

NSC



**STRUCTURAL
STEEL
DESIGN
AWARDS
2012**



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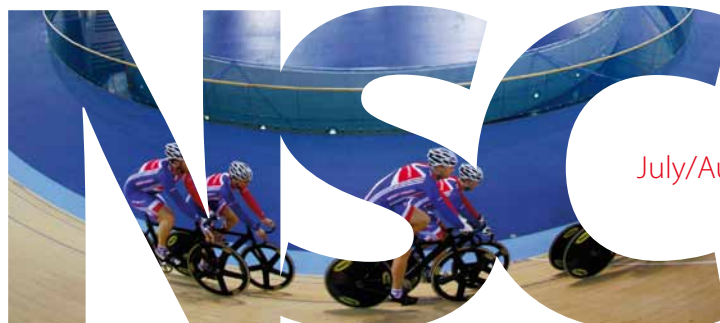
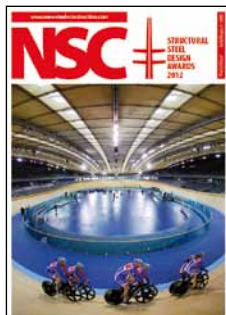
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Cover Image
 London 2012 Velodrome,
 Olympic Park, London
 Client: Olympic Delivery Authority
 Architect: Hopkins Architects
 Steelwork contractor:
 Watson Steel Structures
 (Severfield-Rowen plc)
 Steel tonnage: 1,100t



TATA STEEL



July/August 2012 Vol 20 No 7

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Editor's comment The 2012 Structural Steel Design Awards feature high quality, iconic structures of many types. Editor Nick Barrett says they also highlight the Olympic legacy opportunities created by the versatility, flexibility and efficiency of steel construction.

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Steel gives legacy lessons



Nick Barrett - Editor

Last year at this time NSC wished the rest of the London Olympics structures well in the 2012 Structural Steel Design Awards, following the success of the Legacy Roof of the Aquatics Centre in the 2011 awards. Our good wishes bore fruit as the Olympics Stadium and the Velodrome both achieved Awards, along with four other outstanding steel structures (see News).

UK steel construction at its world leading best was on show at the Awards. No fewer than ten structures were singled out for Commendations, an unusually high number, such was the quality of the entries. The shortlist of projects reveals the depth and breadth of architectural and structural engineering talent being deployed on projects throughout the UK.

There was a very high number of top quality entries - and all on the shortlist of 29 were visited by the senior architect and engineer judges. Perhaps recession has brought a heightened recognition of the need for marketing, and since the SSDA has been running for over 40 years success there delivers more prestige than most other awards.

Whatever the reason, it is obvious from the number and standard of the entries that steel construction is the method of choice for an amazingly diverse range of structures, where its flexibility, economy and sustainability allows architects and structural engineers to realise the ambitions of clients as well as deliver successful projects to the highest global standards of their own professions.

Beyond the 2012 London Olympics there remains a huge challenge for the UK construction industry in turning what looks like possibly the best planned and executed Olympics construction effort ever into what could be the finest Olympics legacy. Thanks to steel's adaptability and flexibility key structures like the Olympic Stadium itself have been economically lean-designed, fabricated and erected with demountability and re-use built in, and we look forward to bringing you news of that work in future issues of NSC.

High sustainability lean design will allow easy reconfiguration of the major Olympic structures, and changing the use of others will ensure no white elephant blight of the type that has bedevilled past Olympic games. Future Olympic construction programmes will doubtless benefit from the lessons learned in London.

Many lessons have been learned - for example, key factors in the success of the iconic and ultra-lean designed Velodrome singled out by the judges were the collaborative effort of construction teams and the early input of specialists like steelwork contractors to the design process, which surely points the way towards legacy learning of how to deliver major and landmark projects on time and to budget. If there was an Olympics construction event steel would ensure that London 2012 wins Gold.



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STRUCTURAL STEEL DESIGN AWARDS 2012

AWARDS

Olympic Stadium,
London

London 2012
Velodrome, Olympic
Park, London

M53 Bidston
Moss Viaduct
Strengthening

Peace Bridge,
Derry-Londonderry

The Royal
Shakespeare Theatre,
Stratford-upon-Avon

The Footbridge,
MediaCityUK

COMMENDATIONS

The Walbrook
Building, London

McLaren Production
Centre, Woking

Jarrol Bridge,
Norwich

West Burton Power
Station

NEO Bankside,
London

RISE Belfast

Borough High Street
Bridge, London

Energy from Waste
Facility, La Collette,
Jersey

Garsington Opera
Pavillion, Wormsley

Deptford Lounge,
London

Steel awards secure London Olympics legacy

The London 2012 Olympic Stadium, which will host many of the major sporting events at this summer's Olympic and Paralympic Games, is one of six Award winning entries in this year's Structural Steel Design Awards (SSDA), which were announced at a special ceremony at the Museum of London.

The five other projects that the judges felt equally worthy to stand alongside the 80,000 capacity stadium are London 2012 Velodrome; M53 Bidston Moss Viaduct Strengthening; Peace Bridge, Derry-Londonderry; The Royal Shakespeare Theatre, Stratford-upon-Avon; and The Footbridge, MediaCityUK.

Journalist and television presenter Helen Fospero presented the awards, now in their 44th year. The judges selected the Award winning entries from a shortlist of

29; all of them scored highly in efficiency, cost effectiveness, aesthetics, sustainability and innovation.

Chairman of the Judges David Lazenby said that 2012 had been an exceptionally good year for entries and compared well with any of those since the scheme was first launched in 1969.

He said: "In the year of the 2012 Olympics it is pleasing to see truly iconic world-class sporting venues entered that will endure in their legacy. The high calibre of submissions demonstrates that steel's use has been key with so many sectors. Entries this year were received from all major building sectors, and amongst them was a range of bridges; a car production centre; a theatre; an energy from waste facility through to an iconic sculpture. We hope that everyone,

like us, feels that the projects are something the industry can be truly proud of".

Ivor Roberts, British Constructional Steelwork Association President, gave the evening's opening address. He said while it is universally known that single storey sheds are almost all built in steel, not everyone knows that steel framed construction represents 70% of the UK's multi storey market.

"As the SSDA shortlist demonstrates, steel is also the structural material of choice for bridgeworks, stadia and a wide range of other projects."

Hans Fischer, Chief Technical Officer, Tata Steel, said he was not surprised by the quality of the SSDA entrants as the UK was Europe's largest market for constructional steelwork.



BCSA President, Ivor Roberts



Host, Helen Fospero



Chairman of the Judges, David Lazenby



Tata Steel Chief Technical Officer, Hans Fischer

The award winning teams



The Olympic Stadium, London



London 2012 Velodrome, Olympic Park, London



M53 Bidston Moss Viaduct Strengthening



Peace Bridge Derry-Londerry



The Royal Shakespeare Theatre, Stratford-upon-Avon



The Footbridge MediaCityUK

Students show innovation in steel design

Winners of the 2012 BCSA/Tata Steel Student Design Competition, organised by the Steel Construction Institute, were announced prior to the SSDA ceremony.

As always, the Student Awards were divided into three categories – Structures, Bridges and Architecture.

For the Structures category students were required to design a building, in a Gulf state, enclosing a golf driving range. The project also had to incorporate an iconic structure shaped like a giant golf ball. In the steel Bridges category students had to design a twin track railway bridge crossing a motorway. And for the Architecture category students were required to design a long span building to house a new medium sized international airport terminal.

First prize for Structures went to the University of Bristol, with the University of Nottingham coming second and third place going to Queen's University Belfast.

The Bridges category was won by Queen's University Belfast – completing a very successful evening for this academic institution, second place went to Cardiff University and the University of Manchester collected the third prize.

Jodi McLeod from the Manchester School of Architecture was the winner of the Architecture category, with fellow students from the same university coming second and third.



Winners of the Structures category, University of Bristol, collect their prize from Helen Fospero, Ivor Roberts and Hans Fischer



The winning team in the Bridges category, Queen's University Belfast, receive their award



Jodi McLeod from the Manchester School of Architecture was the winner of the Architecture student design award

AROUND THE PRESS

Construction News

24 May 2012

Visualising building's future

"Everyone knew who was working where and when," says BAM regional planner David Carson. "The first check of the model found 2,500 clashes between the cladding and structural steelwork. They all got picked up prior to being installed, so we saved a lot of grief as in the past the build period would have been extended."

Construction News

14 June 2012

Pier pressure on Southend project

(Southend cultural centre) Kier's specialist subcontractor GPS Marine used a 400 tonne marine shear leg crane to hoist the 170 tonne (steel framed) building from the wharf at Tilbury and lower it onto a barge.

