JULY/AUGUST 2010 VOL 18 NO 7

NSC

NEW STEEL CONSTRUCTION

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Structural Steel
DESIGN AWARDS
2010

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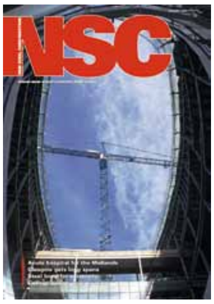

New Steel Construction keeps designers and contractors abreast of all major steel construction related developments and provides detailed technical information on key issues such as the introduction of the Eurocodes. NSC will be the first place most people hear about advances made by the extensive research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

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

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

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

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

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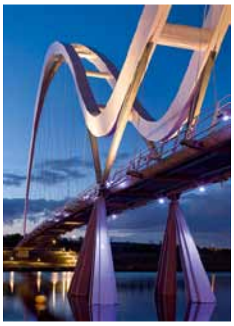
These and other steelwork articles can be downloaded from the New Steel Construction website at www.new-steel-construction.com

Cover Image
Infinity Footbridge, Stockton-on-Tees
Client: Stockton-on-Tees Borough Council
Architect: Expedition Engineering
Steelwork contractor: Cleveland Bridge UK Ltd
Main Contractor: Balfour Beatty Civil Engineering



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Steel shows its diverse appeal

There is always something surprising thrown up by the annual Structural Steel Design Awards, now in their 42nd year and reported on in some depth in this issue. Everybody who attends the awards ceremony and sees the projects displayed in detail must surely see at least one structural steelwork entrant that takes them aback with the audacity of architectural and structural design, and the quality of steelwork.

This year there was as outstanding a crop of worthy shortlisted projects as ever, with some that easily stand comparison with the best of the past 42 years. The judge's comments are telling: "an heroic engineering achievement", "steelwork at its most dramatic", "comprehensively well designed and economical in form".

What might be most surprising to some though is that there were so many quality entrants while the construction industry is in the depths of as bad a recession as any can remember. As the annual market share survey recently showed, steel still commands a dominant share of some 70% of the market for multi storey buildings; and as the SSDA shows, steel is still the material of choice for the most challenging projects, delivering innovative structures that score outstandingly on aesthetics, programme, cost and sustainability. It is no surprise that the use of alternative materials remains in long term decline.

As well as holding its ground with a dominant multi storey buildings market share, steel has been consolidating its market position in new growth sectors. As demand from sectors like schools that have bolstered the construction sector for the past few years tails off, operators of the new generation of waste to energy plants for example are opting for steel. Steel construction appeals to the widest range of clients.

As is usual, the judges – a group including architects and engineers with experience of creating large and iconic structures – reported that they were impressed by the diversity of projects gaining recognition as well as their quality. Awards were granted to inspirational projects as diverse as bridges, education buildings, an airport terminal, an energy recovery plant, a museum, and a sustainability enhancing wind turbine enclosure on top of a multi storey building.

The Legacy Roof of the Aquatics Centre was the first of the London 2012 Olympics structures to achieve an Award; without wanting to pre-empt the judges in any way, it would be surprising if it was the last as steel is making such an invaluable contribution to the success of the challenging Olympics building programme. Others will be eligible for entry next year; we wish them well against what can confidently be predicted to be the usual stiff competition.

Nick Barrett - Editor

STRUCTURAL STEEL DESIGN AWARDS 2010

Big guns roll out for steel awards

The Imperial War Museum, London, venue for the 2010 Structural Steel Design Awards
Photo above: © John Pavel, iStock. Photo below: © Mike Ford, Fabpictures

The Structural Steel Design Awards celebrated its 42nd year demonstrating yet again that steelwork is the structural material of choice as all entries showed imagination, professionalism and above all, service to the client, said Chairman of the Judges David Lazenby.

Awards were presented by television presenter and journalist Bill Turnbull at a ceremony at London's Imperial War Museum on 8 July. Mr Lazenby praised all 17 short-listed projects, spread geographically right across the UK and Ireland, for their enormous variety.

The four Award winners were the Legacy Roof, London 2012 Aquatics Centre; Audi West London; the Infinity Footbridge in Stockton-on-Tees, and Dublin Airport Terminal 2.

"This year we had an enormous variety of entries, with buildings ranging from a major airport terminal to educational establishments, and many commercial and industrial buildings. We are also starting to see work related to the 2012 London Olympics, and no doubt there will be more to follow," said Mr Lazenby.

Comparing the 2010 entries with those from previous years, Mr Lazenby added: "It is useful to look back to projects a few years ago, and make comparisons with the projects of today. For instance, the airport terminals which we ourselves recognised at the time, like Heathrow T1 or Gatwick South which were of their time – but as we can all observe, we have more recently moved to the creation of large open spaces which are flexible for future changes in demand, and structural steelwork is a key element in this progress.

"Probably the most dramatic developments have been in the field of bridges, illustrated by this year's entries, particularly those at Stockton and Derby. And we must not forget the green issues, which could scarcely be better addressed than in the steelworks at Port Talbot where a vast project is environmentally based and driven, yet still provides a financial payback in only two or three years!"

Corus and Tata Steel Europe Chief Operating Officer Dr Karl Köhler concluded the ceremony, praising all the entrants for the achievements represented by their projects. "The UK is the world leader in steel construction," he said. "And the excellence of the Awards shows what can be done with steel."

Awards

- Audi West London
- The Infinity Footbridge, Stockton-on-Tees
- Legacy Roof, London Aquatics Centre
- Terminal 2, Dublin Airport

Commendations

- The Rose Bowl, Leeds Metropolitan University
- Cathedral Bridge, Derby
- Energy Recovery Plant, Corus Port Talbot
- A40 Perryn Road Footbridge

Certificates of Merit

- The Riverside Museum, Glasgow
- Helical Stair, 500 Brook Drive, Reading
- Wind Tubine Enclosure, Strata, London SE1

David Lazenby (left), Chairman of the Judges and Jack Sanderson, BCSA President

Corus and Tata Steel Europe Chief Operating Officer Dr. Karl Köhler

The evening's host, Bill Turnbull, television presenter and journalist

The award winning teams

Audi West London

The Infinity Footbridge, Stockton-on-Tees

Legacy Roof, London Aquatics Centre

Terminal 2, Dublin Airport

All photos on this page: © Mike Ford, Fabpictures

AROUND THE PRESS

The Times
20 May 2010
Get an eyeful of Wenlock and Mandeville
(Referring to the Games' mascots) The London Organising Committee for the Olympic Games hired the children's author Michael Morpurgo to write a tale about the characters. In his imagination, the figures are created from the last drops of steel left over when the final girder for the Olympic Stadium was completed at a factory in Bolton.

New Civil Engineer
27 May 2010
Skyway to the north
(Dalston Junction Station) Here, steel beams have been used as part of the permanent reinforcement, with pairs of beams joined top and bottom with diaphragm plates. These pairs of beams weigh up to 90t each, and span up to 33m. They sit on specially designed bearings that weigh up to 3t and are capable of handling the uplift and the rotation that could be caused by such heavy point loads.

New Civil Engineer
3 June 2010
Closing the gap
(Glasgow's M74 project) Port Eglinton viaduct is the largest of the structures along the route and is on a similar scale to the Kingston Bridge nearby. The 750m long viaduct crosses several streets and three railways and 14,500t structure is constructed from 95 shallow box girders measuring 5.5m wide by 2.5m deep plus 68 deep box girders 5.5m wide and 4.5m deep.

Building
14 May 2010
Nouvel takes Manhattan
(A new 23 storey apartment block) Overlooked by either enclosed or open apartment terraces, this vertical private garden contains trees and ornamental plantings that appear to "float" on various floors and is spanned by a complex grid of high level steel beams.

New Civil Engineer
24 June 2010
Bubble wrap station nears completion
(Newport station) Over the next few weeks, 925m^2 of the two steel structures will be covered by Ethylene Tetrafluoroethylene (ETFE), which will be inflated with air to form the roof of the main concourse buildings.

Output to return to growth in 2011

Jack Sanderson

Paul Morrell

Steel construction output is forecast to increase next year, while over the coming years new infrastructure investment, including power generation plants, will provide opportunities for BCSA members in the medium to long term.

Speaking at the BCSA Annual Lunch held at Drapers Hall, London on 29 June, BCSA President Jack Sanderson, said: "The past year has been the most difficult one for the steel construction industry for the past 20 years.

Steel's market share is holding up and the underlying long term demand for steel construction remains sound. Members are well placed to respond quickly to the recovery which is expected to start next year, although the pace of recovery is likely to be modest."

On the subject of steel prices, Mr Sanderson said they place significant challenges on members when tendering for fixed price contracts.

"The BCSA has endeavoured to give its members maximum notice of price increases and has also put pressure on steelmakers to keep the increases to a minimum, combined with the longest possible period between increases," he said.

Principal guest speaker at the Annual Lunch was Paul Morrell, the Government's Chief Construction Adviser. He said the construction industry as a whole faced major challenges and did not yet have a fully developed plan for its own future. The two biggest challenges were to eliminate waste and to achieve low carbon targets.

Mr Morrell praised the BCSA's Steel Construction Sustainability Charter, saying the idea of progressing through its various levels from Member to Gold as sustainability performance improves was a good one.

Grandstand finish at Hibernian

Scottish Premier League side Hibernian will have a new East Stand for the forthcoming 2010/11 football season.

With room to accommodate 6,400 spectators, the new stand will increase the overall capacity at the Easter Road Stadium to 20,250.

Working on behalf of main contractor Hall Construction, The AA Group (TAAG) completed the steelwork programme during June. Erecting 400t of structural steelwork for the project, the company also installed the precast units for the terracing, steps and vomitory walls.

The new stand is topped with a 30m cantilever roof, formed with Westok cellular beams which were brought to site in two sections.

"All steelwork erection of the cantilever was done from the back of the structure as we were not permitted to stand any equipment on the pitch," said Kevin Nickson, TAAG Contracts Manager. "This meant we had to use a large mobile telescopic crane to lift the roof beams up and over the grandstand structure."

Work on the project is on-going and the East Stand is scheduled to be completed and fully open to spectators later this year.

New guide to offer best practice guidance for MEWPs

A new guide has been prepared to provide clarity about the safe use of MEWPs (mobile elevating work platforms) including planning, equipment selection, and training, familiarisation, safe use, supervision and rehearsal of rescue procedures, together with monitoring of the whole process.

"The guide and its content is vitally important to site management, who must ensure that operators are competent, capable of operating equipment safely and are following safe working procedures," said Pete Walker, BCSA Health, Safety and Training Manager.

Using MEWPs saves time and makes work at height efficient, effective and safer than using traditional methods of access such as ladders. When used safely, MEWPs significantly reduce the risk of injuries through falling from height.

Unfortunately over the past few years a significant number of accidents involving the use of MEWPs have occurred, including a number of fatalities. Some of these incidents have involved the operator or another person being crushed against fixtures or obstacles. The incidents could have been prevented by correct planning and preparation, selection of appropriate machinery and proper use.

"Every year, the construction industry is responsible for causing deaths and serious injury. The constructional steelwork industry has done much to improve its own performance, and made significant improvements to its reportable injury records during the Revitalising Health & Safety Campaign, recording a 60% reduction in reportable accidents," said Mr Walker

The guidance is comprehensive and easy to adopt. It represents best practice and will be issued to BCSA members as soon as it is available. The organisations involved in the publication are:

- Strategic Forum for Construction (SfC)
- Health and Safety Executive (HSE)
- British Constructional Steelwork Association (BCSA)
- Construction Plant-hire Association (CPA)
- International Plant Access Federation (IPAF)
- UKCG
- Fall Arrest Safety Equipment Training (FASET)

Landmark college scheme for Croydon

Work is progressing on a high profile £12M project to upgrade and enhance Croydon College's Fairfield Campus.

The overall scheme involves both new build and refurbishment elements, including the construction of a steel framed glazed rotunda structure, which will become the new college entrance.

Designed by architects Nightingale Associates, the six storey rotunda incorporates a double height space below ground level, which will house drama studios and music practice rooms. The upper levels provide light and spacious circulation areas with glazed walkways and two panoramic lifts giving access to upper levels in the adjoining main college building.

Working on behalf of main contractor ISG, D A Green & Sons is fabricating, supplying and erecting all structural steelwork for the project.

Opera facility spearheads Thames Gateway regeneration

The Royal Opera House's Bob and Tamar Manoukian Production Workshop will open on a 14-acre site in Purfleet, Essex at the end of this year.

Forming part of the Thames Gateway regeneration scheme, the centre represents the UK's first ever national centre of excellence for technical skills, crafts and production for the performing arts and live music industries.

The eye-catching structure is where the scenery, needed for opera and ballet productions, will be made. Carpentry workshops, painting areas and associated office space will all be included within one large 75m x 45m domed building which rises to 20.5m at its apex.

The roof's shape came about because of the client's desire for a stand-out structure, as opposed to a run of the mill industrial unit. However, designing and then erecting the roof have been a challenge for steelwork contractor Graham Wood Structural.

"The building is situated on reclaimed land and so we had to limit the loads being transferred to the foundations," says Norman Hawkins, Graham Wood Project Designer. "The trusses which form the roof have been fabricated from lightweight steelwork - channels and angles. These are cost effective as well as the ideal method for forming the distinctive domed shape."

A total of nine trusses span the 75m width of the building and these are 1.7m deep by 3.5m wide triangulated feature items of steelwork. Each truss was brought to site in five separate pieces and then erected sequentially by two 35t capacity cranes.

Internally the building has two lines of columns, providing the structure with large spans of 25m, 20m and 30m. The central span required one 20m-long section of truss, while the outer two spans were each completed with two sections forming the 25m and 30m truss sections.

NEWS IN BRIEF

Amendments to the Housing Grants, Construction and Regeneration Act 1996 (the Construction Act) were passed by Parliament in November last year as Part 8 of the **Local Democracy, Economic Development and Construction Act 2009.** The Department for Business Innovation and Skills (BIS) has recently concluded a consultation on what consequential amendments will be needed to the Scheme for Construction Contracts, the secondary legislation which provides a default adjudication procedure and payment provisions. More information can be found on the BIS website at *http://www.bis.gov.uk/Consultations/construction-contracts-regulations-1998-amendments?cat=open*. The amendments to the Construction Act are expected to be brought into force next year.

Tekla software has been used in the structural design and construction of the stadiums of this year's FIFA World Cup which took place in South Africa. Of the ten arenas for the world's most watched sports event, three have been modelled using the Tekla Structures 3D BIM (Building Information Modelling) software. A total of five completely new stadiums were built for the Cup. Two of them, the Mbombela Stadium in Nelspruit and the Nelson Mandela Bay Stadium in Port Elizabeth, were modelled using Tekla Structures. In addition, the modeling of the Royal Bafokeng Stadium in Rustenburg, renovated for the Cup, was made with Tekla software.

Last month's (June) issue of New Steel Construction had an error on news page 7 under the headline of Olympic venues on track during busiest year. The final sentence of the story should have read: 'The steelwork packages for the Stadium and the Aquatics Centre have been completed by **Watson Steel Structures** and **Rowecord Engineering** respectively, using a total of 12,800t of structural steel.'

Galvanizing operation at new hospital

Wessex Galvanizers, part of the Wedge Galvanizing Group, has completed the latest phase of galvanizing for Portsmouth's new Queen Alexandra Hospital which has been completely rebuilt and extended, making it one of the largest construction projects in the south of England.

Wessex Galvanizers was contracted to galvanize more than 250t of steel for a new 500-space staff car park at the hospital. Structural steelwork was also galvanized for the building of new plant rooms to house the hospital's main heating boilers and other equipment.

Officially opened in June 2009, the new Queen Alexandra Hospital has more than doubled its previous size to 1400 beds, 27 operating theatres and 6,000 staff. It now incorporates the acute services from two other local hospitals in the Portsmouth area – St Mary's Hospital, Portsmouth, and the Royal Hospital at Haslar, Gosport.

Richard Whiddett, Wessex Galvanizers' Sales Manager, said: "This has been a long-term ongoing project over the past two-to-three years on behalf of our customer.

"We are delighted to be involved in such a major construction initiative, especially as our galvanizing work is helping to create a new hospital with patient facilities which are amongst the very best in Europe."

Trinity Walk steel frame on target

Wakefield's Trinity Walk shopping centre development is on schedule with the steel frame making rapid progress after the delivery of three 22m long steel beams - each weighing more than 30t.

