but the interaction between bolt shear and tension should be verified.

Slip resistances, Clause 3.9.2

$F_{s,Rd,ser} = \frac{k_s n \mu (F_{p,c} - 0.8F_{t,Ed,ser})}{\gamma_{M3,ser}}$	SLS	(Eq. 3.8a)
$F_{s,Rd} = \frac{k_s n \mu (F_{p,c} - 0.8F_{t,Ed})}{\gamma_{M3}}$	ULS	(Eq. 3.8b)

Shear, bearing and tension resistances

$F_{v,Rd} = \frac{\alpha_v f_{ub} A}{\gamma_{M2}}$	ULS	Table 3.4
$F_{b,Rd} = \frac{k_1 \alpha_b f_u dt}{\gamma_{M2}}$	ULS	
$F_{t,Rd} = \frac{k_2 f_{ub} A_s}{\gamma_{M2}}$	ULS	
$N_{net,Rd} = \frac{A_{net} f_y}{\gamma_{M0}}$	ULS	(Eq. 6.8, BS EN 1993 1 1: 2005)

Contact: **Abdul Malik**
Tel: **01344 636525**
Email: **advisory@steel-sci.com**

New and revised codes & standards

From BSI Updates February and March 2013

BS EN PUBLICATIONS

BS EN ISO 898-1:2013
Mechanical properties of fasteners made of carbon steel and alloy steel. Bolts, screws and studs with specified property classes. Coarse thread and fine pitch thread
Supersedes BS EN ISO 898-1:2009

BS EN ISO 4035:2012
Hexagon thin nuts chamfered (style 0). Product grades A and B
Supersedes BS EN ISO 4035:2001

BS EN ISO 4036:2012
Hexagon thin nuts unchamfered (style 0). Product grade B
Supersedes BS EN ISO 4036:2001

BS EN ISO 7539-1:2012
Corrosion of metals and alloys. Stress corrosion testing. General guidance on testing procedures
Supersedes BS EN ISO 7539-1:1995

BS EN ISO 8673:2012
Hexagon regular nuts (style 1) with metric fine pitch thread. Product grades A and B
Supersedes BS EN ISO 8673:2001

BS EN ISO 8674:2012
Hexagon high nuts (style 2) with metric fine pitch thread. Product grades A and B
Supersedes BS EN ISO 8674:2001

BS EN ISO 8675:2012
Hexagon thin nuts chamfered (style 0) with metric fine pitch thread. Product grades A and B
Supersedes BS EN ISO 8675:2001

BS EN ISO 17636-1:2013
Non-destructive testing of welds. Radiographic testing. X- and gamma-ray techniques with film
together with BS EN ISO 17636-2:2013, it supersedes BS EN 1435:1997, which is withdrawn

BS EN ISO 17636-2:2013
Non-destructive testing of welds. Radiographic testing. X- and gamma-ray techniques with digital detectors
together with BS EN ISO 17636-1:2013, it supersedes BS EN 1435:1997, which is withdrawn

BRITISH STANDARDS

BS 7419:2012
Specification for holding down bolts
Supersedes BS 7491:1991

CORRIGENDA TO BRITISH STANDARDS

BS EN ISO 17636-1:2013
Non-destructive testing of welds. Radiographic testing. X- and gamma-ray techniques with film. CORRIGENDUM 1

BRITISH STANDARDS REVIEWED AND CONFIRMED

BS 3692:2001
ISO metric precision hexagon bolts, screws and nuts. Specification

BS 4190:2001
ISO metric black hexagon bolts, screws and nuts. Specification

BRITISH STANDARDS WITHDRAWN

BS EN 1435:1997
Non-destructive examination of welds. Radiographic examination of welded joints
Superseded by BS EN ISO 17636-1:2013 and BS EN ISO 17636-2:2013

NEW WORK STARTED

EN 14399-2
High-strength structural bolting assemblies for preloading. Suitability test for preloading
Will supersede BS EN 14399-2:2005

EN 14399-3
High-strength structural bolting assemblies for preloading. System HR. Hexagon bolt and nut assemblies
Will supersede BS EN 14399-3:2005

EN 14399-4
High-strength structural bolting assemblies for preloading. System HV. Hexagon bolt and nut assemblies
Will supersede BS EN 14399-4:2005