The Structural Engineer

June 2012

London 2012 Olympic Stadium design and construction

All of the steelwork tubular connection elements were left exposed, with Team Stadium believing the natural structural aesthetic of the connections should be neatly detailed and left visible, in keeping of the spirit of an honest, economic, sustainable design.

The Structural Engineer

June 2012

London 2012 Aquatics Centre

The brief for the temporary stands was to create economical demountable structures that could increase the gross seating capacity of the venue from 2,500 spectators in legacy mode to 17,500 gross in Olympic and Paralympic mode.

BREEAM first for steel framed structure

A steel framed pallet warehouse at Severnside near Bristol has become the first building awarded certification to BREEAM New Construction 2011.

BREEAM is the world's foremost design assessment method for sustainable buildings and it is regularly updated to ensure it continues to drive best practice.

Using the new updated BREEAM the warehouse has achieved a 'Very Good' rating.

Working on behalf of main contractor Winvic Construction, Altas Ward Structures fabricated, supplied and erected all of the project's steelwork.

Designed by RPS Planning and Development, the building occupies the first plot to be developed on the 640-acre, Central Park distribution estate.

"A wide range of buildings have been registered to BREEAM 2011 and many are now being assessed," commented Carol



Atkinson, Chief Executive of BRE Global. "Congratulations to the project team involved in the design and construction of this first BREEAM 2011."

Topping out marks milestone for London Bridge Quarter



The London Bridge Quarter (LBQ) development, a project that includes the iconic Shard, has celebrated another significant milestone with the topping out

of the 17-storey Place building.

Providing 55,700m² of floor space, The Place is being developed by Sellar Property Group on behalf of LBQ, a

partnership that includes the State of Qatar.

The steel framed structure has been designed by architect Renzo Piano and is scheduled for completion in Spring 2013.

Stephen Pycroft, Chairman and Chief Executive Officer of Mace, the principal contractor, said: "I am delighted that Mace has, once again, been appointed to deliver another highly complex construction project for the LBQ development."

The steel framed building has an 'Excellent' BREEAM rating and will offer open and flexible office floor space. It provides 16 floor plates of between 1,950m² and 2,800m² and features naturally ventilated winter gardens on floors three to 12 and a landscaped roof terrace.

Steelwork for the project was fabricated, supplied and erected by Severfield-Rowen Structures.

London cable car takes flight



The Emirates Air Line, the UK's first urban cable car, has started a daily service which offers a brand new way of crossing the River Thames.

This latest addition to the capital's transport network connects the North Greenwich peninsula with the Royal Docks on the north side of the river, providing a link between the O₂ Arena and the ExCeL exhibition venue.

Supported by three steel towers, two of which are 90m tall, the cable car travels 1.1km between its two termini. In all, more than 1,100t of structural steelwork was needed for the project, all of which was fabricated, supplied and erected by Watson Steel Structures.

Diary

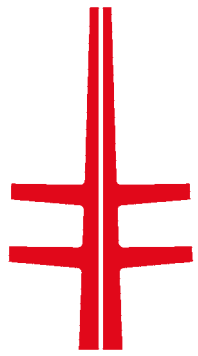
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13 September 2012
Steel Building Design to EC3
Swindon



27 Sept & 9 Oct 2012
On-line Steel Building
Design to EC3 - Part 1
On-line



Structural Steel Design Awards 2012



The Judges



Chairman of the Structural Steel Design Awards judges **David Lazenby CBE** had a distinguished career as a consulting engineer, and as Chairman of the lead European committee he led the huge pan European exercise to develop the Eurocodes. A new turn in the 1990s saw him directing British Standards (BSI). David Lazenby's career began with Balfour Beatty, then moved to consultant Andrews Kent & Stone, where he stayed for 30 years, becoming 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 was asked to become the Director of British Standards, one of three executive directors of the group responsible for over 5000 staff in 100+ countries. His experience both as a user of standards and as a committee and board member helped him to introduce a more businesslike approach and a new focus on market relevance, bringing global success to the organisation. Establishing British Standards as a world leader in its field, as well as making it profitable, has been almost unique among national standards bodies. He was awarded the CBE in 2000. Since 2003 he has operated his own consultancies, Eurocode Consultants, and DWL Consultants, in the fields of certification and company management.



Martin Manning is a Structural Engineer. He is an Arup Fellow. He joined the firm directly from university and for over 40 years has worked in Arup offices, and on projects, around the world, most recently on buildings in the transport sector. He is the Chairman of the SCI, a Fellow of the Royal Academy of Engineering and a Member of The Institution of Structural Engineers.



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 & Pavements Group, with responsibility for the development of the Agency's £28.6m knowledge programme.



Bill Taylor joined architect Michael Hopkins in 1982 straight from Sheffield University School of Architecture and became his partner in 1988. He worked on and was responsible for a large number of distinguished, award winning projects including The Mound Stand at Lord's, Inland Revenue Headquarters and the University Jubilee Campus, both in Nottingham, City Art Gallery, Manchester and the Applied Research Facility at Northern Arizona University. After completing the National Tennis Centre at Roehampton, Bill left his role as Managing Director with the practice in Spring 2010 to concentrate on his own projects. A recipient of a number of Structural Steel Design Awards, he is a member of the RIBA Awards Group, is an Assessor for the RIBA Competitions programme and was a founding member of Tensinet, the pan European research organisation which researches lightweight structures and membrane architecture.



Joe Locke MBE 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. He 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.



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 as 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.



Oliver Tyler joined Wilkinson Eyre Architects (WEA) in 1991 becoming a Director in 1999. He has spent over 25 years in architectural practice with extensive experience in leading and coordinating the design and construction of many high profile buildings and infrastructure projects. 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, regional headquarters for Audi and the Arena and Convention Centre in Liverpool - the centerpiece for the city's 2008 Capital of Culture celebrations. Oliver is lead on a number of major sport, infrastructure and commercial office schemes including as Project Director for the Crossrail Liverpool Street Station and the recently completed London Cable Car (Emirates Air Line).

Introduction

by David W. Lazenby CBE - Chairman of the Judges

Both the sponsors and the judging panel are delighted at the large entry this year for the SSDA, in spite of the tough environment facing the industry. It was not an easy task to select a shortlist, because the quality has been so high. But out of a full list of entries, 29 were finally selected, and all of these were visited by judges, so that the teams could present their work, and we can be confident that the true merits were identified.

The spread of sectors, size and location demonstrates the breadth of activity which the industry has been sustaining. It was to be expected that the 2012 Olympic games would generate entries. The broad interests of society are represented by many health, education, arts, residential and sports developments, together with another EFW plant, power stations and many transport projects. The range of bridges is impressive, and there is a car assembly factory, a seaside pier, a sophisticated city office block and even a politically iconic sculpture. In all, this

covers a huge spectrum.

I have always stressed that the client's response is paramount, and I am delighted that the varied clientele this year reports a high level of satisfaction. Together with excellent collaboration within the project teams which grows ever stronger with the emphasis on total team success, this is a good basis on which to continue forward.

All the projects have merit and are praiseworthy, but as always we look for the outstanding. I have no doubt that this year's winners compare well with those in previous years, and demonstrate great strength in the face of the challenging environment. The judges have been impressed, and I hope that everyone will share our positive views.

David Lazenby



Pictured: The Royal Shakespeare Theatre Stratford-upon-Avon

Olympic Stadium, London



Completed within budget and early, the London 2012 Olympic Stadium has also achieved the client's sustainability objectives, and is consequently the lightest structure of its type in the world.



FACT FILE

Architect: Populous
Structural engineer: Buro Happold
Steelwork contractor: Watson Steel Structures Ltd (Severfield-Rowen Plc)
Main contractor: Sir Robert McAlpine
Client: Olympic Delivery Authority

As the centrepiece for the London 2012 Olympic and Paralympic Games, the 80,000 capacity Olympic Stadium had to be completed quickly and in readiness for its handover last year. This was achieved with time to spare as the project team crossed the finishing line three months early, giving the organisers more time to host test events and fine tune the venue.

"This was a ground breaking project," says Ian Crockford, Project Sponsor for the ODA (Olympic Delivery Authority). "This is not only the most sustainable Olympic Stadium ever built, but it's also the most flexible."

After the Games the stadium could be scaled down to a 25,000 seater by demounting the steel framed upper tier, leaving behind a legacy facility for athletics and other sports.

"This was an important part of the project," adds Mr Crockford. "We were not just constructing a stadium to host the Olympics, we are also creating an arena which will benefit the local community for years to come."

Sustainability is always a key client objective, and this project has a number of green credentials to its credit. Only 10,700t of structural steel has been used on the project, making it the lightest Olympic Stadium to date. In stark contrast to the 40,000t needed for Beijing's Birds Nest Stadium, the majority of London's steelwork is demountable and can be reused at a later date. Also, large diameter tubes used on the project have been fabricated from recycled material from a gas pipeline project.