The steel work was delivered to main contractor Shepherd Construction on special transport and required a 220t capacity mobile crane to lift each beam into place. Shepherd Construction is joint development partner for Trinity Walk project with Sovereign Land and AREA Property Partners.

The beams will be used to support the units above one of the anchor stores, Sainsbury's. The major steelwork programme is scheduled to complete this November and the job will see steelwork contractor William Hare erect more than 6,500t of steel for the retail development.

When Trinity Walk completes in spring 2011, it will provide more than 50 large, modern retail units across a 28 acre site, with a number of major retailers already signed up including Debenhams, Sainsbury's, New Look, River Island and Next.

Nigel Moore, Shepherd Construction's project leader commented: "With the framework rapidly taking shape and with cladding and masonry work continuing apace, Trinity Walk's flagship status in Wakefield is visually emerging."

Diversity wins at Galvanizing Awards

A diverse array of projects were winners at the 2010 Galvanizing Awards held at the Royal Aeronautical Society in London. No overall winner was declared with all four category winners taking equal recognition.

The winners were Kraus Schonberg Architects for Tayson House in Bradford which scooped the Architecture award; Roseisle Distillery, Elgin won the Engineering category; Johnson & Company for its work on St Michael's Church in Linlithgow won the Detail category; and Denis Bryne Architects for Tolka Rovers AFC picked up the top prize in the Duplex category.

Judging the awards this year were sustainable winner of last year's Galvanizing Awards, Rebecca Egan of Bucholz McEvoy Architects; Jan-Carlos Kucharek of RIBA Journal; Phil Williams of The Institution of Structural Engineers; and Iqbal Johal of Galvanizers Association.

Jan-Carlos Kucharek said: "Entering the judging room, I was not only surprised by the number of entries in this year's Galvanizers Awards, but by the general standard, which over the years that I have been helping to judge the awards, has only gone up. I'm usually one of its harshest critics, but on this occasion however my hand was stayed by the scrutiny required to really get to the bottom of a project and discover how each was using the medium of galvanizing to help realise the project's bigger ideas."

Above: Tolka Rovers AFC.
Near right: St Michael's Church, Linlithgow.
Far right: Tayson House, Bradford.
Below: Roseisle Distillery, Elgin.

Diary

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

10, 17 & 24 September 2010
On-line - Steel Building Design to EC3 Part 1
Internet

14 September 2010
Steel Frames & Disproportionate Collapse Rules
Newbury

28 September 2010
MEMBER'S DAY
Ascot

29-30 September 2010
Essential Steelwork Design
Leeds

5 October 2010
Light Gauge Steel Design
Sheffield

THE ROSE BOWL, LEEDS METROPOLITAN UNIVERSITY

Structural Steel
DESIGN AWARDS
2010

Structural Steel DESIGN AWARDS 2010

This year the Structural Steel Design Awards demonstrate successfully yet again, that steelwork is undoubtedly the structural material of choice. As we all know, these are tough times and the responses from all of the entries show imagination, professionalism, and above all, service to the clients.

This year we had 17 projects on the shortlist, geographically spread right across the UK and Ireland. There is enormous variety, with buildings ranging from a major airport terminal to educational establishments, and many commercial and industrial buildings. We are also starting to see work related to the 2012 London Olympics, and no doubt there will be more to follow.

It is useful to look back to projects a few years ago, and make comparisons with the projects of today. For instance, the airport terminals which we ourselves recognised at the time, like Heathrow T1 or Gatwick South which were of their time – but as we can all observe, we have more recently moved to the creation of large open spaces which are flexible for future changes in demand, and structural steelwork is a key element in this progress.

Probably the most dramatic developments have been in the field of bridges, illustrated by this year's entries, particularly those at Stockton and Derby. And we must not forget the green issues, which could scarcely be better addressed than in the steelworks at Port Talbot where a vast project is environmentally based and driven, yet still provides a financial payback in only two or three years!

All types of structures have seen real progress over the years, and no doubt the Steelwork Awards have been a major driver in this.

D W Lazenby CBE DIC FCGI FICE FIStructE
Chairman of the judging panel

AWARDS

THE JUDGES

Chairman of the Structural Steel Design Awards judges **David Lazenby** CBE had a distinguished career as a consulting engineer before taking a new turn in the late 1990s to give British Standards new focus and direction. He also led the huge pan-European exercise to develop the Eurocodes, as Chairman of the lead European committee.

David Lazenby's career began with Balfour Beatty in 1959. In 1964 he moved to consultant Andrews Kent & Stone, where he stayed for 30 years and became managing partner and subsequently a director. In 1990–91 he was one of the youngest ever Presidents of the Institution of Structural Engineers.

In parallel he had become involved in developing codes and standards, advancing from technical committees and sector boards to become a non-executive director of BSI Group. In 1997 he became the Director of British Standards, one of three executive directors responsible for over 5000 staff in 100+ countries, and a budget of £300+M.

His experience both as a user of standards and as a committee and board member helped him to bring a new focus on market relevance and he is credited with bringing global success to the organization. Establishing it as a world leader in its field, as well as making it profitable, has been almost unique among national standards bodies.

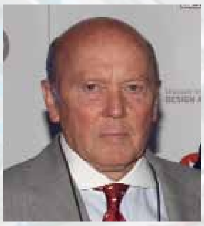
Since 2003 he has operated his own consultancies, Eurocode Consultants, and DWL Consultants, in the fields of company management, and certification.

Martin Manning is a structural engineer. He is an Arup Fellow and a Director of Arup. He joined the firm directly from university and during the last 42 years has worked in Arup offices, and on projects, around the world. More recently he has worked on buildings in the transport sector.

He is the current Chairman of the SCI, a Member of The Institution of Structural Engineers and a Fellow of the Royal Academy of Engineering.

Gerry Hayter has spent his career in transport, mainly in London. He joined London Underground as a civil engineering graduate in 1975, working on the design of railway bridges, lifts and stations. After 10 years he joined the Bridges Engineering Division of the Department of Transport where he developed new standards for the design, assessment of highway bridges and structures for 40 tonne lorries. In 1994 he joined the London Network Management Division of the Highways Agency, responsible for the maintenance of highway structures in West London. A number of senior technical posts at the agency followed, culminating in his present position as Group Manager of the Knowledge Management Group, with responsibility for the development of the Agency's £30m knowledge programme.

Christopher Nash is a Partner of Grimshaw Architects. He graduated in 1978 from Bristol University School of Architecture, and joined Grimshaw in 1982. As an architect he was responsible for many of the practice's high profile buildings. These include - from his early years - the Financial Times Printing Works in London's Docklands and the British Pavilion for the Seville Expo 92, The Western Morning News headquarters in Plymouth, the RAC Regional Headquarters in Bristol and many other projects. Having spent ten years at Managing Partner, Chris has recently returned to leading projects. Following the success of the Zurich Airport fifth expansion project, he is currently Partner in charge of a number of projects ranging from the Gatwick Airport South Terminal modernisation to the Cutty Sark Conservation Project.



Joe Locke retired in 2004 from his position at William Hare, where he was responsible for the engineering aspects of the company's activities and also Executive Director of subsidiary Westbury Tubular Structures; having previously retired in 1998 as Chief Executive Officer of Watson Steel. Joe was an apprentice with Watson and sat his associate membership of the Institution of Structural Engineers at only 23. Joe worked at home and overseas on a considerable number of high prestige contracts, including Sellafield nuclear power station's massive thermal oxide reprocessing plant and the terminal building of Kansai airport, Japan. Joe Locke was awarded an MBE in 1990 for his contribution to the structural steelwork industry. In 2007 he received a Gold Medal of the Institution of Structural Engineers.

Oliver Tyler joined Wilkinson Eyre Architects (WEA) in 1991; he became an Associate in 1997 and then a Director in 1999. He has over 24 years experience in architectural practice and extensive experience in leading and coordinating the design and construction of high profile buildings.

Oliver has led a number of prestigious projects at WEA including Stratford Market Depot and Stratford Regional Station in London for the Jubilee Line Extension; the Dyson Headquarters in Wiltshire and the Arena and Convention Centre in Liverpool - the centrepiece for the city's 2008 Capital of Culture celebrations.

He is currently Director in charge of WEA's Crossrail Liverpool Street Station Project and a number of major sport and commercial developments.

Situated alongside the M4 in west London, the Audi showroom is a celebration of automotive engineering and technical expertise which is seen by thousands of commuters every day.

Fact file

Architects:
Wilkinson Eyre Architects
Structural engineer:
Expedition Engineering
Steelwork contractor:
Rowen Structures Ltd (Severfield-Rowen Plc)
Main contractor:
ISG InteriorExterior
Client: *Volkswagen Group UK Ltd*

Steel was Audi's structural material of choice, from bespoke steel boxes submerged below the basement slab to trapezoidal tapering raking columns at the southern façade. The use of a steel frame in the superstructure has allowed a highly flexible floor plan for future renovations to the showroom and office spaces, while a steel intensive perimeter sheet-piled basement has provided significant cost, aesthetic and construction programme benefits below ground.

Overall, the Audi showroom structure is a seven-storey, 30,000m^2 building with five-storeys above ground. The superstructure also contains three floors of showroom and sales areas, with offices, marketing and conference facilities over the top two floors. Below ground, a two-storey basement contains futuristic workshops and diagnostic facilities.

The structure's architecture was deliberately pared down by Wilkinson Eyre to allow the main features, the cars themselves, to stand out. The structural frame and simple floor arrangements maximise light and airiness.

Long span steel plate girders have been used to allow large (19m span) column free floor plates, while squeezing the floor sandwich to a meagre metre from ceiling to finished floor level. To enable the tight floor construction, early coordination of the services with the structure was essential.

Considering the thickness of the floor construction, composite steel floor decking was the natural choice. This floor construction has allowed for considerable savings in the foundations, reducing the number and size of piles and bringing savings in both material usage and project costs.

The exposed internal roof structure is another key feature providing a backdrop of engineered architecture to the cavernous rear display space. The single curve of the roof is formed of curved rolled sections simply and elegantly braced and connected. The economic design extends to the lightweight steel roof deck, chosen to provide the roof structure, architectural finish and acoustic attenuation. The speed of erection of the roof deck enabled the quick closing of the building envelope following the steelwork erection.

The primary roof structure is based on a single axis of curvature, the southern M4 facing edge of the building introduces a curve on plan producing double curved eaves. This geometrically challenging edge, fabricated from steel, was included in the primary steelwork package to ensure a crisp, engineered finish.

A strong architectural vision for the project was carried right through to the design of steelwork connections. "The connections for the roof and column steelwork are all exposed and needed a lot of design work to get the desired aesthetic effect," explains Jeff Matthews, Rowen Structures' Project Manager.

In summary, the judges say this is a comprehensively well designed and economical structure and its details reflect a technical ethos. The building showcases the values that Audi project to their public with great panache. This is an appropriately stylish and racy building, showing structural steelwork to great effect.

A landmark structure spanning the River Tees, the Infinity Bridge links the multi-million pound North Shore regeneration development with the thriving Teesdale area.

The Infinity Footbridge is a unique linkage for pedestrians and cyclists across the River Tees and forms an integral element for the area's regeneration. The structure is formed of two graceful steel arches that flow into one another, spanning 60m from the south bank to the central pier and a further 120m to the north bank of the river.

The arches are fabricated to form trapezoidal hollow box sections which vary from 1,500mm to 400mm deep and 2,500mm to 200mm wide. The arches' box sections bifurcate on plan over the central pier and are supported by four steel arms. The arms in turn land on two 3t solid machined pieces of high grade steel, forming the central nodes.

At its highest point the bridge stands 40m above the river and the structure was constructed from more than 300t of weathering steel.

The deck is made from precast concrete units suspended from the arch by hangar cables and post-tensioned along their length by a pair of longitudinal cables running either side of the deck. These cables also act as ties for the arch which resolve the horizontal thrust within the structure. The deck is finished with a stainless steel handrail which incorporates the bridge's dynamic lighting system.

Working with 3D digital models was central to the design of the bridge. The shape of the arches was perfected using form-finding 3D analysis techniques, while the structural analysis model was linked through to the geometrical model, allowing simultaneous updates to both structural and visual models.

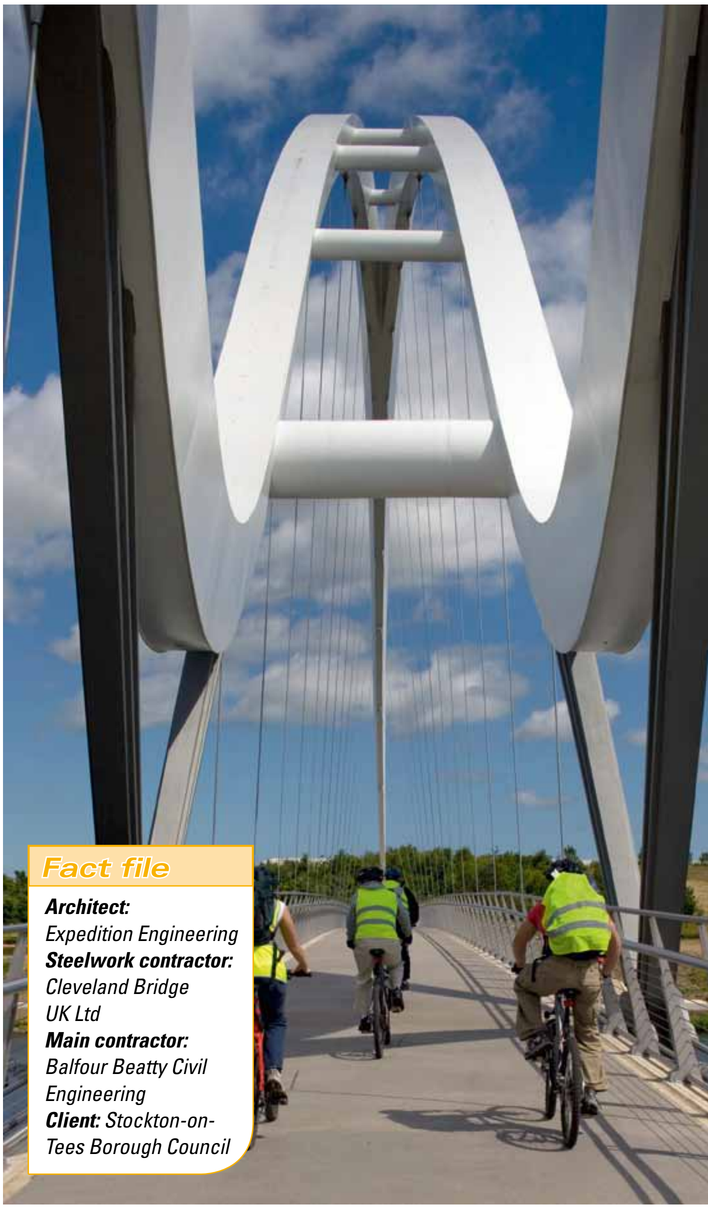
As the project moved into the construction phase several contractual barriers were overcome to allow construction information to be delivered in a single digital 3D model. This was used directly by the steelwork fabricator; the erection sequence designer; casting manufacturer; and for the fabricator of the steel moulds used for casting the deck units.

"The extensive embrace of the digital 3D model led to project-wide efficiencies and removed the risk of interpretation errors. By avoiding cumbersome 2D paper representations of complex geometry in favour of precise, digital 3D models the project exemplifies the leading edge of coordinated steelwork design and fabrication," says Expedition Engineering Project Engineer Tim Harris.

Through close collaboration between designer, contractor and fabricator, the design of the bridge was developed in order to both ease the fabrication and construction, while maintaining the original aesthetic quality.

Lifting the larger steel arch provided a special challenge. Sections of the arch were fabricated in Darlington by Cleveland Bridge and then carefully welded together on the river bank. In a single lift using the UK's largest mobile crane, the large north arch was lifted into place causing minimal disruption for river users.

In summary, the judges say this is an inspirational project which fulfils the client's brief for a landmark. The elegant structure clearly describes the forces on it, and its simplicity belies the technical complexities which were handled by good teamwork. This is steelwork at its most dramatic.



Fact file

Architect:
Expedition Engineering
Steelwork contractor:
Cleveland Bridge UK Ltd
Main contractor:
Balfour Beatty Civil Engineering
Client: *Stockton-on-Tees Borough Council*

Comprising of a stunning waveform roof which sweeps upwards in a smooth curve, the Aquatics Centre will be one of the centrepieces of London's Olympic Park.