EN 14399-5
High-strength structural bolting assemblies for preloading. Plain washers
Will supersede BS EN 14399-5:2005

EN 14399-6
High-strength structural bolting assemblies for preloading. Plain chamfered washers
Will supersede BS EN 14399-6:2005

DRAFTS FOR PUBLIC COMMENT

13/30266419 DC
BS EN ISO 23278 Non-destructive testing of welds. Magnetic particle testing of welds. Acceptance levels
Comments for the above document are required by 24 May, 2013

13/30272523 DC
BS EN ISO 23277 Non-destructive testing of welds. Penetrant testing of welds. Acceptance levels
Comments for the above document are required by 24 May, 2013

ISO PUBLICATIONS

ISO 7452:2013
(Edition 3)
Hot-rolled steel plates. Tolerances on dimensions and shape
Will not be implemented as a British Standard

CEN EUROPEAN STANDARDS

EN 1991-3:-
Eurocode 1. Actions on structures. Actions induced by cranes and machinery.
CORRIGENDUM 1: December 2012 to EN 1991-3:2006

Elastic Design of Single-Span Steel Portal Frame Buildings to Eurocode 3 (P397)

Steel portal frames account for around 50% of the structural steel used in the UK and are firmly established as a light weight, cost effective and efficient way of enclosing usable volumes in construction.

This new publication provides guidance for the design of single-span symmetric portal frames in the UK in accordance with the Eurocodes and the UK National Annexes. The publication gives an overview of the main portal frame elements, loading and initial design before providing more detail on elastic frame analysis and the design of the major components.

The key technical changes from previous practice include:

- Combinations of actions
- The assessment of frame stability
- The allowance for second-order effects (if these are significant)
- The verification of members under combined axial compression and bending

A comprehensive worked example is provided to illustrate the analysis and design process, although it is acknowledged that economic portal frame design is best achieved by the use of bespoke software.

£35 + P& P for BCSA & SCI members
£70 + P & P for Non BCSA and SCI Members

Catalogue number	**SCI P397**
Authors	Dorota Koschmidder, David Brown, Abdul Malik, David Iles
ISBN	978-1-85942-205-2
Pagination	175 pp
Format	A4
Publication date	January 2012

Bowling Alleys

FROM BUILDING WITH STEEL FEBRUARY 1963

'. . . a steel frame was chosen (because) it was the most economical method of spanning such a large area without any intermediate columns and only by using steel could the Centrle have been erected and clad in such a short time.' (Extract from letter received from a prominent firm of architects).

Occupying a unique position over the sea, the Excel Pavilion Lanes Bowling centre at Southend-on-Sea has a frame of structural steelwork with box section metal columns taken onto a continuous steel ground beam running round the perimeter of the site below deck level, this arrangement providing an equal distribution of point loads from the structure onto the pier columns. For the roof, 8 ft. deep compound beams of structural steelwork span the entire width of the playing area avoiding the use of internal columns between lanes. Architects: Silverton & Welton, Southend-on-Sea

Above: Typical scene in a Top Rank bowling centre viewed from the control desk. Elaborate electronic equipment to ensure smooth efficient operation, plus excellent standards of catering and comfort have helped to make bowling popular with people of all ages.

So rapid has been the growth of popularity of ten pin bowling that all over the country promoters have gone into action. Eager to enjoy revenue from their new ventures these promoters have demanded completion with the shortest possible delay. To meet this demand the obvious choice has been structural steelwork.

Bowling centres have been erected as straightforward new buildings, in combination with new cinemas, as additions to existing cinemas and as conversions of obsolete cinemas. For all four types, structural steelwork has been used in the majority of cases. Typical examples are to be found at Hanley, Litherland (Liverpool), Bexleyheath and West Bromwich.

Hanley is a combined cinema and bowling centre using some 400 tons of steelwork. The main auditorium is 56 ft. high by 103 ft. clear span and has a steel framed raking floor to form the cinema floor. The basement is completely given over to bowling with 24 lanes from the back to the front retaining wall. The area to the side of the main auditorium and over part of the bowling area is a car park. The front block consists of a three-story office building to one side with a combined entrance to the cinema and bowling centre to the other. Erection took ten weeks for the main structure with about two weeks for various small extras and revisions.