Early works saw more than 4,000 permanent piles installed for the stadium's foundations, while on top of this more than 100 x 5m high concrete columns were erected to support the podium and lower

ground floor which contains back-of-house facilities.

The site also sloped and this had to be incorporated into the design by locating the athletes' changing rooms and warm-up areas in a basement area at the lower end of the slope beyond the bowl.

Above the concrete bowl, which consists of the lower or permanent tier of the stadium, Watson Steel Structures erected the initial upper steelwork. This consisted of 112 steel rakers, measuring 35m long and weighing 25t each, to support the upper tier terracing.

Above this sits the signature roof, which consists of a 13m high lattice compression truss that rings the stadium and is formed by 900mm tubular steelwork. The truss was lifted into place in 28 sections, each 30m in length and weighing 90t. They were individually lifted into place by a 1,350t capacity crawler crane positioned in the middle of the playing area.

Paul Hulme, Watson Steel Structures Project Manager, says: "This truss was only self stable once the last piece had been installed, so we had to design and erect temporary works which stayed in place throughout this part of the steel erection process."

The erection of the 14 lighting towers followed and this was another challenging part of the project due to their support being provided by the cable net. The towers were not self-supporting until all 14 had been erected and the final high level circumferential cable had been connected and prestressed.

In summary, the judges say the requirement for a severe reduction in capacity after the Olympics has resulted in a lean design, with an expressed exoskeletal steel superstructure.



London 2012 Velodrome, Olympic Park, London

The Velodrome is an iconic world class sporting venue, which will endure in its community legacy use in the VeloPark.



FACT FILE

Architect: Hopkins Architects
Structural engineer: Expedition Engineering
Steelwork contractor: Watson Steel Structures Ltd (Severfield-Rowen Plc)
Main contractor: ISG Construction
Client: Olympic Delivery Authority

The 6,000 seat London 2012 Velodrome will serve as an Olympic and Paralympic stadium for track cycling. It has already been described as a world class venue that has intelligently answered questions of function, beauty, sustainability, buildability and value.

On track for a BREEAM 'Excellent' rating, the Velodrome boasts a number of impressive statistics: 29% recycled content in the building, natural ventilation, exceeding Part L (2006) by 30% and extensive use of natural daylighting. The structural system is said to be so efficient that the steel cable net roof is approximately 35% lighter than the roof of the next best comparable venue in the world.

"The Velodrome is 50% lighter than Beijing's. By using the materials we've chosen for the roof we have produced a lightweight, efficient and sustainable landmark," says Richard Arnold, Olympic Delivery Authority Project Sponsor.

The upper tier of the Velodrome is formed by 48 inclined steel trusses (varying in size from 2m high to 16m high) connected to concrete piers. The lower parts of the truss form the steel rakers supporting the upper tier's precast terrace units. Because of the shape of the roof structure (described as Pringle shaped), the Velodrome has two upper seating areas positioned on either side of the track and suspended within the two curves of the roof.

A tubular plane truss sits on top of the

steel trusses and goes around the entire perimeter of the structure, in a rollercoaster fashion, supporting and helping to form the distinctive double curved roof. The ring beam rises in height by 12m from the shallowest point to the highest part.

Approximately 2,500 sections of steel were installed by Watson Steel Structures to complete the steel programme on the Velodrome. Much of the steelwork was pre-assembled into bays, and once erected only the steel bracing needed to be added.

The ring beam is formed from two CHS columns connected by tubular bracing and was assembled into 8m long sections prior to being erected. Watson Steel began its erection of the ring beam on the eastern end of the venue (one of the two low points of the curved roof) and worked its way around the entire circumference.

"We were dealing with some extremely tight tolerances to ensure the correct geometry of the cable network was maintained," says Peter Barlow, Watson Steel Structures Project Designer. "Due to the magnitude of the forces within the bowl steelwork, huge bolted connections were developed utilising tension control bolts to ensure there was no slippage within the joints."

Once the steelwork was completed work was then able to begin on installing the venue's roof. In what was one of the largest cable net roof lifts in the UK, more than 16km of cable was used. The Velodrome is one of the most sustainable venues in the Olympic Park and the lightweight cable net

roof only weighs 30kg per square metre, roughly half that of any other covered Velodrome, helping to create a highly efficient building.

The cable net is connected to the ring beam at 3.6m centres and the steel ring beam acts as a circular compression member. "About 25% of the loads from the roof are absorbed by the ring, while the remainder are transferred down to the foundations via the steelwork and concrete directly below," explains Andrew Weir, Expedition Engineering Project Manager.

The capabilities and versatility of steelwork have been used well in this fine building, say the judges in summary.





The Footbridge, MediaCityUK

Spanning the Manchester Ship Canal, the Footbridge is a signature element within a large scale regional redevelopment.

The £8.3M Footbridge links the MediaCityUK site at South Quay with the adjacent Imperial War Museum North by spanning the Manchester Ship Canal. As well as enhancing access between the two sites, the bridge has also been designed to be a symbol of regeneration and a marker for further development.

The structure is an asymmetric cable stayed bridge incorporating a main span that pivots through 71 degrees to allow large vessels to pass along the canal.

It comprises of two spans; the main pivoting span crossing the Canal is 63m long, with a short back span of 18m. The back span was constructed as a hollow steel box and then filled with concrete to form the bridge's counterweight for balancing the main span during opening.

"The design was driven by the site's constraints," says James Marks, Wilkinson Eyre Associate Director. "We had to make sure the Canal could still accommodate large vessels and so the pivot point is on one side of the bridge, keeping the navigation channel clear."

Steve Thompson, Ramboll Project Engineer agrees and adds: "We've created a landmark structure for the area, one which has met all of the necessary criteria."

The asymmetric form of the bridge's deck utilises a fanned array of eight, shaped CHS steel masts that converge at their bases atop a sculpted pedestal. The masts are up to 30m tall and support the bridge deck via high tensile steel cables anchored to the east side of the deck.

The deck is supported at 6m centres by the steel cables, which are anchored at their upper and lower ends using fork connectors onto steel outstand lugs aligned in the plane of the stays at the mast tip and deck connections.

"The most economical method of constructing this bridge was to fabricate as much of the structure as possible offsite," explains Gareth Summerhayes, Rowecord Engineering Contract Manager.

To achieve this the majority of the structure was delivered to site in modular sections, which were then welded together and assembled adjacent to the bridge's final position.

Prior to the spans being assembled Rowecord first had to install the steelwork for the pivot bearing. The pivot for the bridge comprises a large steel casting welded into the pivot zone of the steelwork deck and mounted on a slewing bearing, which in turn is supported on a fabricated steel structure.

The bridge was erected on the quayside in its entirety, including the masts and cables. A temporary framework that supported the masts was then struck, the bridge was slid into position and final adjustments to the cables were carried out once the bridge was lowered onto the slewing bearing.

The details of the structure and attachments are well considered and executed. This is analytically courageous and technically accomplished, say the judges.

FACT FILE

Architect: Wilkinson Eyre Architects
Structural engineer: Ramboll
Steelwork contractor: Rowecord Engineering Ltd
Main contractor: Balfour Beatty Regional Civil Engineering
Client: The Peel Group

Photo © Steve Thompson

Photo © Inside Out

M53 Bidston Moss Viaduct Strengthening



Fully restoring a vital road link and undertaking extensive welding inside confined spaces, with minimal disruption to traffic, were all safely achieved on this bridge project.

The 730m long Bidston Moss Viaduct is a multi span box girder structure that connects the M53 to the River Mersey's Kingsway Tunnel, carrying 63,000 vehicles a day on this strategic route into Liverpool.

A recently completed strengthening programme has now fully restored the structure, allowing load restrictions (HGVs were not allowed on the outside lanes) which had been imposed during the last ten years to be lifted.

Previous strengthening works on the bridge, which was originally built in the late 1970s, uncovered some structural deficiencies, problems which had resulted in restrictions being imposed and partial closure was imminent.

"The completed project was vital as the whole bridge would have had to be closed to HGVs which would have put an enormous strain on other roads and had a serious knock-on effect to the local economy," says Graham Dakin, Highways Agency Project Manager.

Keeping traffic disruption to a minimum was also seen as vital, and this was achieved as the majority of the steel strengthening works, all undertaken by Cleveland Bridge, were executed inside the structure's box girders. To protect the road user, workforce and the environment, the 3.7km of box girder was housed within a bespoke scaffold

containment.

Steel was chosen as it is compatible with the existing structure. The material also allowed significant flexibility in design and construction, as well as reducing future maintenance costs.

The overall scope of works involved strengthening 3,900 linear metres of existing box corner welds. Some 32,500 retrofit shear pin connectors enhanced the longitudinal shear transfer capacity of load from the reinforced concrete slab to the steel, while 140,000 holes required drilling.