Fact file

Architects: *Zaha Hadid Architects*
Structural engineer: *Arup*
Steelwork contractor: *Rowecord Engineering Ltd*
Main contractor: *Balfour Beatty Group Ltd*
Client: *Olympic Delivery Authority*

This is a heroic engineering achievement which has overcome severe programme and constructional problems, say the judges. A necessarily complex structure delivers the form and shape at the heart of what will become the emblematic and beautiful icon of the London 2012 Olympics.

The 11,000m^2 roof structure of the Aquatics Centre spans a column free area measuring 160m long and up to 90m wide. It is supported on bearings on two just concrete cores, 54m apart, near its northern end and on a concrete wall at its southern end.

More than 3,200t of structural steel is contained in the roof, of which 2,000t are fabricated plate girders.

Forming the roof are a series of long span trusses spanning lengthways over the main pool hall. They span between two transverse trusses, one mounted on the southern supporting wall and another spanning between the northern cores.

The main trusses lie in a fan arrangement to create the plan shape of the roof. The centre fan trusses cantilever northwards beyond the north transverse truss to form an overhanging canopy above the public entrance plaza.

"We wanted to simplify the roof as much as possible for construction," says Mike King, Arup's Project Engineer. "It's a complex structure and the main structural challenge is the fact that it's only supported at three points."

To construct the roof while causing minimal impact on the overall programme the steel structure was built in situ, with the trusses made from fabricated H-sections. The initial steel section to be erected was a primary truss which sits on the south wall and supports the fan trusses that span the entire length of the roof.

"Early in the design process we did consider building the roof with timber," adds Mr King. "However, it became apparent that the structure has too many high forces in its geometry, particularly where the fan trusses are thinnest."

The individual truss members were fabricated in Rowecord's South Wales factories and transported to site on 512 separate deliveries being controlled by Rowecord in conjunction with the Olympic Delivery Authority logistics centre.

At site the members were bolted together to produce erectable truss lengths of around 30m – 40m. The trusses were lifted onto pre-erected lines of temporary trestles and joined together with bolted splices. There were three main lines of temporary trestles with further temporary trestles at the north and south ends of the structure.

The major benefit of the chosen erection sequence was that while the trusses were being erected the two northern cores were also being constructed. By the time the roof reached the north end the cores were complete. Also, by this time the southern or first line of support trestles were dismantled, once the roof got to the middle point. This allowed main contractor Balfour Beatty to get started with the job of excavating the pool facilities.

Dublin Airport's new Terminal 2 is a flexible, contemporary and user-friendly facility developed to cater for 10-15 million passengers per annum.

The new terminal building comprises of arrivals, departures, check-in buildings and link bridges totalling approximately 12,000t of structural steelwork.

In order to meet a challenging build schedule, Dublin Airport Authority decided on a package approach to various aspects of the expansion. This allowed the airport more flexibility with the phasing of packages and accelerated the overall process.

The client's brief was to provide a sustainable landmark building that could adapt over time to the ever changing requirements of the airport. The structure was to be light and airy, and make the maximum use of natural light to provide a calm atmosphere.

The new terminal was designed to utilise appropriate technology, which remains flexible to ensure future "proofing" and to provide enhanced efficiency for both airlines and the operator. Certain elements of the structure are designed to allow for further expansion and also to allow for the required increase in demand.

A highly architectural design was chosen with a curved shape and extensive use of glass. With the passengers in mind, the building also provides a simple efficient and user-friendly experience for all.

The shape of the roof and the large designed spans clearly pointed to the use of steel as the most practical and economic way of creating the curved shape of the building.

Bespoke fabricated box section roof girders were designed and these were fabricated from curved plates and fully welded in the factory. Prior to despatch the roof girders were bolted together during the fabrication process to ensure the tolerances and fit up on site were achieved.

One of the main drivers during the design was to reduce the amount of work on site and this was achieved by providing large prefabricated units, up to 20t each. These were bolted together at low level to form the main roof girders. Heavy plate girders and plated columns were also used to create large spans.

In order to achieve a very tight programme and to avoid disrupting the existing airport operations, all the works were planned on both a day and night shift basis.

"Working in and around a 'live' airport was the most challenging aspect of the project," says Mike Bowen, Watson Steel Structures' Contracts Manager.

The structure also presented a considerable challenge in respect of fabrication workmanship. The roof and the sides of the building are curved in both plan and in elevation. The use of 3D modelling and CNC data transfer to the cutting and drilling machines was essential in achieving the accuracy and tolerances in the individual components.

To conclude, the judges say this is a large complex infrastructure scheme designed and constructed in a short time in the middle of the day-to-day life of a busy international airport. A well executed project which demonstrates close cooperation between all involved, and a fine example of the capabilities of steelwork.

Fact file

Architect: *Pascall+Watson architects*
Structural engineer and project manager: *Arup*
Steelwork contractor: *Watson Steel Structures Ltd (Severfield-Rowen Plc)*
Construction manager: *Mace*
Client: *Dublin Airport Authority*

Housing the new faculty of Business and Law, the Rose Bowl also provides top quality teaching facilities and a central hub for connecting students from all over the campus.

Fact file

Architects:
Sheppard Robson
Structural engineer:
Arup
Steelwork contractor:
Fisher Engineering Ltd (Severfield-Rowen Plc)
Main contractor:
BAM Construction Ltd
Client:
Leeds Metropolitan University

The Rose Bowl project is an excellent example of how effective collaboration and teamwork within the client, design and contractor teams can help deliver a complex and successful building responding to the client's brief. The Rose Bowl provides Leeds Metropolitan University with a landmark, easily identifiable building, central to its campus, with a distinctive branding that defines the university.

This complex project, on a challenging city centre site, posed the construction team a number of key challenges, not least the tight budget and programme. These were actively addressed from the outset and were key drivers in the choice of a structural steel frame.

"The above ground superstructure is steel for its speed of construction," says Simon Sutcliffe, BAM Construction Project Manager. "The design certainly lent itself to steel, especially the 'pod' lecture theatre structure, as well as the need for long spans in the office block."

The lecture theatre 'pod' which sits 'half in and half out' of the atrium contains one 250-seat theatre, two 140-seat and four 60-seat theatres. As well as having a highly unusual oval bowl-like shape, tapering outward as it gets higher; the structure is clad in distinctive triangulated reflective glass panels, fixed using structural silicone to a bespoke aluminium backing frame system.

A series of bridges cross a semi public atrium, day lit by a high level structural glazed roof light, linking the 'pod' to the outer U-shaped four storey main floorplates, which house the offices and ancillary teaching spaces.

The building is built over a two to three storey basement car park which extends significantly beyond the footprint of the building. From ground level up the structure is steel framed to provide maximum flexibility to the floor plate. Cellular beams were used, with agreed hole arrangements and centres, to allow the co-ordination of mechanical and electrical services into the void. Clear spans of 15m are found throughout the building with perimeter columns set back into the space to create a clean façade.

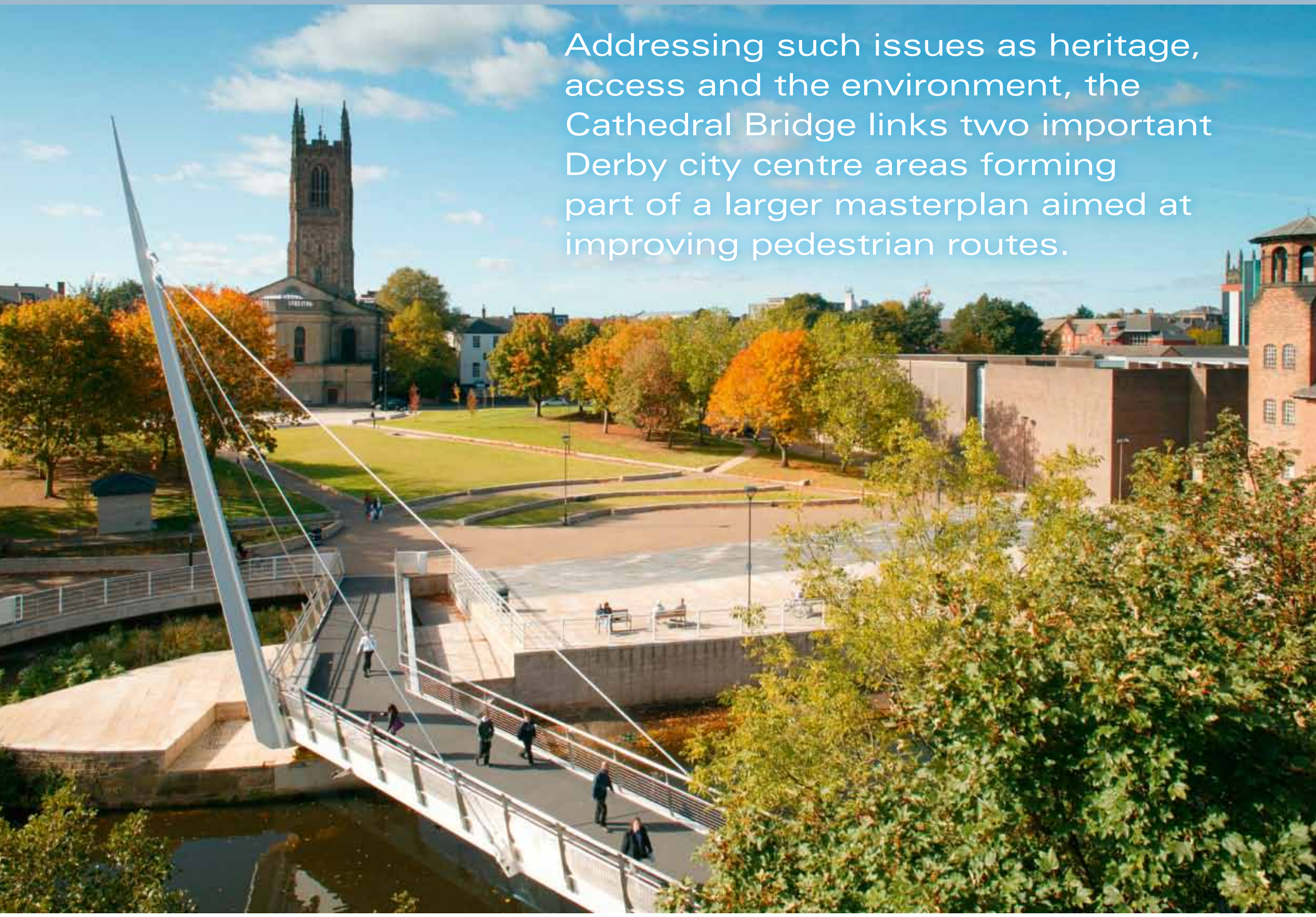
The pod structure itself consists of a series of Y-shaped feature columns connected to a circumferential truss extending around the envelope of the pod. Temporary stability during the pod erection was ensured by tying the circumferential trusses back to the four internal main columns which were in turn temporarily tied together to form a central braced core.

Once the central core and ring of Y columns were in place, the steel diagrid and floors were then erected using the temporary core to control the position of the diagrid and provide stability. On completion of the diagrid shell to third floor level, the concrete deck was poured and the pod became stable. The remaining diagrid and floors were then installed and the temporary bracing removed.

The judges say the careful detailing and fine fabrication are commendable.

CATHEDRAL BRIDGE, DERBY • COMMENDATION

Addressing such issues as heritage, access and the environment, the Cathedral Bridge links two important Derby city centre areas forming part of a larger masterplan aimed at improving pedestrian routes.



The Cathedral cable stayed pedestrian swing bridge forms an important element within a masterplan which will reinvigorate Derby's historic city centre, while also improving access routes around the Silk Mill Museum and Derwent River.

The area has World Heritage status as the birthplace of the factory system where water power was first harnessed for textile production.

The bridge, which lynchpins these two agendas both metaphorically and literally, also had to respond to the site constraints associated with a low banked, fast flowing river that can rise quickly by up to 1m. It provides a flexible structure low enough to integrate well with the floodplain environment, swift enough in its mechanics to respond to water fluctuation; while its sharp steel profile evokes associations with the tools - scissor and needle - used in textile manufacture.

The structure spans both the River Derwent and the adjacent Mill Race waterway, which once powered a nearby textile mill. The bridge's kinked backspan links across the Mill Race while also contributing structural efficiencies since it counterbalances the main deck which spans the Derwent. The 20m high needle-like mast is connected to the hollow box steel section of the deck via three pre-stressed steel cables.

"We worked closely with the steel fabricator from the early stages of design to ensure a highly efficient, integrated steel solution," says Stephen Wilson, Ramboll Project Engineer.

"Feasibility analysis took prominence in early design phases since this complex bridge had to be tuned to function under variable loading conditions both in its open and closed positions, as well as in its transitional mode."

During transition the bridge rotates about a vertical axis on a pivot bearing located under the mast. The tail end bearing is supported along a concealed track concentric to the pivot point and a massive cast steel roller mechanism concealed beneath the elbow of the bridge deck provides continual vertical support.

The nose end of the bridge is entirely unsupported during transition. "We calculated projected deflection values to within a hair's breadth, pre-cambering the structure - which was fabricated in sections and welded together onsite - for efficiency of construction," adds Mr Wilson.

The key sustainability contribution of the design is the near-effortless mechanical solution. The kinked blade of the deck is perfectly balanced to rotate using minimal energy. Keeping the structure as lean as possible reduced the use of materials, all of which were sourced and fabricated within 15 miles of site.

Ecological sensitivity played a key role, with the project's minimal riverside intervention, which helped protect the local inter-tidal habitat. The design is future-proofed to accommodate potential future rises in water levels, as defined by current Environment Agency recommendations. Analysing the structure to achieve the slimmest possible steel deck depth meant Ramboll was able to calculate a generous tolerance for floodwater rise.

Fact file

Architects: *Ramboll*
Structural engineer: *Ramboll*
Steelwork contractor: *Briton Fabricators Ltd*
Main contractor: *Dean & Dyball*
Client: *Derby City Council*

A new BOS gas recovery plant will allow the Corus Port Talbot facility to harness off-gas as a source of energy for other on-site power plants. The payback period for the entire project is less than three years.

A major energy efficiency scheme commissioned at the Corus Port Talbot steelworks will allow the facility to harness the off-gas, rich in carbon monoxide, generated by the basic oxygen steelmaking (BOS) process as a source of energy.

To facilitate this new process, a large gas holder along with 3km of associated pipework and two 70m high stacks, were fabricated, supplied and erected by Rowecord Engineering.

Corus Project Manager Guy Simms, says: “The financial and environmental benefits of the full scheme are very attractive especially given the rise in energy costs over recent years.”

Previously, all BOS off-gas produced at Port Talbot was flared and the resulting CO_2 sent into the atmosphere. Now it replaces Coke Oven Gas (COG) to supply power plants, with the knock-on effect being a 60% reduction in on-site natural gas imports. Natural gas is currently used to fuel reheat furnaces in the hot mill, COG now not needed for power plants is diverted here instead.

Remarkably the payback period for this multi-million pound project is only two years. “Every year after that there will be an ongoing financial benefit, derived from less natural gas imports and a 15% reduction in electricity imports as well as the social and environmental benefit of reducing our CO_2 emissions by 250,000t per annum,” explains Mr Simms.

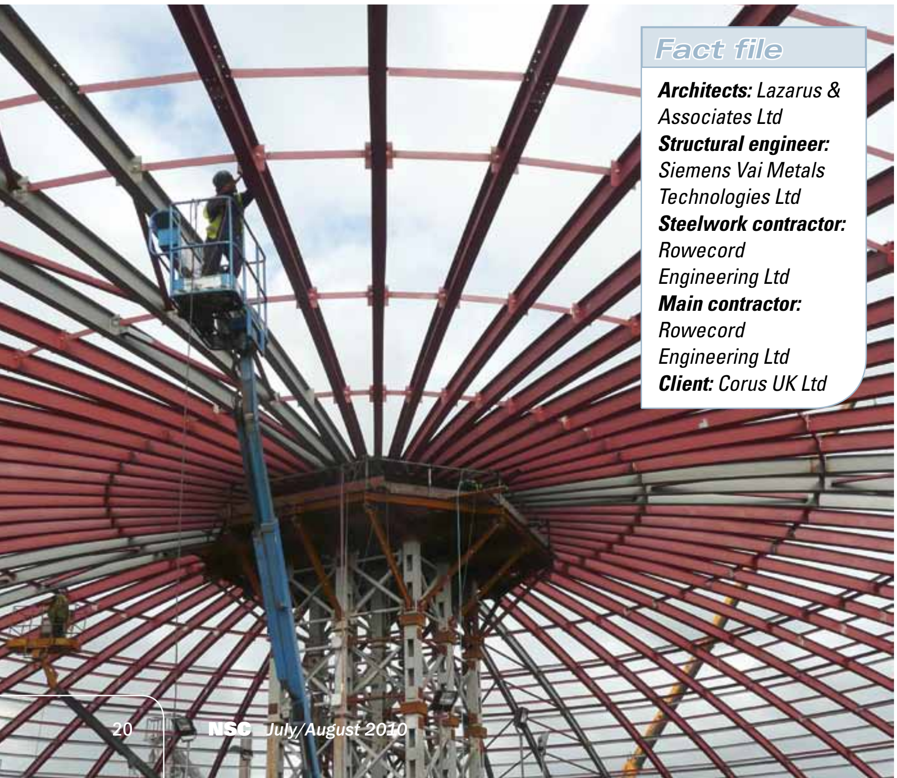
A 75,000m^3 gas holder is central to the scheme. Approximately 2,700t of steelwork went into this large structure which is 63m-high to the apex of its rooftop vent, 54m in diameter and erected from steel plates.