Litherland is a conversion of a cinema carried out by putting in an intermediate floor. The cinema was not long enough for the lanes so that the existing gable had to be removed and the building extended by 40 ft. The bowling centre has twenty-two lanes.

The stanchions on the ground floor were placed approximately 12 ft. from each side wall and the floor above was carried on cantilever beams to avoid interference with the existing side wall foundations and to reduce floor beam sizes. Erection was completed in two weeks.

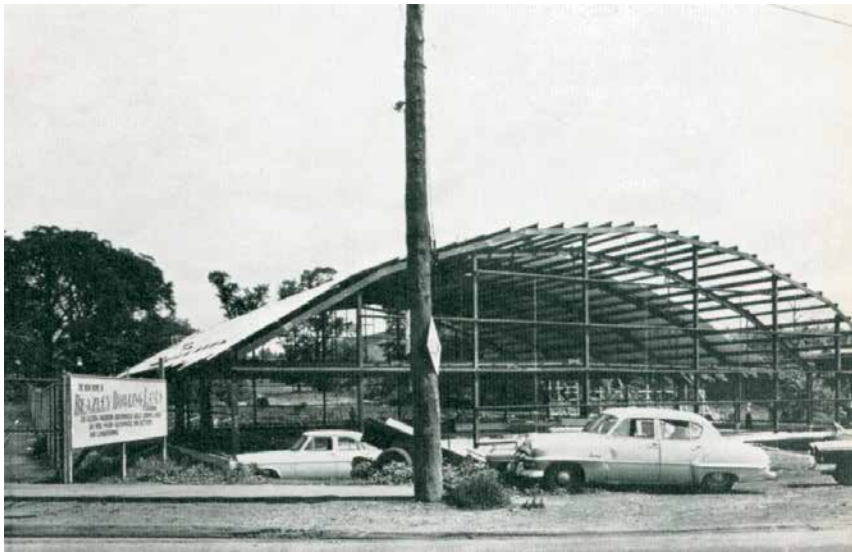
Bexleyheath is a new bowling centre of twenty-four lanes adjoining and connected to an existing cinema. At ground floor level is a car park and the first and second floors are fitted for bowling. The building is 165 ft. long by 82 ft. wide, the floor being of two equal spans with a centre line of columns and the roof being a pitched clear span. Both gable ends are hipped. Weight of steel is approximately 180 tons and erection took five weeks.

Architect for these three centres was C. J. Foster, L.R.I.B.A., of Associated British Cinemas Ltd.

West Bromwich. The structure, a straightforward new bowling centre, was erected in three weeks. The roof was quickly added so that work on the interior could be carried out under cover with total avoidance of delays of any kind and was required to give a clear unobstructed spans of 116 ft. This was achieved by the use of large span steel trusses of unusual design, with site connections carried out by means of high-strength friction-grip bolts.

The two-storey front portion of the building contains entrance halls, bar and restaurants and the mechanical equipment rooms. Here the use of Universal Beam and Column sections enabled the framework casing to be much simplified.

Architects for this twenty-four ten pin lane Fairlanes bowling centre were Michael Lyell Associates of London.



Above: Seen on the course of construction in the City of Dartmouth, Nova Scotia, is a bowling centre of structural steelwork exported from Britain. The building is 114 ft. in span by 11 ft. high to eaves and 117 ft. long.

Below: Structural steelwork at the Fairlanes bowling centre, West Bromwich.