To install more than 565t of steel, 26,200m of finished weld was completed using highly specialised labour, varying between one and 14 runs over a distance of 100km.

"The majority of the work was carried out in a confined space, whereby much of the strengthening was done by welding new steelwork to the existing steel," explains Darren Bearwish, Amey Project Engineer. "Through value engineering we developed hybrid solutions and bolted alternative solutions which were utilised in certain areas."

In order to create a safer working environment and lessen any problems that may have arisen from the existing bridge's superstructure, a staged sequence was used, minimising potential weakening due to drilling, cutting or applying heat.

Mr Bearwish adds that working as an integrated team reduced the number of solutions needed to achieve the required strength. "Having the whole team, including the steelwork contractor, on board helped the project meet its deadline, which also included repainting, drainage renewal and other highway works."

Summing up, the judges say a shipbuilder executed the original bridge structure, and this is the third exercise to strengthen it to current standards. The work of the designer and steelwork contractor has been outstanding in investigating, analysing and executing the strengthening throughout the 3km length.

FACT FILE

Structural engineer: Amey
Steelwork contractor: Cleveland Bridge UK Ltd
Main contractor: Costain
Client: Highways Agency





Peace Bridge, Derry-Londonderry

Linking historically divided communities on either side of the River Foyle, the Peace Bridge was conceived as a landmark structure and a focal point for when the city becomes UK City of Culture in 2013.

The Peace Bridge in Derry-Londonderry has quickly become a symbol of recent political and cultural changes in Northern Ireland. Connecting two historically divided communities on the east and west banks of the River Foyle, it is an aesthetically pleasing expression of the unification of the city.

Funded from the European Union's PEACE III Programme managed by the Special EU Programmes Body (SEUPB) it is the most significant capital project in Derry-Londonderry for decades and of fundamental importance to the city's regeneration plan.

The structure is a 312m long S-shaped self-anchored suspension bridge for pedestrians and cyclists, divided in half with each portion supported from a single 38m high inclined steel pylon.

At the centre of the river these systems cross over to form what has been called a symbolic handshake. "We have two similar structural systems, back to back, overlapping in midstream," explains James Marks, Wilkinson Eyre Associate Director.

As well as supporting the deck, the catenaries are used as a device to manipulate views and at midspan they cradle the pedestrian on the deck at the most exposed

part of the crossing."

The bridge deck is an orthotropic steel triangular box section, fabricated from painted weathering steel and stiffened both longitudinally and transversely. The width of the deck varies, from 3.5m at the ends to 4.5m at pier locations.

An array of hanger rods, comprising of helically spun spiral strands, supports the deck at one edge only. They are spaced along the concave edge at approximately 4.5m centres.

Kandiah Kuhendran, AECOM Technical Director says: "The design exploits the combination of the deck curvature, opposing inclined towers and suspension cables to create balancing radial forces to achieve stability."

He adds: "The close involvement and cooperation of the entire team during the design phases assisted us in developing an efficient design to suit the fabrication process; this was a key element of the project."

Prior to fabrication, a comprehensive 3D model of the pylons and bridge deck was created, and this assisted in visualising the structure and simplified the checking process. Subsequently it was also used to produce component, fabrication and assembly drawings.

A large barge equipped with a crane, which had previously transported the steel sections from a temporary sub assembly area in Londonderry Port, was used for the erection process.

"The deck was brought over from our works in Wales in lengths of approximately 30m and the pylons as complete 38m long sections. As there was no road access to the erection site we had to deliver and erect everything over the river from the water," explains Peter Samworth, Rowecord Engineering Contracts Manager.

Following the installation and welding of all the deck units, the suspension cable installation was undertaken in two stages. In the first stage the cables were anchored to the deck and pylon anchorages using a system of multiple winches and guides that hoisted the cable up from the deck. All of the hangers and clamps were attached to the cables as they were winched up to minimise working at height and over water.

In the second stage the suspension system was stressed by an innovative system of jacking the main catenary cables only, as opposed to incremental stressing of individual hangers.

The judges say this excellent bridge is much loved within the city and across Northern Ireland.

FACT FILE

Architect: Wilkinson Eyre Architects
Structural engineer: AECOM
Steelwork contractor: Rowecord Engineering Ltd
Main contractor: Graham Construction
Client: Ilex Urban Regeneration Company



The Royal Shakespeare Theatre, Stratford-upon-Avon

At the heart of the £112M renovation of the Royal Shakespeare Theatre is a new auditorium containing a thrust stage which brings audiences closer to the performance.

FACT FILE

Architect: Bennetts Associates Architects
Structural engineer: Buro Happold
Steelwork contractors:
 Billington Structures Ltd (primary steelwork)
 CMF Ltd (auditorium steelwork)
Main contractor: Mace Group Ltd
Client: Royal Shakespeare Company

A new 1,000 plus seat auditorium at Stratford-upon-Avon's iconic Royal Shakespeare Theatre formed the main element of a multi-million pound renovation project.

"We wanted to move away from the 19th Century proscenium design to a theatre which celebrates interaction," explains Royal Shakespeare Company Artistic Director, Michael Boyd. "The best way to achieve this was in a bold thrust stage one room auditorium."

The new auditorium sits in between the retained 1930s Grade II listed Scott Foyer and the theatre fly tower. There was little room in which to work, and to add to the overall complexity two foyer areas were also being erected either side of the new auditorium.

"It was an incredibly complex project," explains Andrew Wylie, Associate Director for Buro Happold. "We had to look at which parts of the building were staying up, which were coming down and, importantly, if it would stand up. How do we keep the retained bits of building safe during the construction?"

Structural steelwork was used on a number of key elements and the most striking were the roof trusses, which span the new auditorium. The two main trusses are each 24m long x 3.5m deep and weigh over 30t each.

As work was going on around various parts of the site, steelwork contractor Billington Structures had to bring in a mammoth 500t capacity mobile crane to lift the trusses.

"A combination of reach, weight and careful location within the tight footprint of the building necessitated the size of the crane, anything smaller wouldn't have had the necessary reach," says Paul Hayes, Billington Structures Project Manager.

The two trusses are supported by the new inner concrete walls of the auditorium and are connected by a series of steel support beams. These are then connected to new steelwork which forms a roof over the entire renovated building.

Along the riverfront elevation of the building a new four storey wing has been erected. This houses dressing rooms and a top floor (rooftop) cafe for the company.

The project has a number of sustainability credentials, not least the choice of materials used. "We used materials that were best for each section of project,"

adds Mr Wylie. "A steel frame is lighter than alternatives for the new additions."

The steel wing structure also includes a 10m long Vierendeel truss which picks up the rooftop cafe's canopy. The truss weighs 10t and was brought to site in one piece and lifted into position by mobile crane.

On the town side of the building, another new four storey steel framed wing was also constructed. The lower level of this structure has a colonnade from the theatre's new entrance, with a series of exposed feature steel columns.

Summing up, the judges say the complete remodeling of this iconic theatre and varied ancillary areas has been exceptionally challenging. The steelwork has been key to dealing with the varied major areas, with interesting interactions of structural materials.