Early works on site involved ground preparation and piling, prior to concrete slab and steel floor plate being installed. This then allowed the main steel erection programme to begin, with the uppermost ring of plate steel installed first. Each steel plate is 2.4m high x 11.3m long and one circumference - with welded connections - took seven days to complete.

Next the roof framework was erected consisting of a series of 600mm deep rafters which fan-out to the perimeter from a central point that was temporarily supported on a trestle.

Once the roof was clad the structure was raised by a series of hydraulic jacks placed around the circumference. The jacking process took approximately five hours and raised the entire steel ring 2.4m, which allowed another complete circumference of steel plates to be installed, before the process was carried out again and again until the gas holder reached its full height.

Summing up, the Judges say in a tough industrial environment, this large scheme shows how steelwork contributes to enormous environmental benefits. Waste gases are now treated and transported to a large steel gas holder for reuse. The challenges of working in an operational steelworks were huge. Structural steelwork on a large scale is key to the astonishing pay-back time of less than 3 years! This is outstanding.



Fact file

Architects: *Lazarus & Associates Ltd*
Structural engineer: *Siemens Vai Metals Technologies Ltd*
Steelwork contractor: *Rowecord Engineering Ltd*
Main contractor: *Rowecord Engineering Ltd*
Client: *Corus UK Ltd*

Photos on this page © Mike Humphries

Perryn Road footbridge is a high quality steel footbridge with numerous innovative features. It was designed to fit a highly constrained site and meet challenging accessibility requirements.

The bridge layout and architecture required careful consideration to successfully create a crossing that is attractive, safe to use and serves the needs of the local community and Transport for London (TfL). The choice of steel allowed a visually interesting and elegant structure that is efficient yet robust.

The footbridge was introduced as a variation into a major bridge replacement contract in west London. This involved the replacement of two 1920's concrete bridges carrying the A40 major arterial road over mainline railways with steel composite bridges.

Responding to local community concerns over proposals to replace the former footbridge at this steeply sloping site with an at-grade crossing, TfL reviewed pedestrian movements and accident statistics and then analysed social and financial benefits in favour of a new footbridge.

Land availability was severely restricted and compounded by the numerous buried services that ran under the footway. Construction of the footbridge had to be undertaken within the constraints of the main contract with regard to working areas, working times and lane closures. The footbridge design allowed construction to satisfy the many conflicting and pre-existing constraints and was programmed to minimise disruption to the main contract.

The bridge was fabricated in North Yorkshire and was transported, painted and erected as one unit. The steelwork contractor SH Structures modelled it in Tekla Structures, which allowed final details to be agreed and fabrication issues to be resolved efficiently.

The bridge design incorporates supports that are major steel fabrications, having numerous functions while maintaining an architectural elegance. The main span and supports are fully integral, with full moment connections between the truss and supports.

To provide the necessary stiffness and mass, but retain a slender profile, the supports were fabricated in 40mm steel plate and then concrete filled.

The bridge truss comprises curved upper and lower chords that are connected by variously sloping straight bracing members. All the chords and bracing are circular hollow sections and the sizing and truss geometry was carefully developed so that no stiffening or overlapping of members was required at joint nodes.

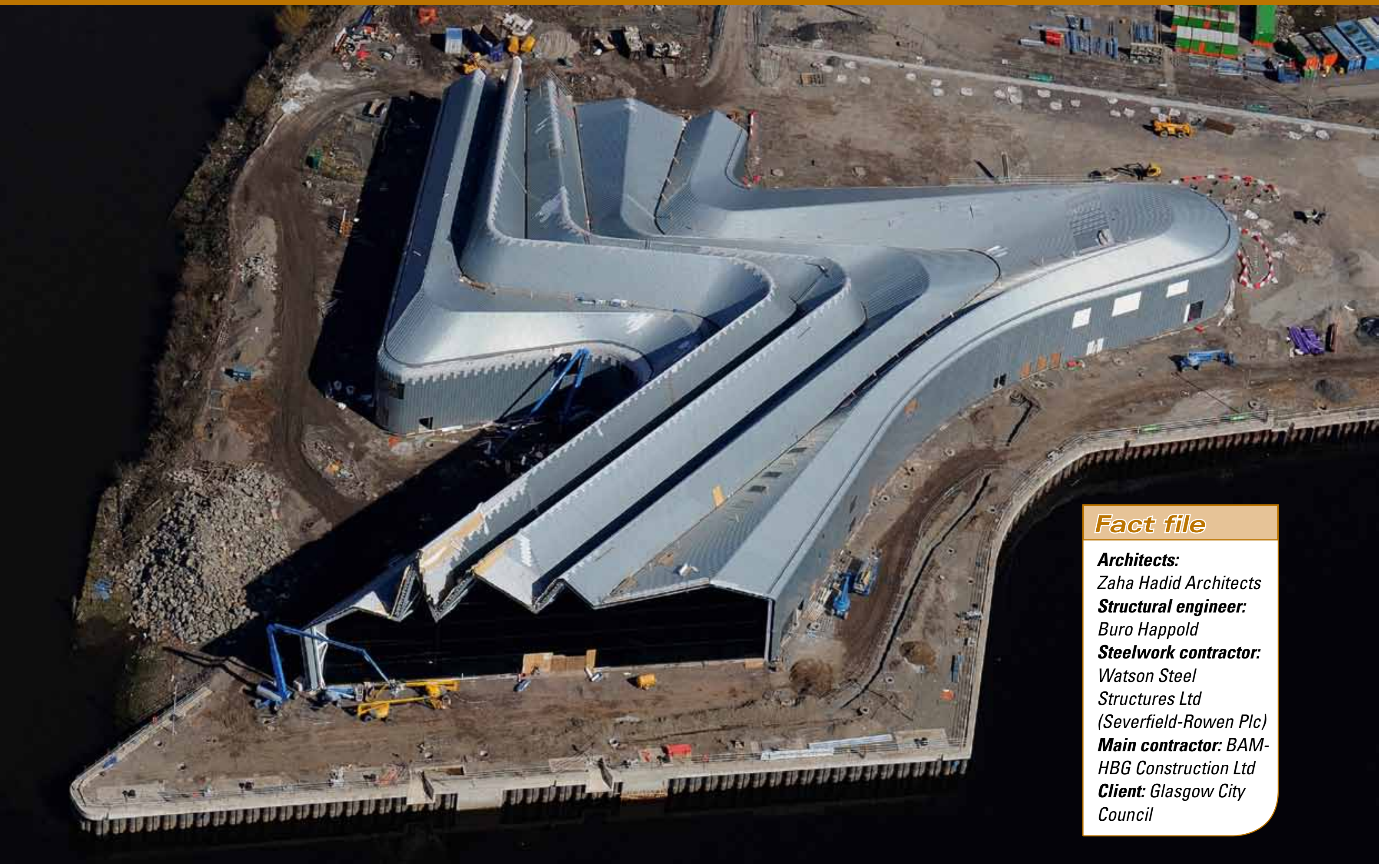
The chord members are curved to parabolas, the top chords being in vertical planes while the bottom chords (from which transverse members support the bridge deck) are in inclined planes to give the bridge deck an elegant vertical profile.

Following civil engineering work on site, the bridge supports were erected and concrete filled. During a single night time road closure, the first permitted on the A40, the lightweight main span was lifted into position and made fully integral with the supports.

A well considered and executed urban design produces a robust yet elegant solution, say the judges.

Fact file

Architects: *Grimshaw*
Structural engineer: *Hyder Consulting (UK) Ltd*
Steelwork contractor: *SH Structures Ltd*
Main contractor: *Carillion Civil Engineering*
Client: *Transport for London*



Fact file

Architects:
Zaha Hadid Architects
Structural engineer:
Buro Happold
Steelwork contractor:
Watson Steel Structures Ltd (Severfield-Rowen Plc)
Main contractor: *BAM-HBG Construction Ltd*
Client: *Glasgow City Council*

Steel's flexibility and quality have been highlighted on a challenging design for Glasgow's new iconic transport museum.

One of the most prestigious and eye-catching projects along the banks of the River Clyde is The Riverside Museum, a new iconic museum to showcase Glasgow's transport heritage.

The museum is being built on a 1.2ha site at the confluence of the Clyde and Kelvin rivers, one of the few intact areas of historic quayside, and a fitting reminder of the city's shipbuilding past.

Work on site started in 2007 and the design of the building was the brainchild of much-acclaimed architect Zaha Hadid. The building is a twisting and curving steel-framed structure on plan with two folds or transition zones (the points at which the building's straight planes turn), while the roof is an innovative pleated concept with five peaks and valleys.

With two main façades, one facing the city and the other leading directly to the riverfront, the design creates a tunnel-like building which will create a historic transportation journey for visitors.

Large open column free spaces, up to 50m wide in places, have been achieved by forming the innovative roof with a series of inclined trusses, following the external geometry of the roof, which utilises folded plate action. The inclined planes are supported at the north and south facades on a series of structural mullions and within the building at the two transition zones.

"The project's geometry is unique," explains Tim Kelly, Senior Engineer for Buro Happold. "The structure exploits the convex and concave geometry to form a locked structure which spans across the width of the exhibition space to the column lines which flank the building."

Phase one of the steel erection consisted of a two-storey zone approximately halfway along the eastern elevation. This zone was chosen as the starting point as it would stand up without any propping. From here on adjacent phases were erected all supported with temporary props and trestles.

The props were predominantly CHS sections and connected to roof nodes via an 80mm diameter pin. "We designed the props so they could be re-used throughout the project," explains Andrew Hart, Watson Steel Structures' Contract Manager.

"As the erection front of each zone moved forward, it was progressively de-propped from the rear with the majority of the temporary members being used again in later zones."

The steel pleated roof, featuring five differing peaks, of which the highest is 18m above ground level, is the most complex part of the project. Watsons designed a unique node connection (dubbed a can) which can accommodate the numerous incoming rafters, bracing and ridge valley members which form the roof.

As the roof pitches at various angles and also slopes from south to north, most nodes or cans are unique and can accept up to ten steel members. The biggest node is approximately 1m in diameter.

The judges say this unusual building, located on a prominent riverside site, is unmissable.

500 Brook Drive is a BREEAM Excellent rated building and the latest PRUPIM development of the Green Park business park in Reading. The building provides large open plan floor plates with an efficiency of between 86.5% and 88.5% net to gross internal area - figures that represent a highly efficient building.

This efficiency was partly achieved through the provision of two fire escape stairs positioned externally to the building floor plates. The bespoke sculptural form of the stairs integrate with the high quality aesthetic of the headquarters building.

"The spring-like form of the staircases are visually dynamic features of this commercial development, defining the elevations and quality of this landmark building in harmony with its natural environment," comments John Czernobay, Director Project Management, PRUPIM.

The helical stair design follows the principle of creating a functional stair for escape purposes in an innovative aesthetic sculptural form. When viewed across the lake or building entrance the stairs stand alone against the glass cladding backdrop of the building, creating visual interest as light is reflected within the twist of the sculpted steel stringers. The minimal balustrade design allows the stairs' main sculptural helical form to be expressed.

"Steel provided the perfect material for creating the dynamic sculptural form," says Philip Barritt, Ramboll Project Engineer. "We wanted to keep the stairs as slender as possible while emphasising the inner stringer."

To this end, the delicate structural steel elements of the spring-like form deceive the eye as to how the stair is supported. Steel bracing within the slender landings restrains the spring form to the building, providing sufficient stiffness to avoid vibration and movement. The ribbon like central steel stringer was formed from a steel CHS and allowed for a seamless finish and consistent radius.

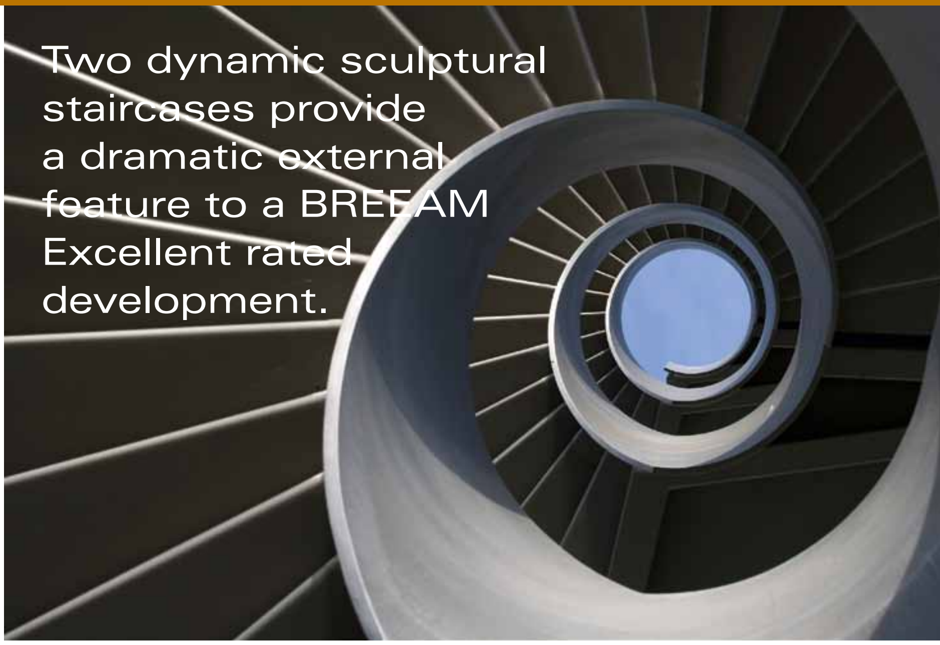
Each steel member has been designed to be the minimum required size reducing the steel weight. With vertical support provided by the central stringer, the traditional central column has been entirely removed.

Using the four story helical central stringer as the stairs primary support is an innovative solution. The eye is deceived by how the spring like form can withstand the vertical loading.

Torsion in the stringer is braced back to the building by the thin landings and held at the base by the piled foundation. The restraint at these points enables the spring like form to support the vertical load without deflection or resonant movement. The use of finite element modelling during the design allowed detailed stress analysis to make each structural element more efficient, using less material.

Structural steel is inherently recyclable and reusable, properties that influenced the design and fabrication. "The supporting helical central stringer was cut from a circular hollow section sourced from over-order on a pipeline project, reusing what was otherwise a waste product. Off cuts of the CHS were then used on a number of charitable projects including a school playground sculpture and a personal memorial," adds Mr Barritt.

Summing up, the judges say the designer and steelwork contractor have worked closely to achieve delicacy of the steel elements, and the outstanding results demonstrate craftsmanship of the highest order.