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				●	●	●	●		●	●			●	●		●	Up to £2,000,000
Adstone Construction Ltd	01905 794561			●	●	●										✓		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				●					●	●			●	●		●	Up to £800,000*
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✓	●	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		●	●	●	●	●	●	●	●	●	●		●		✓	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●			Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●		✓	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●			●	●	✓		Up to £3,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●	●			●	●	✓	●	Up to £2,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●	●	●	●	●		●	●	✓	●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●		✓	●	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		●	●	●	●	●	●	●	●	●	●		●		✓	●	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✓	●	Up to £3,000,000
Fisher Engineering Ltd	028 6638 8521		●	●	●	●	●	●	●	●	●	●				✓	●	Above £6,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●			●							Up to £3,000,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●				Up to £800,000
Graham Wood Structural Ltd	01903 755991		●	●	●	●	●	●	●	●	●	●		●		✓		Up to £6,000,000
Grays Engineering (Contracts) Ltd	01375 372411	●			●					●	●			●	●			Up to £100,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●		●		✓		Up to £3,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●						●			●	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✓		Up to £2,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✓		Up to £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			●	●	●	●	●	●	●	●	●		●	●	✓	🟡	Up to £4,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●						🟢	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	●	●	●	●	●	●	●	●	●	●	●	●	●		✓	🟡	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								●		●				●	✓	⚪	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
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	🟡	Above £6,000,000
S H Structures Ltd	01977 681931						●	●	●	●		●				✓	⚪	Up to £3,000,000
Severfield-Watson Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	🟡	Above £6,000,000
Shipley Fabrications Ltd	01400 251480			●	●	●	●		●	●	●			●	●			Up to £1,400,000
SIAC Butlers Steel Ltd	00 353 57 862 3305		●	●	●	●	●	●	●		●	●				✓	🟢	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		●	●	●	●	●	●	●		●	●		●		✓	⚪	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●											Up to £1,400,000
Tubecon	01226 345261						●	●	●	●				●	●	✓	🟡	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			●	●	●			●	●	●					✓	⚪	Up to £2,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●		✓	🟡	Above £6,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**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

Company name	Tel
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, ● = Silver, ● = 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	●									

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
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							●			●
Fabsec Ltd	0845 094 2530	●									
FabTrol Systems UK Ltd	01274 590865		●								
Ficep (UK) Ltd	01924 223530					●					
FLI Structures	01452 722200	●									●
Forward Protective Coatings Ltd	01623 748323						●				

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, ● = 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.

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	●	●	●	●			●	●	✓			●	Up to £2,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	✓	✓	✓	●	Above £6,000,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●		●	●	●	✓		✓	●	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●	●	●	●			●	●	✓			●	Up to £800,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	✓	✓	✓	●	Above £6,000,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●		●	●	✓	✓	✓		Up to £4,000,000
Painter Brothers Ltd	01432 374400	●		●					●	✓			●	Up to £6,000,000
Remnant Plant Ltd	01594 841160	●	●	●					●	✓				Up to £400,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	✓	✓	✓	●	Above £6,000,000
S H Structures Ltd	01977 681931	●		●	●	●			●	✓		✓	●	Up to £3,000,000
Severfield-Watson Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	✓		✓	●	Above £6,000,000
SIAC Butlers Steel Ltd	00 353 57 862 3305	●	●	●	●	●		●	●	✓			●	Above £6,000,000
Non-BCSA member														
ABC Bridges Ltd	0845 0603222	●								✓				Up to £100,000
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	✓				Up to £1,400,000
Cimolai Spa	01223 350876	●	●	●	●	●	●			✓				Above £6,000,000
Concrete & Timber Services Ltd	01484 606416	●	●	●		●	●		●	✓			●	Up to £800,000
Donyal Engineering Ltd	01207 270909	●						●	●	✓		✓	●	Up to £1,400,000
Francis & Lewis International Ltd	01452 722200							●	●	✓			●	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	●	●	●	●	●	●	●	●	✓			●	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	●									●
Hempel UK Ltd	01633 874024						●				
Hi-Span Ltd	01953 603081	●									●
Highland Metals Ltd	01343 548855						●				
Hilti (GB) Ltd	0800 886100									●	
International Paint Ltd	0191 469 6111						●				●
Jack Tighe Ltd	01302 880360						●				
Jamestown Cladding and Profiling	00 353 45 434288	●									
Jotun Paints (Europe) Ltd	01724 400000						●				
Kaltenbach Ltd	01234 213201					●					
Kingspan Structural Products	01944 712000	●									●
Lindapter International	01274 521444									●	
Metsec plc	0121 601 6000	●									●
MSW	0115 946 2316	●									
Murray Plate Group Ltd	0161 866 0266								●		

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
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						●				●
Structural Metal Decks Ltd	01202 718898	●									●
Tata Steel	01724 404040				●						
Tata Steel Distribution (UK & Ireland)	01902 484100								●		
Tata Steel Service Centres Ireland	028 9266 0747								●		
Tata Steel Service Centre Dublin	00 353 1 405 0300								●		
Tata Steel Tubes	01536 402121				●						
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						●				

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ANY QUESTIONS?

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