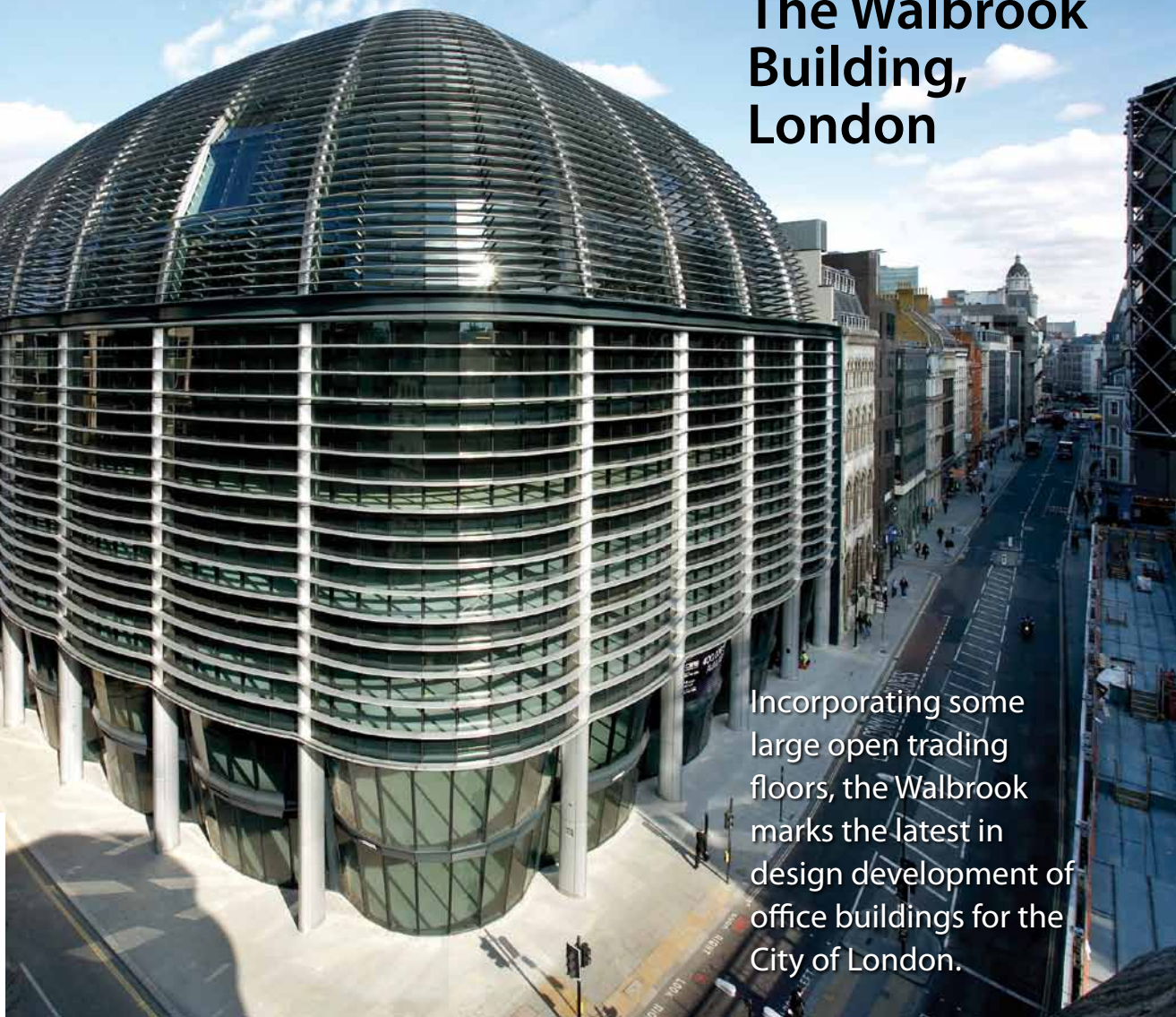
Photo © Peter Cook



The Walbrook Building, London

FACT FILE

Architect: Foster + Partners
Structural engineer: Arup
Steelwork contractor: William Hare Ltd
Main contractor: Skanska UK Plc
Client: Minerva Ltd



Incorporating some large open trading floors, the Walbrook marks the latest in design development of office buildings for the City of London.

Built on a City of London site directly opposite Cannon Street Station, the 10 storey Walbrook Building is an L shaped structure providing 3,693m² of retail space and 35,283m² of office floorspace.

The project required more than 6,000t of structural steelwork and is located within the height limitation band imposed by the nearby St Paul's Cathedral.

The structure consists of steel columns and beams with composite floor slabs cast in situ on metal decking, with cellular beams used extensively throughout to accommodate services.

In order to create the desired open plan column free spaces, the steelwork is based around a 9m grid pattern, with only 10 internal columns on a typical floor plate.

"The floor plate, driven by the need to create space for the broadest range of occupiers, resulted in the use of long span cellular beams throughout the structure," says Darren Burnham, William Hare Engineering Quality Manager.

The project team agrees that the most challenging and complex part of the job

was the sloping columns that rake inwards, mansard style, up the building's elevations from the sixth floor to the roof.

Below the sixth floor the steel frame is based on a relatively simple layout, but above this floor level the members crank in multiple locations. This results in some complex nodes with members clustered at awkward angles.

"The geometry was very challenging as every column above floor six is cranked at a different angle to allow for the creation of a seamless cladding envelope," says Joanne Larmour, Arup Associate.

The unconventional framing pattern on the upper levels meant careful consideration was needed to provide temporary stability for the steelwork above the sixth floor.

"Normally temporary works are left to the steelwork contractor, but the unique characteristics of this job meant we agreed the best approach with the engineer, Arup," explains Mr Burnham. "They provided temporary loads from the framing model, and an agreed strategy was developed which included additional in-plane and vertical bracing."

Another important consideration for the temporary works was to provide support to the atria beams. Architect Foster + Partners wanted to ensure a clean finish without visible bolts, so all joints were site welded.

The overall cost of the site welding scheme was reduced by pairing up the temporary support beams so that they could also support a temporary works platform, avoiding the need for separate scaffold towers.

The topmost level (roof) design was further complicated by the provision of a Building Maintenance Unit (BMU) which had to cantilever over the curved façade of the building.

"The unusual shape of the building required a bespoke BMU for façade cleaning. It is supported at roof level and imposes significant forces on the roof structure. The interface of the BMU rails and loading on the already complicated roof geometry required a high degree of analysis incorporating many load cases, thus ensuring all eventualities were addressed," says Ms Larmour.

In summary, the judges say the project further developed steelwork's capabilities for offices.

West Burton Power Station

Designed, fabricated and erected quickly, the West Burton Power Station is one of the first major projects to conform to the Eurocodes.



To meet increased energy requirements, EDF Energy has built a new 1,300MW Combined Cycle Gas Turbine (CCGT) power station at its West Burton site, near Retford, Nottinghamshire.

Work commenced on site in January 2008, with the main steelwork programme kicking off during the middle of 2009. Many of the larger new structures on the site are steel framed buildings, including the three turbine halls.

These halls are huge and each one has an identical portal frame that is 32m high to the eaves, and measures 82m long x 35m wide.

In order to give the turbine halls the necessary column free interiors a series of 4.5m deep x 35m wide trusses span them.

As the trusses were too long to lift or transport as one piece, they were brought to site in three equal sections. Two of these were bolted together on site, then this piece along with the remaining third section was lifted into place in a tandem lift involving two mobile cranes.

Supporting the roof trusses is a series of substantial fabricated plate girder columns spaced at 12.5m and 15m intervals. Brought



to site in two 32m lengths, these columns measure 1800mm x 600mm at the base, and were assembled on the deck before being erected as one 33t piece.

Because the columns support an internal high-level crane, the upper sections are smaller (weighing 9t instead of 24t) and have an L-shaped indent to accept the crane's track.

"One of our main challenges was working around the numerous other trades on this busy site," says Barry Craig, Fisher Engineering Project Manager. "We had to leave some large openings in the frames so the large power equipment could be installed."

Each of the turbine halls has two internal floors which were installed once the main concreting programme was completed.

Fisher eventually installed 12,000m² of open mesh flooring for the entire project.

Sequencing of the overall works also had to take into account the turbine hall's height. Consequently the cladding could not begin until the floors had been completed, as they added the necessary stiffness and bracing to the structures.

Running parallel to each of the turbine halls is a pipe rack which connects each hall to its own substation. Each rack is identical and has multiple levels of steelwork for its associated pipework. Fisher installed 1,400t of steelwork for these structures, "which equates to more than 6,000 lifts as all of the sections were small pieces," says Mr Craig.

John Jenkins, Kier Construction Project Manager says: "The steelwork programme ran to schedule with the required high degree of accuracy. All of the necessary milestones were met during the construction of the turbine halls, which was highly important as so many trades were involved."

A good example of practical and economical use of heavy steelwork, say the judges in summary.

FACT FILE

Architect: EDF Energy

Structural engineer: EDF Energy

Steelwork contractor: Fisher Engineering Ltd

(Severfield-Rowen Plc)