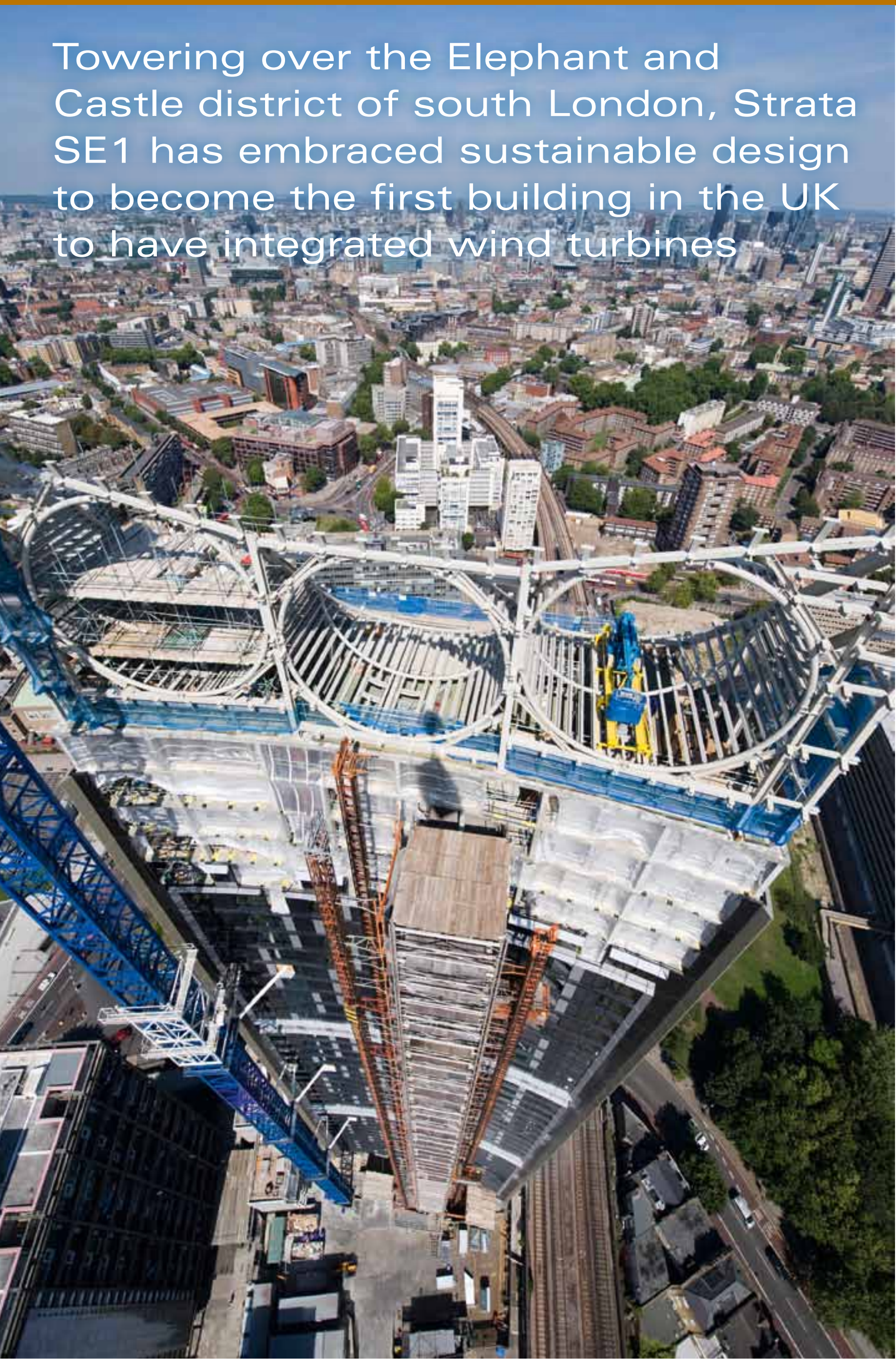


Two dynamic sculptural staircases provide a dramatic external feature to a BREEAM Excellent rated development.

Fact file

Architects:
Scott Brownrigg
Structural engineer:
Ramboll
Steelwork contractor:
Littlehampton Welding Ltd
Main contractor:
Miller Construction
Client: *PRUPIM*

Towering over the Elephant and Castle district of south London, Strata SE1 has embraced sustainable design to become the first building in the UK to have integrated wind turbines



Housed in a unique steel structure, three, nine metre diameter turbines, able to generate up to 45kW of electrical power at peak times, sit atop of the Strata at level 43.

The enclosure for the three turbines consists of 24 individual elliptical CHS sections and six curved CHS sections. Between these components, beams connecting to fin plates form the rib cage for the cladding. Due to the complexity and the scale of the cladding, the elliptical frame design could only be produced using steel, as it allows the curved profiles of the venturis to be accurately followed.

The elliptical openings for the turbines were formed from a total of 30 curved hollow section segments, all of which were set out in the fabrication shop using electronic survey data to ensure accurate positioning. The data for the setting out was provided by transferring the information from the 3D models to the survey teams, which enabled three dimensional setting out to be achieved

Fact file

Architects:
BFLS
Structural engineer:
WSP
Steelwork contractor:
Bourne Steel Ltd
Main contractor:
Brookfield Construction (UK) Ltd
Client: *Brookfield Construction (UK) Ltd*

Using steel also enabled the designers to make best use of the limited space available at the roof top location. The turbines' power was maximised with longer blades achieved by the narrow structural envelope of the 17m high frame.

The supply and installation of complex steelwork, at a height of 150m, with only the structural footprint to work on, was a challenging aspect of the project. The site is bounded on two sides by busy London artery roads, an existing 21-storey residential tower and a Network Rail viaduct carrying live tracks just three metres from the edge of the project. "This meant prefabrication and off-site assembly was key to eliminating the risk of working at height and ensured accurate geometry," says Daniel Cowan, WSP Project Engineer.

In order to optimise the installation sequence, Bourne Steel trial erected the steelwork at a temporary off-site yard. The assembly replicated the on-site conditions and ironed out all potential problems. Because steel is versatile, last minute design and installation adjustments could easily be carried out. This process not only ensured an accurate fit, but also gave follow-on trades the opportunity to review and gain a clear understanding of the structure before it was dismantled and erected at its final roof top location.

As a result of the curved façade, a number of closed sections were used to deal with the large torsions caused by significant off-sets to the cladding supports. To ease fabrication and reduce costs the rings were single rather than double curved and straight sections were incorporated into the design wherever possible.

Also, to ensure the wind turbines movement didn't affect the stability of the structure, High Strength Friction Grip (HSFG) bolts were used throughout. The use of such bolts meant that special attention had to be paid to the connection design for access requirements.

Summing up the judges say the wind turbine enclosure makes a crucial contribution to sustainable energy generation, which could only have been achieved by high quality steelwork.


Haulotte
01698 732418

SOUTH COURTYARD INFILL, LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE

Enhancing a Grade II listed building, this project's design includes a contemporary research, learning facility, housed within a large redundant courtyard. The architecture aims to maximise the use of space, while retaining the character of the original courtyard and the quality of the light to the surrounding building.

The job involved the demolition of the existing 1920's lecture theatre situated in the middle of the courtyard and the insertion of a new structure rising five storeys, surrounded on all sides by top-lit atria.

Linkages between the old and new are limited to walkways at each level and the points at which the atrium roof meets the surrounding building. The aim was to limit connections into the existing building, limit the load onto the existing building, and also minimise disruption and costly and difficult works associated with such connections.

The building is steel-framed with precast hollocore planks to maximise thermal mass and reduce onsite construction time and disruption to the school. The main lecture theatre is supported by deep trusses within the theatre walls, which span between the building's primary columns. Edge members and steel frameworks were introduced at the atrium roof level to enable connections directly into columns and standardise connections where possible.

Fact file

Architects: *Devereux Architects Ltd*
Structural engineer: *Sinclair Knight Merz*
Steelwork contractor: *Graham Wood Structural Ltd*
Main contractor: *Geoffrey Osborne Ltd*
Client: *London School of Hygiene & Tropical Medicine*

RIVERSIDE BRIDGE, CAMBRIDGE

The first new bridge in half a century to be built on Cambridge's famous Cam River, this structure provides a pedestrian and cycle link from the town centre to a newly developed housing area on the north bank.

The bridge rises in a gentle ramp over a floodplain on the north bank, sweeps across the river, then sweeps through a 90 degree angle to connect with a road running along the southern bank. The flowing curve of the bridge deck responds to the natural meandering of the river. With no sharp turns, steps or gradients steeper than 1 in 20, it is fully accessible for all users to enjoy. The arched form is well suited to the constraints of the site since it allows a very slender deck, minimising the length of the approach ramp which is needed to achieve the specified clearance of +3.6m over the river.

Steel hangers, suspended from the bridge's arch, support the pedestrian deck while wishbone steel elements support the wider cycle deck. Rigorous analysis went into tuning this geometrically complex form to achieve the most streamlined, stable structure possible. Four tuned mass dampers are incorporated within the deck structure to mitigate dynamic oscillations, enabling the overall mass to be minimised and driving costs down.

Constructed using largely recycled steel, the new bridge was conceived as the centrepiece for the local sustainable transport strategy. It improves and promotes cycling across the Cam and creates a new route that widens user access.

Fact file

Architects: *Ramboll*
Structural engineer: *Ramboll*
Steelwork contractor: *Watson Steel Structures Ltd (Severfield-Rowen Plc)*
Main contractor: *Balfour Beatty*
Client: *Cambridgeshire County Council*

M8 HARTHILL FOOTBRIDGE REPLACEMENT

The M8 Harthill footbridge is a landmark structure situated approximately halfway between Edinburgh and Glasgow, crossing Scotland's busiest motorway. Connecting the M8 Motorway's first ever service station to the town of Harthill, it replaces an existing overbridge that has fallen into a state of disrepair.

The main span is 90m in length and supported by four slender 'V' supports. The helical diagrid provides the shear transfer between continuous top and bottom chords allowing it to act as a deep composite section. Circular hollow sections were used for all primary steel members of the bridge and detailed structural analysis allowed each to be optimised, although the steel thicknesses varied through the span.

With the main span being formed of prefabricated tubular steel, a similar system for the approach ramps proved to be the most cost effective option. They were fast to erect, maximised spans through the use of lightweight performance materials, improved the quality of the end product and minimised the need for temporary works.

The innovative steel helical truss design of the footbridge offers many benefits. The open framework results in elements being primarily in tension or compression, to create a very light but stiff form of construction – facilitating a speedier installation programme.

Twelve circular hollow sections wind around the outside of the structure to create the signature corkscrew-like appearance – the slender lines of the curved steel tubes and the neat welded joints ensuring the sharp lines of the structure.

Fact file

Client's engineer: *Scott Wilson Ltd*
Structural engineer: *Buro Happold*
Steelwork contractor: *S H Structures Ltd*
Main contractor: *Raynesway Construction Ltd*
Client: *Transport Scotland*

FORTHSIDE PEDESTRIAN BRIDGE, STIRLING

Photo © Paul McMullin

Fact file

Architects: *Wilkinson Eyre Architects*
Structural engineer: *Gifford LLP*
Steelwork contractor: *Rowecord Engineering Ltd*
Main contractor: *BAM Nuttall Ltd*
Client: *Stirling City Council*

Stirling's new footbridge provides a key pedestrian crossing linking the city with the Forthside development acting as a catalyst for a long term redevelopment plan.

The bridge is a three span structure of 113.4m, with a main span of 88.2m, crossing seven rail lines in close proximity to Stirling Station, its car park and the feeder road to the new Forthside development. Steps and panoramic lifts provide access at each end.

By using a steelwork superstructure, with substantial elements fabricated and finished off-site, the impact of the construction operations were controlled and disruption minimised.

The bridge is an unusual structure based on the principle of an inverted 'fink' truss but is sufficiently removed from its generic root as to be unique. Two tapered and inclined truss planes are arranged to create a twisting form. The design is such that the approaches (lifts and steps) are effectively landscape features which are offered up to a high level pier.

The bridge is a visually and structurally independent structure that connects the two approach assemblies. The defining feature is the pair of up-stand trusses to either side of the deck with steel masts with cable cross bracing but, critically, is devoid of a top chord.

Each truss is a propped cantilever with its visual and structural mass resting on one side of the railway and its diminishing form reaching across to the other; one truss reaches from Forthside to Stirling and the other from Stirling to Forthside – an overlapping and interlocking structural 'handshake'.

Stirling's Provost Fergus Wood said: "This iconic and unique structure will grace the skyline of Stirling for many years".

NORTH LIVERPOOL ACADEMY

The inspiration for the central structure of the North Liverpool Academy was a classic door handle from a Jaguar car.

Separating two traditionally built steel-framed teaching blocks, the 140m-long by 15m wide central 'handle' structure features a complex design that is not symmetrical about the short axis and is a floor higher than the rest of the building.

Because of the complexity, the steel erection was sequenced around its design. "Ordinarily the project would have been built north to south with the two teaching blocks and the central handle constructed as one. However, the design work needed for the handle was so involved that the two outer blocks were erected first, while the handle's design was still being finalised," explains Tony Foster, Wates Project Manager.

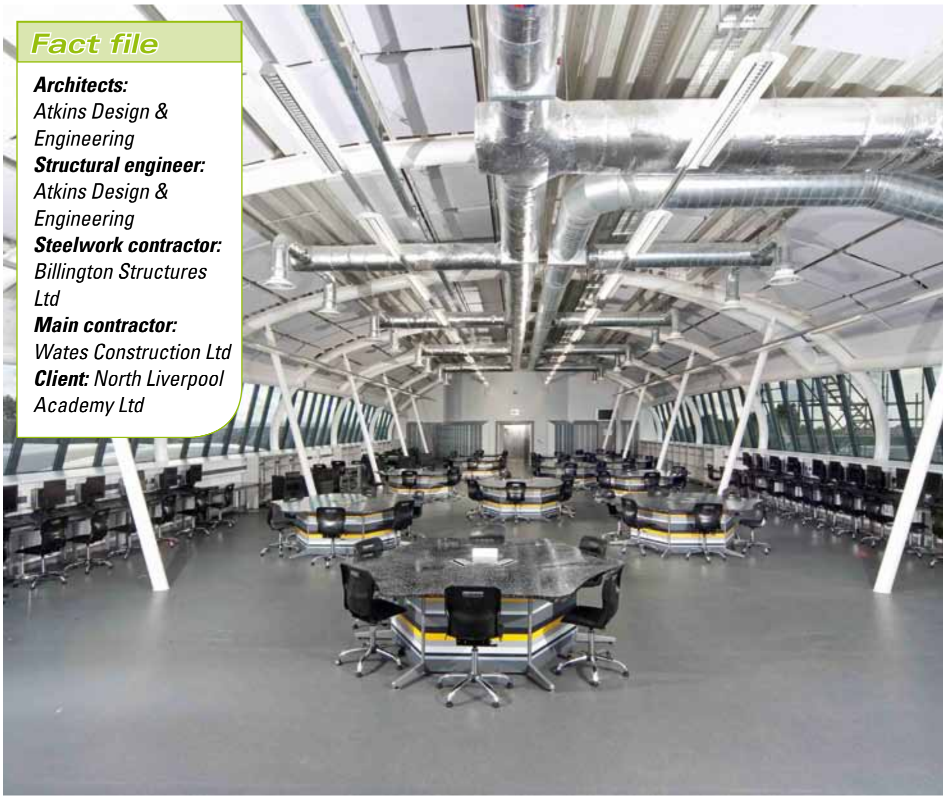
"The challenge in designing the handle was the fact that it's curved and also skewed by three degrees on plan, which means every connection is different," adds Nick Garcea, Atkins Project Engineer.

Primary bowstring trusses at 12m centres - all of differing length and depth - supported on oval sections form the rounded handle shape up and above a steel ribcage.

Stability for the handle is achieved through diaphragm action of the floor plate transferring lateral loads to the lift shafts at both the head and the tail ends. The connections to the lift shaft at the head allow longitudinal temperature movements.

Fact file

Architects:
Atkins Design & Engineering
Structural engineer:
Atkins Design & Engineering
Steelwork contractor:
Billington Structures Ltd
Main contractor:
Wates Construction Ltd
Client: *North Liverpool Academy Ltd*



MONKSEATON COMMUNITY HIGH SCHOOL

Fact file

Architects:
Devereux Architects Ltd
Structural engineer:
Parsons Brinckerhoff
Steelwork contractor:
Pocklington Steel Structures Ltd
Main contractor:
Shepherd Construction
Client: *North Tyneside Council*

The new Monkseaton Community High School was inspired by the Exemplar Designs from the Department for Children, Schools and Families which were produced before the Building Schools for the Future (BSF) programme in 2004 as a blueprint for new schools.

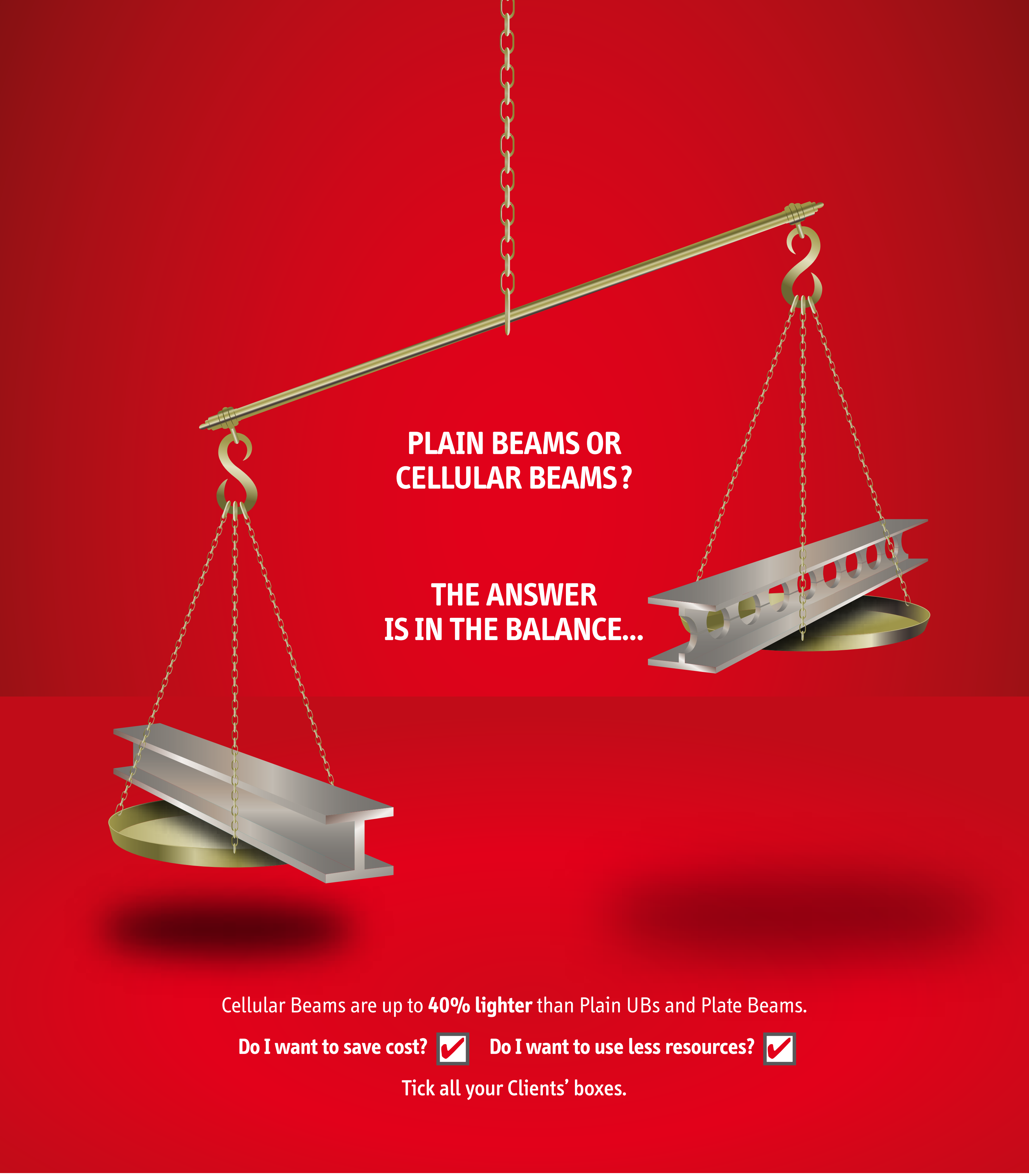
Constructed on the playing fields of the old school, it provides state of the art facilities for over 900 students. Facilities include specialist ICT suites, a sports hall containing a full size indoor football pitch, two gyms, specialist teaching areas, music rooms, a recording studio, drama rooms and a number of independent learning areas.

Parsons Brinckerhoff Project Leader Hemendra Goel, explains: "Visually the main feature of the school building is the roof, which covers the entire footprint and allows natural light into the heart of the structure. It's elliptical in shape and measures 95m x 65m approximately about the major and minor axes respectively."

As well as the large dome shaped roof, another noticeable feature element of the project is a series of 4.5m high Y-shaped columns which ring the perimeter of the structure and support the roof.

These unusual columns were initially trial erected at the steelwork contractor's fabrication facility. Mark Page, Pocklington Steel's Project Manager, explains: "They're not your regular steel sections and so we decided to trial erect them, which ensured it was all going to go up on site without any hitches."

The Y frames serve the double purpose of providing rigidity and distinct aesthetics. The high rigidity provided by the frames helps reduce lateral deflections, thus making the structure suitable for a heavily glazed façade.


PLAIN BEAMS OR CELLULAR BEAMS?
THE ANSWER IS IN THE BALANCE...
Cellular Beams are up to **40% lighter** than Plain UBs and Plate Beams.
Do I want to save cost? ✓ Do I want to use less resources? ✓
Tick all your Clients' boxes.

Transpired solar collectors now in SBEM

Richard Hall, SCI's renewable energy research engineer, explains the introduction of Transpired Solar Collectors (TSCs) to the UK renewable heat market, and how SCI has been working with the Building Research Establishment to incorporate a TSC energy yield model into the Part L compliance software for non-domestic buildings.

Part L 2010

Part L of the Building Regulations has recently been revised and the new documents will come in to force in October 2010. Part L sets out the required energy and carbon performance of new buildings and across the non-domestic sector: the Government are targeting an aggregate 25% reduction in operational CO_2 emissions compared with Part L 2006. The exact Target CO_2 Emissions Rate (TER) for each building will be defined by the 2010 Notional Building.

The Simplified Building Energy Model (SBEM), used to calculate the non-domestic Building CO_2 Emissions Rate (BER), has been updated in line with the new Part L 2010 regulations. The new version of the SBEM will become the official tool, alongside the updated Dynamic Simulation Models (DSMs), for calculating the operational CO_2 emissions from a building for compliance with Part L 2010, when these regulatory changes come into force in October.

In order to reduce operational CO_2 emissions, one option is to substitute fossil fuel based energy with renewable energy. The current version of SBEM (SBEM 2006 v3.5) already has an in-built range of renewable energy yield models and renewable energy technologies such as solar hot water, photovoltaic or wind energy systems can be included within the compliance model with relative ease. However, the list of renewable energy technologies in SBEM 2006 is not comprehensive and does not include all renewable technologies on the market. The most notable missing technology is the Transpired Solar Collector (TSC), a key renewable heat solution in the steel sector.

To eliminate this omission, SCI has been working closely with the Building Research Establishment (BRE), the developers of SBEM, to incorporate a TSC energy yield model in SBEM 2010.

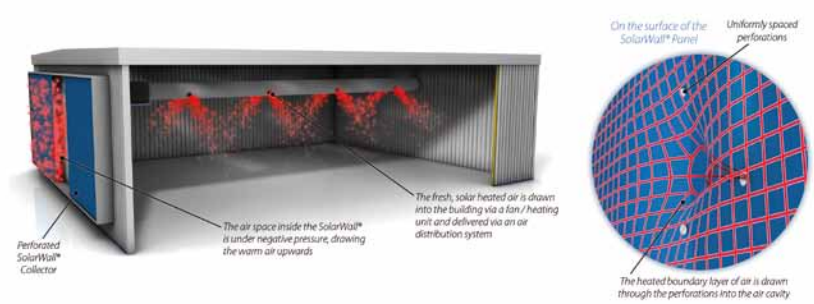


Figure 1: Diagram showing how TSC generates and supplies renewable heated air to a building (courtesy of CA Group)

Transpired Solar Collector Technology

A TSC is a renewable energy technology that heats fresh ambient air using solar energy, reducing the need for carbon intensive heating. The main component of a TSC is a perforated plate absorber (predominantly steel) that absorbs the energy from sunlight and transfers it to the ambient air as it is drawn through the perforations (see Figure 1). The solar heated air is then supplied directly to the building, significantly reducing its heating requirement and thus reducing the operational CO_2 emissions, whilst at the same time providing a higher level of building ventilation.

The TSC was invented by Conserval Engineering Inc. in the mid 1980s and has been used successfully in Canada and Northern America for the last 30 years. In 2006, CA Group brought the technology to the UK and have completed a number of SolarWall® TSC projects (SolarWall® being the global commercial name for this TSC technology).

Installations

As the TSC is installed as an additional skin to the building envelope, it can be incorporated into both new and retrofit projects. It can also be used with almost any building type, as long as there is a need for heated air or fresh ventilation, and there is sufficient area to install the absorber.

One of the first SolarWall® installations in the UK was on CA Group's own Profiling Mill in County Durham (Figure 2). The 1,211m² SolarWall® is currently saving CA Group around 299,000 kWh of energy and 71 tonnes of CO_2 per year.

Independent studies based on the monitoring of the Profiling Mill by BSRIA and a theoretical model produced by Battle McCarthy, have shown that TSCs can reduce heating demand by up to 50% and provide up to 20% of the building's overall energy requirements.

In retrofit projects, which may be driven by policy measures such as the CRC Energy Efficiency Scheme (also known as the Carbon Reduction Commitment), an increased awareness of energy use from the introduction of the Energy Performance Certificates (EPCs), or simply as part of a company's

Figure 2: SolarWall® on the southern elevation of CA Groups own Profiling Mill in County Durham

Figure 4: SolarWall® retrofitted to the Jaguar Land Rover technical training academy in Leamington Spa

Corporate and Social Responsibility (CSR), a TSC can deliver both operational CO_2 emission reductions and contribute to improving indoor air quality, whilst also saving on the annual heating costs.

In 2008, Jaguar Land Rover used SolarWall® when renovating their technical training academy in Leamington Spa (see Figure 3). CA Group installed a 268m^2 SolarWall®, saving the academy around 80,000 kWh of energy and 19 tonnes of CO_2 per year.

Transpired Solar Collector in SBEM

The new TSC SBEM energy yield model was inspired by the RETScreen® renewable energy modelling software developed by Natural Resources Canada, and the research carried out by the International Energy Agency's Solar Heating & Cooling Programme.

RETScreen V3.1 Solar Air Heating project module has been used for a number of years in countries around the world to design TSC projects. And while it is a simplified energy model, it shows good agreement when compared with more complex dynamic simulation modelling.

The user interface to the new version of SBEM includes a 'Transpired Solar Collector' tab, which is located in the building services section of the interface.

The TSC model uses the following main parameters to calculate the energy yield:

- Area, Location, Orientation and Tilt: these parameters define the amount of available solar radiation;
- Type: this defines the type of TSC project, selecting between low, standard and high temperature rise applications;
- Absorptivity: the colour of the collector is a good indicator of the absorber's ability to convert

solar radiation into heat. The parameter allows the designer to chose a wide range of external colours from light (low absorptivity) to very dark (high absorptivity);

- Independent Fan: many TSC design do not require a separate fan to operate. This option allows the user to specify whether there is an additional fan being used;
- Supply Specific Fan Power: this option and text input enable the designer to override the default specific fan power parameter;
- Air Flow Rate: the rate of air being supplied by the TSC.

Future of TSCs in the UK

In the UK, TSCs can generate between 250 and 500kWh/m²/year of renewable heat; varying with location, absorptivity of the absorber, type of controls, angle of the absorber and so on. Given that TSCs combine high energy yields with relatively low capital costs, TSCs can achieve extremely competitive economic payback periods of around three years for new build and seven years for refurbishment projects.

In the next few years, we are likely to see a rapid expansion of TSC projects in the UK, particularly if energy prices continue to rise. There are, however, still a few challenges to overcome; SCI and others are actively working to resolve these issues.

One of the most significant challenges is the lack of support under the proposed Renewable Heat Incentive (RHI). TSCs are currently not included in the RHI list of technologies, skewing the market against TSC technology.

An opportunity for TSCs to further reduce operational CO_2 emissions is to use the heat generated in the summer months (when there is little or no heating demand). For example, could the summer heat be used to improve the performance of a desiccant cooling system?

We are also aware that many buildings are designed with DSMs that are independent of SBEM, and that designers who use DSMs will not be able to directly incorporate the new SBEM TSC energy yield model into their designs. To assist in resolving this issue, SCI are working to develop a DSM in TRNSYS, which should bridge the gap until the DSM software providers include the capability to model TSCs.

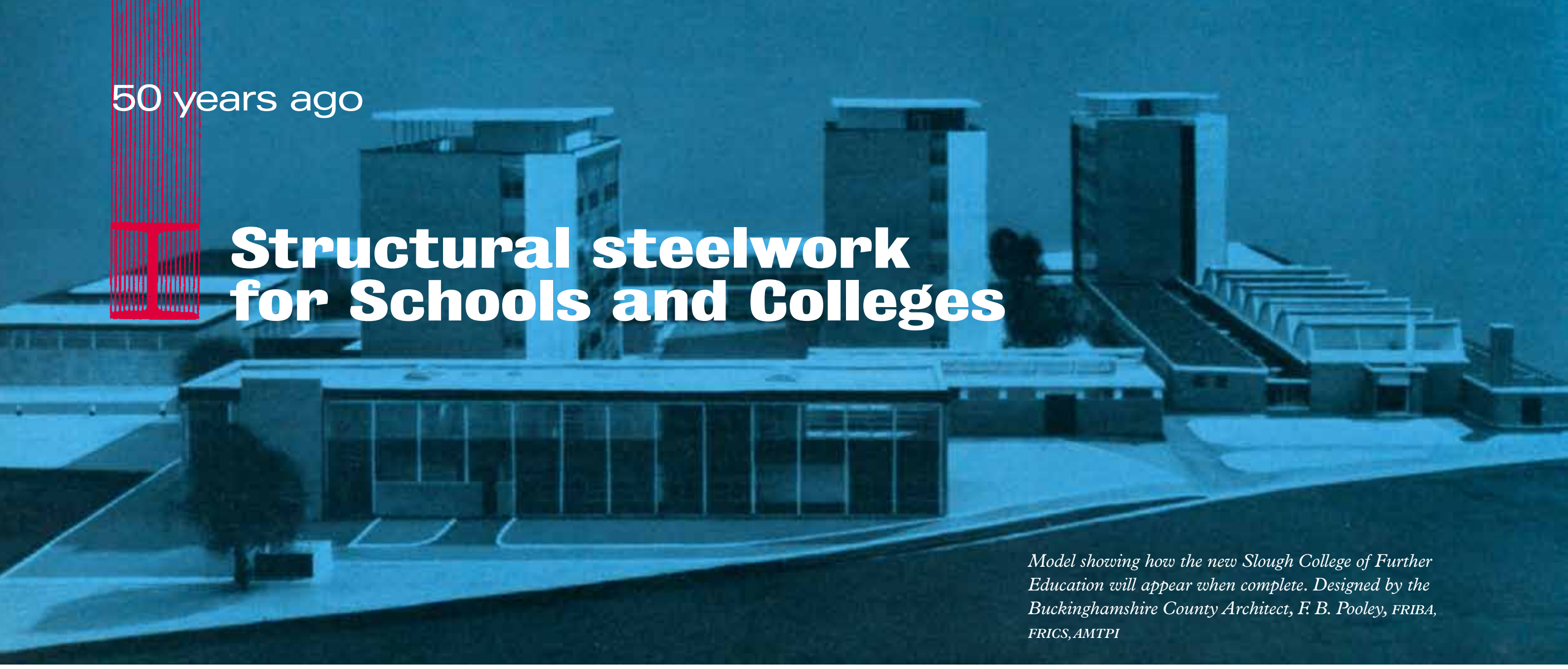
Summary

The ability to model TSCs in SBEM will be an important step in the expansion of TSC technology in the UK. A TSC energy yield model is now built into the 2010 version of the compliance process for non-domestic buildings, enabling designers to easily prove the impact that a TSC can have on energy and carbon performance of new and existing buildings.

A reader has pointed out an error in the May 2010 technical article on combined bending and compression. In the article, it was stated that $\bar{\lambda}_y = \frac{\text{major axis resistance}}{\text{cross-sectional resistance}}$ when this should have read $\chi_y = \frac{\text{major axis resistance}}{\text{cross-sectional resistance}}$.

The article should have pointed out that having calculated χ_y, $\bar{\lambda}_y$ can be back-calculated, using Figure 6.4 of BS EN 1993-1-1, or look-up tables such as those found in the *Concise Guide*. Knowing from Table 6.2 of the Standard that the appropriate buckling curve for major axis buckling is curve 'b', $\bar{\lambda}_y$ can be found to be approximately 0.75, and the use of Figure 4 of the article then continues correctly.

Two other minor typographical errors in the table on page 30 (which have no impact on the calculations) also escaped our checks: the minor axis flexural resistance should be 832 kN and not 832 kNm. The LTB resistance should be 174 kNm and not 74 kNm. Our thanks are expressed to Paul Kavanagh for bringing these to our attention.