Main contractor: Kier Construction Ltd

Client: EDF Energy

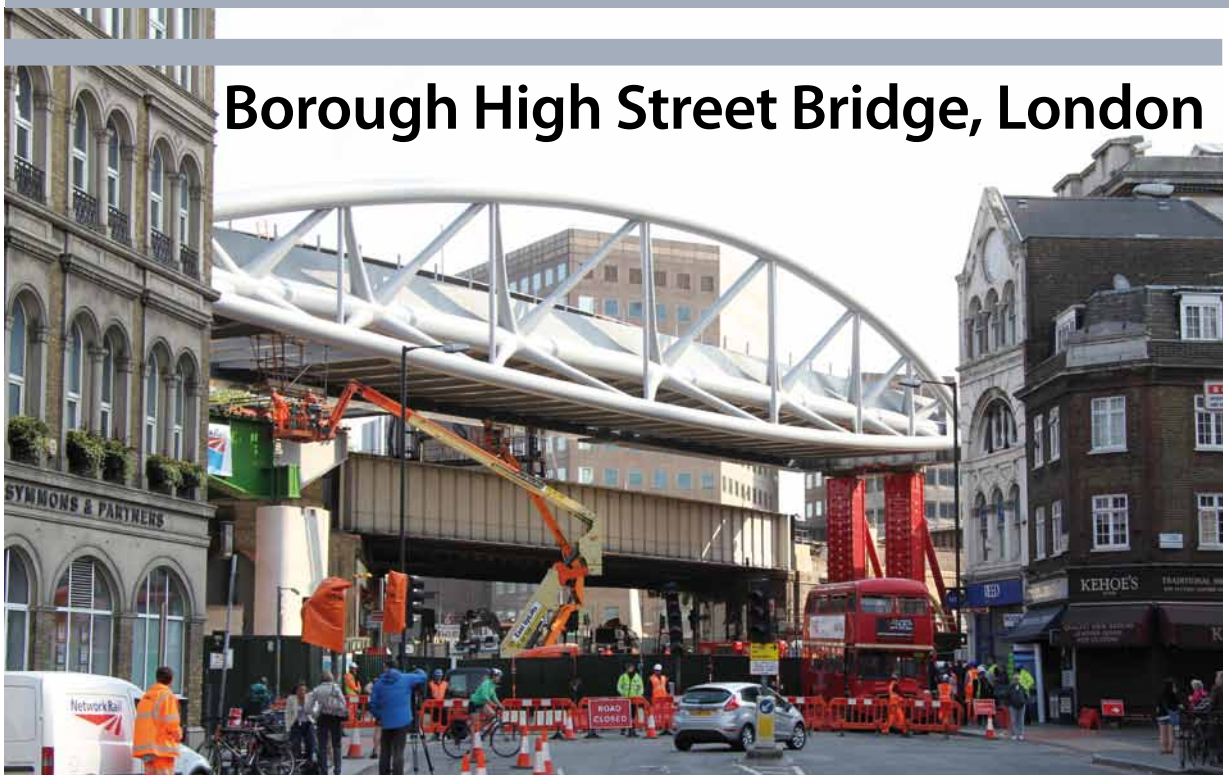




Borough High Street Bridge, London

FACT FILE

Architect: Jestico + Whiles
Structural engineer: Atkins
Steelwork contractor: Watson Steel Structures Ltd (Severfield-Rowen Plc)
Main contractor: Skanska Civil Engineering Ltd
Client: Network Rail



Substantial additional rail capacity is accommodated on the Borough High Street Bridge, a structure that had to be pre-assembled and then launched over a busy London market and streets.

Forming an integral part of the Thameslink project, an initiative which will expand the existing rail network in London and the

south east, the new Borough High Street Bridge allows a notorious bottleneck to be expanded from two tracks to four.

The project is located above the busy Borough Market, close to London Bridge Station, and consists of three main steelwork parts: a 128m long western approach viaduct, a 50m long viaduct to the east and the main 70m long Borough High Street Bridge.

The two approach viaducts consist of a standard through-deck plate girder design with beams spanning 7.6m between deep edge girders.

Incorporating 850t of structural steelwork the main bridge has a trapezoidal girder construction from large diameter tubes with tapering ends.

The north elevation of the bridge is largely obscured due to its closeness to an existing railway bridge; therefore the girder on this elevation is a simple 6m deep economic plate girder.

The main tubes are up to 1,200mm diameter with 50mm wall thickness, and due to their size many of the major joints had to be butt welded on site.

"The client wanted an aesthetic looking structure and also one that incorporated a tubular truss, which was one of the main reasons for choosing steel," explains Mike Richardson, Atkins Project Engineer.

The bottom chords have significant torsional stiffness, ensuring continuity between the cross girders and the internal tubular steel members of the truss.

The entire girder was first assembled in Watson Steel Structures' fabrication workshop to ensure an exact fit, before being dismantled and sent to site in sections weighing up to 65t each.

Mr Richardson says the main highlight of the project was the installation of the bridge. "Because of the confined nature of the site, the only way to install the bridge was to assemble offsite and then launch it into position, something that was easier to do with a lightweight steel structure."

The programme required the western approach viaduct to be completed first and this was then used as a working platform for the assembly of the main bridge.

Extensive temporary supports were required for this procedure as the bridge is up to 3m wider than the viaduct on which it was assembled.

"To recreate factory conditions for welding and painting we constructed a temporary tunnel. As each third of the bridge was assembled it was pushed through this structure which sheltered the joint for our high spec works," says Paul Hulme, Watson Steel Structures Project Manager.

When the bridge steelwork was completed and the concrete deck unit installed, the bridge was prepared for installation. The rear end of the bridge structure was supported on a slide track with Teflon pads, while the front end of the bridge was supported on hydraulic towers, which in turn rested on multi axle vehicles.

Over the Bank Holiday weekend in April 2011, the bridge was launched across Borough High Street at a speed of a few centimetres a minute and was then lowered down onto the bearings.

The technique of launching the main span from the viaduct itself was inspired, say the judges.





NEO Bankside, London



NEO Bankside is the first major residential scheme in the UK to feature an external steel bracing system.

FACT FILE

Architect: Rogers Stirk Harbour + Partners
Structural engineer: Waterman Structures Ltd
Steelwork contractor: Watson Steel Structures Ltd (Severfield-Rowen Plc)
Main contractor: Carillion
Client: GC Bankside LLP



Representing a considerable engineering challenge, the NEO Bankside development consists of four concrete framed residential pavilions each featuring a perimeter steel bracing system.

The systems serve three key purposes: to provide lateral and overall stability; to reduce the requirement for shear walls allowing greater internal flexibility, and to provide support for the winter garden elements at the prows of the buildings.

"The external bracing system allowed floorplate arrangements for the apartments to be reconfigured to respond to changing market requirements," says Marcello Marinoni, Waterman Structures Project Engineer.

Initially the design incorporated an internal perimeter bracing system, but this was reviewed and external bracing was chosen as it offered a simpler interface with the cladding.

Stability forces are transferred into the external perimeter bracing via nodes, which are arranged on a six storey interval vertically and on a sequenced interval horizontally.

The nodes transfer the lateral stability

forces into the bracing system. Lateral loads from the intermediate floors are transferred to the nodal floors by reinforced concrete walls arranged around the core.

Prefabricated spindle and node fin plate assemblies were delivered to site on 4.5m long steel stanchions that were then embedded within the primary concrete columns. Fabrication and site erection tolerances had to be very tightly controlled to ensure that the bracing elements would fit between the node fin plates, although some adjustments were possible via a counter threaded fork end connector.

The bracing sections taper at their ends and attach to the node fin plates via cast fork ends, with close tolerance pins of up to 100mm in diameter.

The colour of the external perimeter bracing was an important factor affecting the structural design, with implications to the range of thermal stresses and movements to which the system would be subjected.

The external diagrid bracing system provides gravity load support to the promontory winter gardens at each end of the pavilions by utilising a system of external hangers or struts at their apexes.

The offset of the bracing from the façade

means that a fire inside the apartment would never reach sufficient temperatures at the bracing members to require intumescent treatment; also, the system has been designed to remain stable even if, due to a catastrophic fire in one apartment, up to three nodes failed.

Site installation of the nodes was particularly challenging because of the extremely tight tolerances that were required. The accurate positioning was achieved by adapting a two stage concrete pour strategy which allowed the nodes to be fixed and held back securely to the partially complete concrete structure with temporary supports, while the second pour was carried out which then locked them finally in position.

"The use of exposed steelwork has helped us add delicacy and grace and humanise high density living," explains Graham Stirk, Project Architect. "The bracing systems were also a more cost effective solution and have now become selling points with buyers requesting nodal apartments."

Summing up, the judges say this project is outstanding in its rigour and attention to detail. Intelligently conceived, designed and beautifully built, it is clear that the whole team was immersed in every aspect.

**FACT FILE**

Architect: Foster + Partners
 Structural engineer: Buro Happold
 Steelwork contractor: Atlas Ward Structures Ltd (Severfield-Rowen Plc)
 Main contractor: Sir Robert McAlpine
 Client: McLaren



McLaren Production Centre, Woking

An automotive production building for McLaren had to be constructed within an extremely tight programme while adhering to some very stringent planning restrictions.

Located on a greenbelt site near Woking, a new production facility for the manufacture of the McLaren MP4-12C super sports car was completed in a tight 54 week programme.

Because of the location, tight planning restrictions on building height had to be adhered to, and this meant the two storey structure had to be sunk into the landscape. This sensitive design, which hides the facility from nearby public thoroughfares, was chosen as it integrates with the landscape and minimises its visual impact.

Early works involved the excavation of some 180,000m³ of soil (equivalent to nearly 70 Olympic sized swimming pools),

all of which was retained and later reused to landscape the site.

The buried portion of the facility is concrete while all of the above ground elements are steel framed, with more than 1,900t of structural steelwork fabricated, supplied and erected by Atlas Ward.

"Steelwork allowed us to achieve the long spans, while being a cost effective solution given the tight budget constraints," says Angus Palmer, Buro Happold Project Engineer. "Prefabrication also gave us the required rapid erection programme."