Structural steelwork for Schools and Colleges

Model showing how the new Slough College of Further Education will appear when complete. Designed by the Buckinghamshire County Architect, F. B. Pooley, FRIBA, FRICS, AMTPI

It is generally accepted in this age that education must remain one of Britain's most basic and essential national investments. With a steadily growing population entering world of ever-increasing material complexity, no other attitude is possible.

WHAT KIND OF BUILDINGS?

With implicit realisation of the vital role of education in shaping the nation's future, national and local budgets were adjusted to meet the magnitude of the task. The fortunate corollary of the resulting unprecedented level of expenditure was of course the amount of thought and planning that went into ensuring the best value was achieved. Consequently the dark, cramped, gothic windowed and insanitary establishments of fifty or more years ago yielded to the vision of an airier and more expansive age.

STEEL STEPS IN

In practical terms, the new-type buildings called for structures with ceilings and roofs of wider span, with few or no intermediate supports. Such requirements favoured the choice of steel as the basic structural medium. Pressing time factors reinforced this choice which promised not only speed in building, but adaptability in design and structures of strength and elegance.

Cheaper steel and the wider application of advanced techniques are now making steel construction the obvious choice. Amongst the new techniques employed the use of Castella beams is notable. These beams, ideally suited to wide spans with light loading, have not only meant weight-saving and more economical construction; they have also aesthetic possibilities which have been seized by architects, and they can often be seen remaining exposed in such finished structures as halls and gymnasia, where they blend well with the 'contemporary' style.

Advances in cladding techniques are also saving time and money. Cheaper and lighter alternatives to conventional walling have also helped to speed construction, often by the use of prefabricated cladding units.

RECORD ACHIEVEMENT

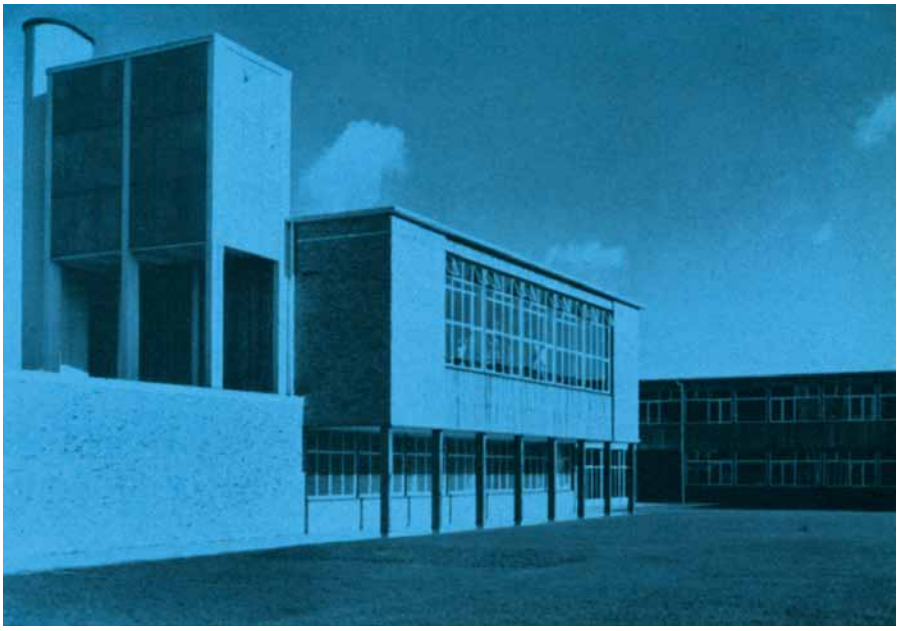
Bilston Grammar School, a two-form entry school completed for Staffordshire Education Committee in no more than nine months, is an outstanding example of a particular modern school building system which has already been employed for more than a hundred schools.

In this instance the use of Castella beams and special composite stanchions, with exterior cladding of precast concrete blocks and hardwood panels, has achieved a saving in cost and something like 50% of the time required for more traditional construction.

ADAPTABILITY

Adaptability is a keynote of the new Slough College of Further Education, designed by the Buckinghamshire County Architect's Department.

This project, costing nearly £1,000,000, and scheduled for completion in March 1961 makes notable provision for internal alteration to meet changing requirements over the years. This has been made possible by adopting completely steel-framed buildings with concrete floors, in which partitioning between rooms carries no structural loading. Built-in flexibility for future planning is thus incorporated in each of several six-storey structures.



Above: Bilston Grammar School. Architect: A. C. H Stillman, FRIBA, Staffordshire County Architect. Assistant Architect: D. J. Richardson ARIBA

Right: Thomas Bennett Schools, Tilgate Campers, Crawley. Architect: F. Reginald Steele, FRIBA, RIBADistTP, FRICS, MTPI, AMIStructE, County Architect, Chichester.

Confessions of a Codewriter

Time, as usual was racing on. Lunch had been a coffee and curly sandwich and I was trying to complete my normal working day an hour earlier. There seemed to be an incessant number of phone enquiries ranging from steel quantities and sources of supply to publication queries and I still had to complete a written response for one of our members prior to leaving. Eventually I had finished (or was it stopped) and the only bend I now had to go around was regarding curved beams. My thoughts regarding these had not quite formed into a firm proposal that I could put to my colleague the following day. However, I still had a few hours left before then so I switched my mind onto automatic, picked up my bag and started on my way to Heathrow for the flight to Brussels.

Almost gone now are the days where I could just go to London, meet the other UK code writers at the BSI meeting centre and return home that night. Now the normal thing is a flight to Brussels to meet at the CEN offices. Here with my European national counterparts, a European Standard is being prepared which will eventually replace the equivalent national standard in all our countries. To do this means flying out the night before to be ready to start at 09.00hrs; here in the UK, morning flights tend to be impossible with the one hour time zone against you!

So here I was with my curve problem, ie how to draft a clause that would cover the differing tolerance requirements from cambered through to curved beams that were reasonable to fabricate to but not so excessive as to cause problems to the following trades. Between leaving the office and the start of the meeting I needed an answer, and like most of the drafters I know, that needed uninterrupted thinking time. This is a luxury seldom, if ever, available when engaged in routine duties at one's office. I had the result of my previous research, viz, a summary of clauses on this subject taken from the various national standards in the office, my personal experience of what was achievable in practice and an instinct of what might be acceptable in the European Community at the end of the day. This latter item is important as at CEN a weighted voting system is in use to approve a standard rather than the consensus agreement adopted at BSI.

As any tolerance has to be measured by at least two people it needs to be set so that both obtain the same result whatever the condition of their eyesight. The method of measurement of these tolerances should preferably be simple and carried out with reliable instruments. If I could arrange this to be done just by the use of a rule or tape, a line or plumb bob then so much the better. There is little that can go wrong with such 'instruments'.

I then considered the normal procedure of setting a minimum tolerance, having a uniform variable tolerance over the general range, and finally a maximum tolerance that should never be exceeded. As in this case the tolerance range was likely to be small, I felt the middle section should be omitted, or replaced with a single step if subsequently found necessary.

Of course not all tolerances given in a specification need to be measured to ensure acceptance. In fact when the first issue of BS 449 was published almost the only tolerance measured was the length of the beam or column. That single requirement virtually controlled all the steelwork erected, viz if it did not fit, it was wrong! There is a school of thought that fabrication tolerances are not essential; the end product is an erected steel framework and it is that alone that must be right at the time of handover. Although it is not a point of view I subscribe to, it does have some elements of logic.

The number of items for which I have been asked to set tolerances

is growing often from the requirements of the following trades, the use of large pre-assembled cladding panels and other types of unit construction, etc. The growing importance of quality assurance and introduction of legislation such as the products directive in Europe are also requiring controlled checking to be carried out at intermediate stages of production.

Most people realise that you cannot quality assure a product unless it is processed to a standard and that standard needs to be in specification terms and not those of a code of practice. Here in the UK this has always been the case for steelwork, relying on British Standards 449 and 5950 part 2 and more recently the National Structural Steelwork Specification. I wonder what happens to structures in the UK for which similar standards do not exist. For such cases, unless the specifier incorporated suitable clauses in his Contract Documents, there may be little control on the resulting structural elements.

The majority of code writer with whom I am in contact are engineers mostly involved in working on building structures on a regular basis. The responsibilities we share are undertaken voluntarily, often with more kicks than rewards! From some of the queries I have to deal with it would seem that some people are under the illusion that the clauses have some mystic power as if they were inscribed on tablets of stone. Experience is only worth the paper it's written on, and this is what we are giving: our experience in an endeavour to ensure that our successors design structures that are neither unsafe nor unserviceable in use. No standard can over every situation and eventually a designer may have to use his own engineering judgement, and I hope that the guidance given in the standards we write will ensure the correct judgement is made.

Closing my front door quietly that following evening I crept upstairs. "Hi" said my wife's voice in the dark, "How was Brussels?" "Wet" I responded, "what little I saw of it between the airport and the city centre. However, I did manage to get most of my proposals accepted at this stage so at least I do not feel my time has been wasted".

In fact the French and Germans were quite supporting of the work that had been done which I found personally quite pleasing. You see, code writers are human after all – with feelings just like you!

Refurbishment of Listed City Office Building

The redevelopment of Sir Edward Lutyens' Britannic House in Finsbury Circus, now known as Lutyens House, has recently been completed following a three year design and construction period. Some 19,000m² of high quality lettable office space has been created behind the magnificent restored Portland stone façades and marble lined entrance halls of one of the City of London's major commercial buildings of the 1920, originally the headquarters of the Anglo Persian Oil Company (now BP). Built in two phases between 1924 and 1927, the building was listed Grade II in 1950. The original steel frame has been retained in parts and complemented by a new composite construction steel frame. The results show how conservation of a historically important building can be successfully reconciled with the demands of 1990s office users and technology.

New and Revised Codes & Standards

(from BSI Updates June 2010)

CORRIGENDA TO BRITISH STANDARDS

BS EN 1991-1-7:2006
Eurocode 1. Actions on structures. General actions. Accidental actions
CORRIGENDUM 1

BS EN 1991-2:2003
Eurocode 1. Actions on structures. Traffic loads on bridges
CORRIGENDUM 2 *Also incorporates Corrigenda 1*

BS EN 1993-1-3:2006
Eurocode 3. Design of steel structures. General rules. Supplementary rules for cold-formed members and sheeting
CORRIGENDUM 1

BS EN 1993-1-12:2007
Eurocode 3. Design of steel structures. Additional rules for the extension of EN 1993 up to steel grades S 700
CORRIGENDUM 1

BS EN 1993-6:2007
Eurocode 3. Design of steel structures. Crane supporting structures
CORRIGENDUM 1

BS EN 1998-2:2005+A1:2009
Eurocode 8. Design of structures for earthquake resistance. Bridges
CORRIGENDUM 1 *Also incorporates Amendment 1*

BS EN 1998-3:2005
Eurocode 8. Design of structures for earthquake resistance. Assessment and retrofitting of buildings
CORRIGENDUM 1

BS EN ISO 14713-3:2009
Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures. Sherardizing
CORRIGENDUM 1

NEW WORK STARTED

BS ISO 7452
Hot-rolled structural steel plates. Tolerances on dimensions and shape

CEN EUROPEAN STANDARDS

EN 1990:-
Eurocode. Basis of structural design.
CORRIGENDUM 1: April 2010 to EN 1990:2002

EN 1991-1-4:-
Eurocode 1. Actions on structures. General actions. Wind actions
Amendment 1: April 2010 to EN 1991-1-4:2005

Advisory Desk

AD 347
Saw cutting of composite slabs to control cracking

The purpose of this AD Note is to discuss the issues involved in the use of saw cutting to form crack inducing joints in composite slabs and to emphasise the risks involved and the care needed in practice. The alternative and strongly preferred method of crack control, by providing appropriate reinforcement, is also discussed.

Modest cracking over beams in composite floor construction is commonplace because of shrinkage and hogging bending of the slab over the supporting beams. For most structures and finishes, the presence of such cracks will not be detrimental to the slab's performance in terms of durability or serviceability. However, the application of some floor finishes to the slab or the environmental exposure of the surface of the slab may require a greater degree of crack control.

SCI is aware that in practice some contractors achieve crack control in composite slabs by the use of shallow saw cuts to concentrate the strain into one crack, normally along the centre-line of the composite beam. Such saw cutting is traditional practice for ground-supported floor slabs but they do not have to perform the same structural functions as suspended composite slabs, and the technique cannot simply be transferred.

If saw cutting is to be carried out, it should be done with extreme caution, and certainly with reference to the designer, who will ultimately be responsible for the outcome. The principal danger is the risk from cutting the mesh reinforcement, as explained in SCI publication P300, Section 4.2.4, or the risk of damaging the shear connectors. Cutting the reinforcement will reduce the strength of the shear connection and the performance of the slab in the fire condition. Clearly, it is essential to detail and position the reinforcement below the depth of any intended cut, and to ensure that the depth and position of the actual cut is compatible with the actual position and cover to the reinforcement and shear connectors. The cutting process must be accurate and monitored closely.

The cracks induced by cutting will need to be filled using appropriate flexible fillers, to maintain durability and performance in fire. It should also be noted that such crack inducers are not always successful in concentrating the cracking in one location as expected, and that some other random cracking is still possible.

Although this method is high risk, we believe that, provided that the reinforcement is not severed or the shear connectors damaged, the resistance of the shear connectors, the dynamic performance and the diaphragm action will not be impaired by a shallow saw cut or the small crack that it may induce. The reinforcement will prevent the concrete from bursting sideways and will confine the concrete around the stud. Whilst local hogging moments in the slab will still strain the reinforcement in tension and contribute to the crack, they will also compress the concrete around the bottom of the slab, and this confinement is helpful to the stud resistance.

In choosing a location for the cut, there is no 'ideal' line and off-setting it from the centre line of the beam could be difficult to set out and might induce cracking on both sides of the beam – so defeating the object.

The preferred method of controlling cracking in composite slabs is by providing an appropriate area of reinforcement transverse to the beam to minimize the crack widths to a level commensurate with the exposure conditions and finishes. The minimum reinforcement area should be 0.2% or 0.4% of the concrete area above the ribs of the decking, for unpropped and propped slabs respectively (advice on this is given in SCI publication P300, Section 4.2.4). Further advice on controlling cracking is given in BS EN 1992-1-1, Section 7.3, where a method is presented for the calculation of crack widths.

In summary, although saw cutting is sometimes used as a means of controlling cracking of composite slabs, there is considerable risk with saw cutting, and the process requires a high level of supervision on site. This method is not recommended and we would advise using reinforcement to control cracking.

This note has been prepared in consultation with The Concrete Society.

Contact: J W Rackham
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Email: advisory@steel-sci.com

Steelwork contractors for buildings

BCSA is the national organisation for the steel construction industry.
Membership of BCSA is open to any Steelwork Contractor who has a fabrication facility within the United Kingdom or Republic of Ireland.
Details of BCSA membership and services can be obtained from
Gillian Mitchell MBE, Deputy Directory General, BCSA, 4 Whitehall Court, London SW1A 2ES
Tel: 020 7839 8566 Email: gillian.mitchell@steelconstruction.org

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

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

Notes

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●		●										Up to £2,000,000
ACL Structures Ltd	01258 456051			●	●	●	●				●				●		Up to £3,000,000
Adey Steel Ltd	01509 556677				●	●	●	●		●	●			●	●		Up to £3,000,000
Adstone Construction Ltd	01905 794561			●	●	●											Up to £4,000,000
Advanced Fabrications Poyle Ltd	01753 531116				●		●	●	●	●	●				●	✓	Up to £400,000
Andrew Mannion Structural Engineers Ltd	00 353 90 644 8300		●	●	●	●	●	●			●	●		●		✓	Up to £3,000,000
Angle Ring Company Ltd	0121 557 7241												●				Up to £1,400,000
Apex Steel Structures Ltd	01268 660828				●		●			●	●						Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●		●	●					Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●		Up to £800,000*
ASD Westok Ltd	01924 264121												●				Up to £6,000,000
ASME Engineering Ltd	020 8966 7150				●					●	●			●	●	✓	Up to £1,400,000*
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✓	Above £6,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●		●							●			Up to £2,000,000
AWF Steel Ltd	01236 457960				●				●	●	●			●	●		Up to £400,000
B D Structures Ltd	01942 817770			●	●	●	●				●			●			Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✓	Up to £2,000,000
Barnshaw Section Benders Ltd	01902 880848												●			✓	Up to £800,000
Barrett Steel Buildings Ltd	01274 266800			●	●	●	●									✓	Up to £6,000,000
Barretts of Aspley Ltd	01525 280136			●	●	●				●	●			●	●		Up to £3,000,000
BHC Ltd	01555 840006	●	●	●	●	●	●							●			Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Browne Structures Ltd	01283 212720				●			●							●		Up to £400,000
Cairnhill Structures Ltd	01236 449393				●	●	●	●		●	●			●	●	✓	Up to £1,400,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●	●	●	●	●		●	●	✓	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 502277	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000*
CMF Ltd	020 8844 0940				●		●	●		●	●				●		Up to £6,000,000
Cordell Group Ltd	01642 452406	●			●	●	●	●	●	●	●					✓	Up to £3,000,000
Cougar Steel Stairs Ltd	01274 266800									●					●	✓	Up to £6,000,000*
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●		Up to £1,400,000
Crown Structural Engineering Ltd	01623 490555			●	●	●	●		●		●			●		✓	Up to £800,000
D A Green & Sons Ltd	01406 370585		●	●	●	●	●	●	●	●	●	●		●	●	✓	Up to £6,000,000
D H Structures Ltd	01785 246269				●						●						Up to £40,000
Deconsys Technology Ltd	01274 521700				●					●				●	●		Up to £100,000
Discain Project Services Ltd	01604 787276				●					●	●				●	✓	Up to £1,400,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●			●					✓	Up to £6,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✓	Up to £6,000,000
Emmett Fabrications Ltd	01274 597484			●	●	●	●							●			Up to £1,400,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✓	Up to £3,000,000
F J Booth & Partners Ltd	01642 241581			●	●		●				●				●	✓	Up to £4,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**Contract Value (1)**

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
Fisher Engineering Ltd	028 6638 8521		●	●	●	●	●	●	●	●	●	●				✓	Above £6,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●			●						Up to £3,000,000
Gibbs Engineering Ltd	01278 455253				●		●	●		●	●				●	✓	Up to £800,000
GME Structures Ltd	01939 233023			●	●		●	●		●	●			●	●		Up to £800,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●			Up to £800,000
Graham Wood Structural Ltd	01903 755991		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000
Grays Engineering (Contracts) Ltd	01375 372411				●			●		●	●				●		Up to £100,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●				✓	Up to £4,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●			●						Up to £2,000,000
Had Fab Ltd	01875 611711								●		●				●	✓	Up to £1,400,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✓	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●					Up to £2,000,000
Henry Smith (Constructional Engineers) Ltd	01606 592121			●	●	●	●	●									Up to £4,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●		Up to £4,000,000
Hills of Shoeburyness Ltd	01702 296321									●	●				●		Up to £1,400,000
J Robertson & Co Ltd	01255 672855									●	●				●		Up to £200,000
James Bros (Hamworthy) Ltd	01202 673815			●	●		●			●	●	●			●	✓	Up to £2,000,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●			Up to £6,000,000*
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●						Up to £1,400,000
Lowe Engineering (Midland) Ltd	01889 563244									●	●			●	●	✓	Up to £400,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✓	Up to £3,000,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		Up to £1,400,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Maldon Marine Ltd	01621 859000				●			●	●	●					●		Up to £1,400,000
Midland Steel Structures Ltd	024 7644 5584			●	●	●	●			●	●	●		●	●		Up to £2,000,000
Mifflin Construction Ltd	01568 613311		●	●	●	●	●				●						Up to £3,000,000
Milltown Engineering Ltd	00 353 59 972 7119			●	●	●	●	●									Up to £6,000,000
Newbridge Engineering Ltd	01429 866722			●	●	●	●								●	✓	Up to £1,400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●						✓	Up to £4,000,000
On Site Services (Gravesend) Ltd	01474 321552				●		●	●		●	●				●		Up to £400,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		Up to £1,400,000
Paddy Wall & Sons	00 353 51 420 515			●	●	●	●	●	●	●	●					✓	Up to £6,000,000
Pencro Structural Engineering Ltd	028 9335 2886			●	●		●	●			●				●	✓	Up to £2,000,000
Peter Marshall (Fire Escapes) Ltd	0113 307 6730									●					●		Up to £1,400,000
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		Up to £1,400,000
REIDsteel	01202 483333		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000*
Remnant Engineering Ltd	01564 841160				●		●	●	●	●	●			●	●	✓	Up to £400,000*
Rippin Ltd	01383 518610			●	●	●	●	●									Up to £1,400,000
Robinson	01332 574711		●	●	●	●	●		●	●	●	●		●	●	✓	Above £6,000,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Rowen Structures Ltd	01773 860086		●	●	●	●	●	●	●	●	●	●		●			Above £6,000,000*
RSL (South West) Ltd	01460 67373			●	●		●				●						Up to £1,400,000
S H Structures Ltd	01977 681931						●	●	●	●							Up to £3,000,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Shipley Fabrications Ltd	01400 231115			●	●	●	●		●	●	●				●		Up to £200,000
SIAC Butlers Steel Ltd	00 353 57 862 3305		●	●	●	●	●	●	●		●	●				✓	Above £6,000,000
SIAC Tetbury Steel Ltd	01666 502792			●	●	●	●				●	●				✓	Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●		●								●		Up to £2,000,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		Up to £800,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●	●			●		Up to £400,000
Terence McCormack Ltd	028 3026 2261			●	●		●	●									Up to £800,000
The AA Group Ltd	01695 50123			●	●	●	●			●	●				●		Up to £4,000,000
Traditional Structures Ltd	01922 414172		●	●	●	●	●	●	●		●	●		●		✓	Up to £4,000,000*
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●		Up to £4,000,000
W I G Engineering Ltd	01869 320515				●					●					●		Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✓	Up to £6,000,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●			●			●	●	●	●				●	✓	Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●					✓	Up to £2,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)

Associate Members

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9
AceCad Software Ltd	01332 545800		●							
Advanced Steel Services Ltd	01772 259822								●	
Albion Sections Ltd	0121 553 1877	●								
Andrews Fasteners Ltd	0113 246 9992									●
ArcelorMittal Distribution – Bristol	01454 311442								●	
ArcelorMittal Distribution – Mid Glamorgan	01443 812181								●	
ArcelorMittal Distribution – Birkenhead	0151 647 4221								●	
ArcelorMittal Distribution – Scunthorpe	01724 810810								●	
Arro-Cad Ltd	01283 558206			●						
ASD metal services - Biddulph	01782 515152								●	
ASD metal services - Bodmin	01208 77066								●	
ASD metal services - Cardiff	029 2046 0622								●	
ASD metal services - Carlisle	01228 674766								●	
ASD metal services - Daventry	01327 876021								●	
ASD metal services - Durham	0191 492 2322								●	
ASD metal services - Edinburgh	0131 459 3200								●	
ASD metal services - Exeter	01395 233366								●	
ASD metal services - Grimsby	01472 353851								●	
ASD metal services - Hull	01482 633360								●	
ASD metal services - London	020 7476 0444								●	
ASD metal services - Norfolk	01553 761431								●	
ASD metal services - Stalbridge	01963 362646								●	
ASD metal services - Tividale	0121 520 1231								●	
Austin Trumanns Steel Ltd	0161 866 0266								●	
Ayrshire Metal Products (Daventry) Ltd	01327 300990	●								
BAPP Group Ltd	01226 383824									●
Barnshaw Plate Bending Centre Ltd	0161 320 9696	●								
Barrett Steel Services Ltd	01274 682281								●	
Bentley Systems (UK) Ltd	0141 353 5168		●							
Cellbeam Ltd	01937 840600	●								
Cellshield Ltd	01937 840600							●		
CMC (UK) Ltd	029 2089 5260							●		
Composite Metal Flooring Ltd	01495 761080	●								
Composite Profiles UK Ltd	01202 659237	●								
Computer Services Consultants (UK) Ltd	0113 239 3000		●							
Cooper & Turner Ltd	0114 256 0057									●
Corus	01724 404040				●					
Corus Ireland Service Centre	028 9266 0747								●	
Corus Panels & Profiles	0845 308 8330	●								
Corus Service Centre Dublin	00 353 1 405 0300								●	
Corus Tubes	01536 402121				●					
Corus Wednesfield	01902 484100								●	
Daver Steels Ltd	0114 261 1999	●								
Development Design Detailing Services Ltd	01204 396606			●						
Easi-edge Ltd	01777 870901							●		
Fabsec Ltd	0845 094 2530	●								
Ficep (UK) Ltd	01924 223530					●				
FLI Structures	01452 722200	●								
Forward Protective Coatings Ltd	01623 748323						●			
GWS Engineering & Industrial Supplies Ltd	00 353 21 4875 878									●
Hadley Rolled Products Ltd	0121 555 1342	●								
Hempel UK Ltd	01633 874024						●			
Hi-Span Ltd	01953 603081	●								
Hilti (GB) Ltd	0800 886100									●
International Paint Ltd	0191 469 6111						●			
Interpipe UK Ltd	0845 226 7007								●	
Jack Tighe Ltd	01302 880360						●			
Kaltenbach Ltd	01234 213201					●				
Kingspan Structural Products	01944 712000	●								
LaserTUBE Cutting	0121 601 5000								●	
Leighs Paints	01204 521771						●			
Lindapter International	01274 521444									●
Metsec plc	0121 601 6000	●								
MSW Structural Floor Systems	0115 946 2316	●								
National Tube Stockholders Ltd	01845 577440								●	
Northern Steel Decking Ltd	01909 550054	●								
John Parker & Sons Ltd	01227 783200								●	●
Peddinghaus Corporation UK Ltd	01952 200377					●				
Peddinghaus Corporation UK Ltd	00 353 87 2577 884					●				
PMR Fixers	01335 347629	●								
PP Protube Ltd	01744 818992	●								
PPG Performance Coatings UK Ltd	01773 837300						●			
Prodeck-Fixing Ltd	01278 780586	●								
Profast (Group) Ltd	00 353 1 456 6666									●
Rainham Steel Co Ltd	01708 522311								●	
Richard Lees Steel Decking Ltd	01335 300999	●								
Rösler UK	0151 482 0444					●				
Schöck Ltd	0845 241 3390	●								
Site Coat Services Ltd	01476 577473						●			
Steelstock (Burton-on-Trent) Ltd	01283 226161								●	
Structural Metal Decks Ltd	01202 718898	●								
Studwelders Ltd	01291 626048	●								
Tekla (UK) Ltd	0113 307 1200		●							
Tension Control Bolts Ltd	01948 667700									●
Voortman UK Ltd	01827 63300					●				
Wedge Group Galvanizing Ltd	01909 486384						●			

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
Roger Pope Associates	01752 263636
Highways Agency	08457 504030

Steelwork contractors for bridgework

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

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

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

Notes

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

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

Company name	Tel	FG	PG	TW	BA	CM	MB	RF	AS	QM	Contract Value (1)
'N' Class Fabrication & Installation	01733 558989	●	●	●	●			●		✓	Up to £800,000
Andrew Mannion Structural Engineers Ltd*	00 353 90 644 8300	●	●	●	●					✓	Up to £3,000,000
Briton Fabricators Ltd*	0115 963 2901	●	●	●	●	●	●	●	●	✓	Up to £3,000,000
Cimolai Spa	01223 350876	●	●	●	●	●	●			✓	Above £6,000,000
Cleveland Bridge UK Ltd*	01325 502277	●	●	●	●	●	●	●		✓	Above £6,000,000*
Concrete & Timber Services Ltd	01484 606416	●	●	●		●	●		●	✓	Up to £800,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●		●		✓	Up to £6,000,000
Interserve Project Services Ltd	0121 344 4888							●	●	✓	Above £6,000,000
Interserve Project Services Ltd	020 8311 5500	●	●	●	●		●	●	●	✓	Up to £400,000*
Mabey Bridge Ltd*	01291 623801	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●						●		✓	Up to £800,000
Nusteel Structures Ltd*	01303 268112	●	●	●	●	●		●	●	✓	Up to £4,000,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓	Up to £3,000,000*
Remnant Engineering Ltd*	01564 841160	●							●	✓	Up to £400,000*
Rowecord Engineering Ltd*	01633 250511	●	●	●	●	●	●	●	●	✓	Above £6,000,000
SIAC Butlers Steel Ltd*	00 353 57 862 3305	●	●	●	●	●		●	●	✓	Above £6,000,000
TEMA Engineering Ltd*	029 2034 4556	●	●	●	●	●	●	●	●	✓	Up to £1,400,000*
Varley & Gulliver Ltd*	0121 773 2441	●						●	●	✓	Up to £4,000,000
Watson Steel Structures Ltd*	01204 699999	●	●	●	●	●	●	●	●	✓	Above £6,000,000

* Denotes membership of the BCSA

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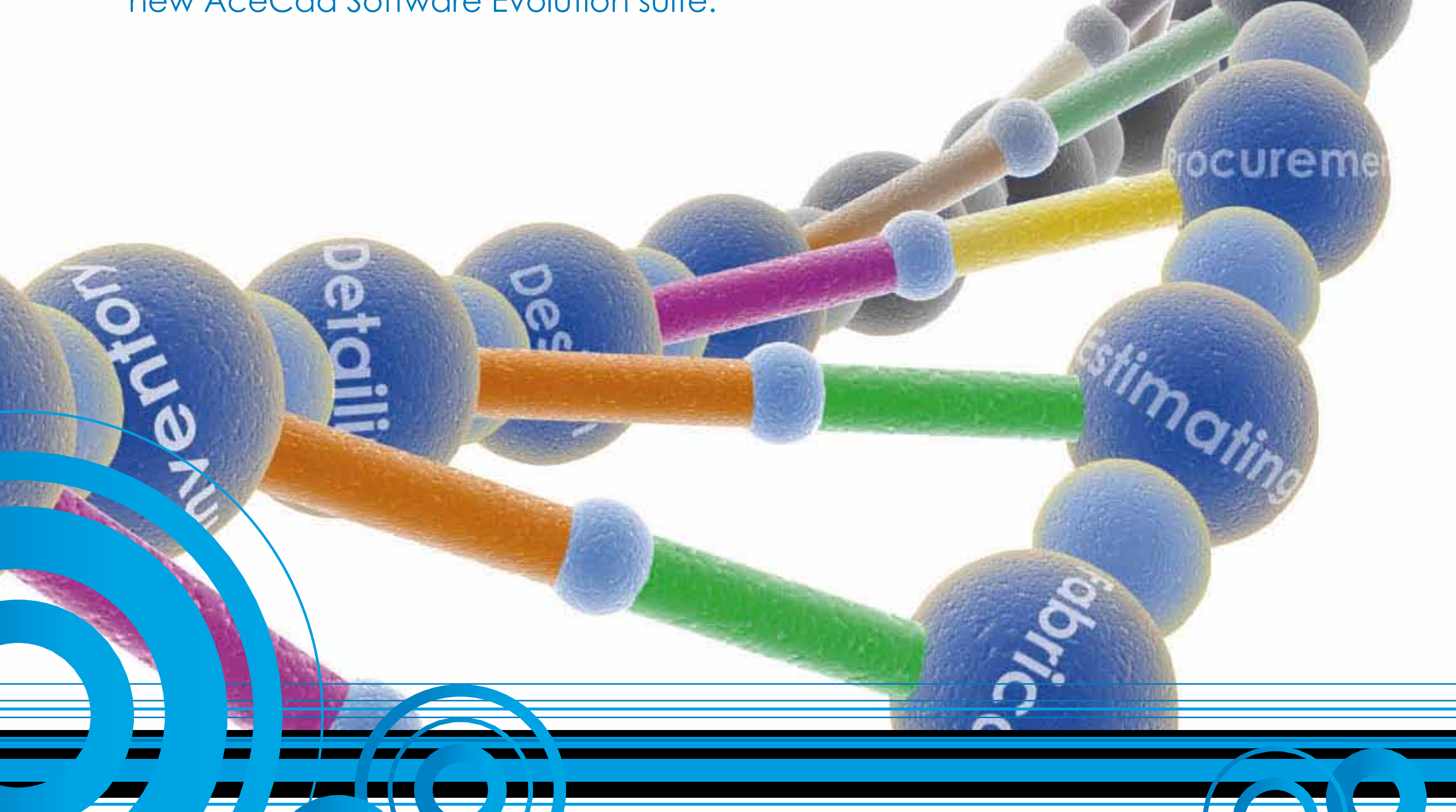

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