The steelwork was designed using double primary beams and columns, which allowed all of the services to be

hidden within the frame.

"By accommodating all of the building's services within this void we not only created a clean aesthetic space but we also built in flexibility," says Iwan Jones, Foster + Partners Project Architect.

One of the key aspects in the project's design is the simplicity and repetition. A cross grid of 18m, 21m, 21m and 18m was chosen in order to optimise the working aisle widths. These were then repeated on an 18m grid for 12 bays along the length of the building.

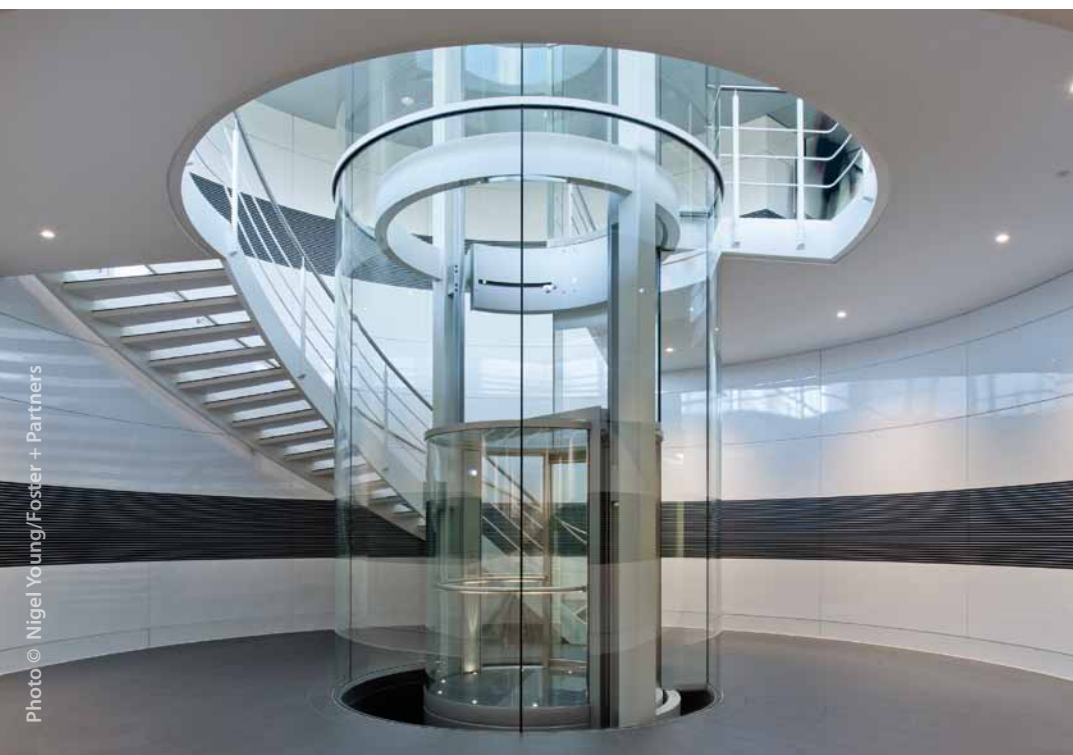
Primary, secondary and tertiary beams were then optimised for these spans and repeated throughout the building. The detailing of the key interfaces was carefully considered and a prototype of a typical bay was fabricated and installed. After approval of the prototype, fabrication commenced and the steel was erected on site as the lower concrete areas progressed simultaneously.

Although the bulk of the internal steel is standardised, the structure's perimeter steel elements and its entrance drums have been designed to match the appearance of the nearby McLaren Technology Centre. Detailed spiral stairs and viewing galleries have been added to enhance the visitor experience.

"The building's exposed beams didn't require fire protection and consequently they have a glossy painted finish creating the desired appearance," adds Mr Jones. "This also creates continuity with the nearby McLaren Technology Centre, which has a similar family of details."

Quite a few sustainability features were also incorporated into the project's design in order to meet the stringent planning requirements. Most notably, the flexibility of the steel frame will allow for future modifications, while the material contains a high proportion of recycled content and could be recycled again.

Summing up, the judges say this shows what can be achieved if sufficient care is taken over all aspects of a project.





Spanning the River Wensum, the Jarrold Bridge is supported by just two slender columns and appears to float above the water.

FACT FILE

Architect: Ramboll
Structural engineer: Ramboll
Steelwork contractor: S H Structures Ltd
Main contractor: R G Carter Ltd
Client: Jarrold (St James) Ltd

Jarrold Bridge, Norwich

Named after, and conceived by, local businessman Peter Jarrold, the 80m long Jarrold Bridge has instantly become a local landmark due to its unique form that appears to float over the site with little visible means of support.

"The concept was for a bridge that was slender, with sweeping curves derived from the unique features of the site and the imposed clearances," explains Stephen James, Ramboll Associate.

To achieve the design requirements the bridge is fixed by concrete abutments on each bank and propped (supported) by just two slender pin jointed stainless steel columns. The structure then acts as two mutually stabilising propped cantilevers.

The main structure is fabricated from weathering steel which was chosen primarily for aesthetic reasons. However, the material also brings a number of maintenance and environmental benefits to the project. It should require no painting during its 120 year lifetime, negating the need for any work taking place over the river and lessening the chances of spillages into the ecosystem.

Stainless steel top rails accentuate the curved form and a lightweight stainless steel mesh encloses the deck, allowing full visibility along and across the river. There are no applied finishes anywhere on these surfaces, further reducing maintenance requirements.

Structurally, the 90m long bridge consists of a curved primary box beam which carries cantilever supports for the decking. A closed

steel box beam represented the optimum form to resist the bending and torsion experienced by the deck and allowed the designers to manipulate the cross sectional shape to achieve the required aesthetic and structural form.

Steelwork contractor S H Structures fabricated the bridge steelwork in five sections for ease of transportation to site. Once delivered, the sections were set up on temporary trestles, with the two midspan and main span sections then welded together on site, which limited the work to be carried out over the water to just three lifts.

During fabrication a lot of emphasis was placed on offsite manufacture, and to this end site welds were minimised. S H Structures advised Ramboll throughout the design procedure about buildability of the bridge, and also designed a bolted splice

connection at midspan to remove any need for temporary works to be placed in the river during the erection process.

"Using a 1,000t capacity crane the bridge was quickly erected," says Dave Perry, S H Structures Contracts Manager. "We initially installed the two abutment sections and supported them on temporary works, then during the following day we installed the large central span."

A large proportion of the timber decking was installed prior to the lifts and although this made the craneage programme heavier, it minimised the amount of work needed to be done over water.

Summing up, the judges say this is an elegant architectural solution which is sensitive to its setting and topography. This beautifully crafted structure gives an impression of already being well established in its setting.





Garsington Opera Pavilion, Wormsley

A demountable temporary summer pavilion to accommodate the Garsington Opera has been erected and integrated into a historic landscape.

Providing 600 seats and six wheelchair positions, the Garsington Opera Pavilion is said to have taken its design from traditional Japanese pavilions by incorporating sliding screens and verandas.

Conceived as a lightweight structure positioned in a parkland setting, the design is planned to allow the auditorium, verandas and terraces to face towards a landscaped view. The stage, side stages and backstage storerooms are discreetly located to the rear.

The key elements for the project were that it had to be demountable and then erectable in three to four weeks, had to architecturally fit into the historic Wormsley Park landscape in rural Oxfordshire and finally, the structure needed to have world class acoustics.

"This is the first temporary acoustically designed structure to be built for opera," says Robin Snell, Snell Associates Project Architect. "The only material that satisfied all of these requirements was steel."

The steel frame supports stressed fabric walls shaped to enhance the room acoustics. A double layer fabric roof absorbs rain noise

like the flysheet of a tent.

The sides of the auditorium are enclosed with transparent PVC fabric sails to minimise draughts, while retaining views out over the surrounding gardens.

Using structural steelwork allowed the pavilion to be built using prefabricated sections, which minimised material waste, reduced the construction programme on site and allows the building to be assembled/disassembled quickly and economically.

The entire steel structure was prefabricated at Sheetfabs' factory and galvanized, providing a maintenance free, durable and corrosion resistant protective finish.

The need for the structure to be demountable led to an entirely bespoke structure being preferred which allowed the roof and column trusses to be designed with a minimum number of modules. This reduced the number of needed crane lifts once the steelwork was delivered to site.

"The tight programme for design and fabrication was the most challenging aspect of the project," comments Dave Mason, Sheetfabs Project Manager. Work on the

pavilion commenced in October 2010 and was completed in time for the Festival Season the following May.

Because the building is modular, it is also extremely flexible and can be easily reconfigured to suit various performances. The structure's sliding screens' track allows the outer line of the building envelope to be adjusted in a matter of minutes.

"Steelwork contributed in that it was relatively inexpensive to fabricate long span bespoke curved roof trusses and other details which allowed the architect's brief to be realised," says Mark Priestley, Unusual Rigging Project Manager. "Also, given the need to make the building capable of being dismantled, stored and re-erected, use of steel allowed us to 'palletise' the building by modularising it - other materials would not have been robust enough for this."

The brief was for a theatre with full facilities, yet to be demountable annually. Techniques used in 'instant' open air concert staging have been used and developed, with lightweight superstructure, and heavier floor and terraces, all with ingenious membrane cladding, say the judges in summary.

FACT FILE

Architect: Snell Associates

Structural engineer:

Momentum

Steelwork contractor:

Sheetfabs (Nottm) Ltd

Main contractor:

Unusual Rigging Ltd

Client: Garsington Opera



Energy from Waste Facility, La Collette, Jersey



FACT FILE

Architect: Hopkins Architects
 Executive architect: EPR Architects
 Structural engineer: Campbell Reith Hill LLP
 Steelwork contractor: Bourne Steel Ltd
 Main contractor: CSBC
 Client: States of Jersey Transport and Technical Services Department

Prominently located, the La Collette Energy from Waste Facility near St Helier on the island of Jersey replaces an old incinerator, and provides the Channel Island

The La Collette Energy from Waste Facility near St Helier on the island of Jersey replaces an old incinerator, and provides the Channel Island

with a reliable means of waste disposal for the next 25 years. It will also be able to produce 10MW of power, equivalent to 7% of the island's electricity usage.

The facility is accompanied by a bulky waste recycling plant, with the capacity to pre-treat up to 40,000t of household, commercial and industrial waste per year.

States of Jersey Director of Waste Strategy Projects, Will Gardiner, says the plant's development represents the end of a lengthy process, involving the consideration of numerous technological options.

Although the new plant sits adjacent to an existing power station, with which it will share a chimney, cooling water and other auxiliary services, the facility does not resemble a run of the mill industrial building. Because of its headland position the brief called for buildings of the highest architectural quality.

"Steel was chosen for the structure's main frame to fit the overall architectural

concept," explains Will Shaw, Campbell Reith Project Engineer. "And in order to get the required open internal spans, steel was the obvious option."

The exposed frame is formed by six large 36m long roof trusses supported on 37m high CHS columns, which are spaced at 16m intervals. At roof level the main trusses are tied together by a series of 16m long secondary trusses. Each gable end is formed with a box section goal post structure that stands approximately 800mm inside of the main perimeter column line.

Completing the steelwork concept, the columns are connected together with seven lines of bespoke fabricated cladding wind rails, which begin 6m above ground level and extend upwards to the roof at 4m intervals.

Delivering structural steelwork to a site in Jersey from mainland UK was logistically challenging. From Bourne's facility in Poole, Dorset, the steel was transported by road to Portsmouth and then shipped overnight by ferry. To navigate the narrow Jersey roads from the harbour to the site, all deliveries to site were made on Sundays,

when there is usually less traffic.

"We had an assembly yard on site where the tubular columns and roof trusses were welded, shotblasted and painted, before being lifted into place as complete sections," says Neil Senior, Bourne Steel Contracts Manager.

A further 400t of structural steelwork was erected to support the internal equipment and to provide maintenance walkways. The internal steelwork is completely independent from the main frame, as the two steel elements are not connected at any point.

The columns and roof trusses boldly articulate the building as part of a cost effective steel structure, sum up the judges.





Deptford Lounge, London

Featuring long spans and a design that required acoustic and thermal isolations between spaces, the Deptford Lounge is a vibrant community hub.

The Deptford Lounge combines a state of the art district library and a primary school, with both sharing resources and facilities.

Designed as a three storey steel framed building with reinforced concrete cores, the key structural challenges for this project were the construction issues associated with a busy inner city site.

The overall development comprises four buildings, with the shared school/library structure being the scheme's centrepiece. Maximising space, including the positioning of a games area on the roof of the Lounge Building, were important design requirements.

"Steel was the natural choice for a number of reasons," says Jon Bennett, Atkins Associate. "The need for flexible open spaces resulted in long spans, while twin 2.1m diameter sewers beneath the building meant it was essential to have a lightweight structure."

The sharing of facilities between the Deptford Lounge and the primary school maximises the resources available to both as well as the local community. The shared facilities include an interconnecting suite

of hall and assembly spaces; a rooftop ball court and changing facilities; a children's library; and design technology and music rooms.

The majority of spaces on the structure's first floor, as well as the ball court, will be set aside for school use in the day during term time, and offered up for community use at other times.

The combined complex has been designed with a 'moving wall' access method which works along the central core of the building. This allows different users to securely use modular parts of the structure at allotted times, ensuring the facilities being used by the school are completely closed off to the public, and vice versa.

The external cladding to the Lounge building comprises a twin layered system. The internal layer is a rendered external wall insulation system on blockwork, with the external layer consisting of tensioned cables supporting perforated copper sheets.

The perforated cladding system is a bespoke system designed to provide a striking appearance, while also meeting the technical requirements to control light and shading. The degree of perforation varies

across the façade to create interest in the aesthetics and to control the degree of light perforation for the classrooms, sustaining a high quality of natural light without the need for additional shading.

To the south façade the external perforated cladding system is offset from the primary steelwork frame by up to 2.5m. A series of secondary steelwork trusses span between compression struts which are braced back to the primary steel columns at the top and base of the cladding system.

There were a number of technical complexities in the structural design of the ball court which was designed to be structurally isolated from the adjacent offices. This was achieved through the use of double beams on the edges of the ball court, a structurally separated floor slab from the adjacent office spaces, and high-load rotational pot bearings.

"A detailed analysis of the ball court floor structure was undertaken to ascertain the natural frequency and prevent excessive vibrations to the library below," says Mr Bennett.

Steelwork is key to this remarkably successful building, say the judges.

FACT FILE

Architect: Pollard Thomas Edwards architects

Structural engineer:

Atkins

Steelwork contractor:

Conder Allslade Ltd

Main contractor:

Galliford Try

Client: London Borough of Lewisham



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RISE, Belfast

The largest piece of public art in Northern Ireland, the RISE sculpture threw up a number of challenges, not least an erection programme in the middle of a busy roundabout.

The RISE sculpture is viewed by thousands of pedestrians and motorists, some on their way to nearby George Best Belfast City Airport, everyday.

The unique design of this large steel sculpture consists of a pair of concentric spheres supported on tangential and traditional columns.

A lightweight structure was critical as the sculpture sits in the middle of a roundabout which has subways beneath it.

"Steel was the only option for this project," explains Sculptor Wolfgang Buttress. "The material gave us the required lightness, while designing with tubular steelwork produced soft simple angles."

An efficient design was a key requirement in order to guarantee an accurate erection programme. This resulted in over 4,000 steel components, connected with approximately 10,000 bolts, being



FACT FILE

Architect: Wolfgang Buttress
Structural engineer: Price & Myers
Steelwork contractor: M Hasson & Sons Ltd
Main contractor: Wolfgang Buttress
Client: Belfast City Council

distilled down to less than 60 individual types.

This standardisation allowed steelwork contractor M Hasson & Sons to focus on delivering the level of accuracy required to ensure that every member would adopt its correct position on the surface of each of the two spheres.

"We worked with the artist for six months to get the correct design for his sculpture," says Emmanuel Verkinderen, Price & Myers Project Engineer. "What we have is a unique design whereby the spheres are being supported by columns that are holding them in a way that resembles a 'cupped-hand'."

A host of prototype assemblies were prepared which allowed the erection team to start planning for a most complex programme. The trial assemblies provided invaluable insight into the actual behaviour of the geodesic frameworks during lifting and up-ending operations.

"The fabrication process was made easier and more cost effective by the fact that we designed an extremely simple node connection," adds Mr Verkinderen.

The erection process was always going to be an extremely challenging exercise,

due to the location in the middle of a busy roundabout and the required prolonged lifting operations.

While the geodesic form of each sphere was very stiff and stable when complete, a lot of care was needed to ensure that stability was maintained during the erection process.

A series of bespoke temporary works, lifting appliances and associated accessories were designed to minimise risks and to ensure intermediate and final stability, as well as steelwork accuracy.

Maximising the number of connections at ground level, catering for the highly non-linear nature of the partially completed structure, was an essential part of the design and the execution of the temporary works.

The final operation of transferring the weight of the inner sphere off the temporary works through 72 steel suspension cables and then onto the outer sphere brought the complex erection programme to a conclusion.

"It's a simple and elegant concept, harmonising art and engineering," says Mr Buttress.

In summary, the judges say this large sculpture is impressive for its geometric form and precision.



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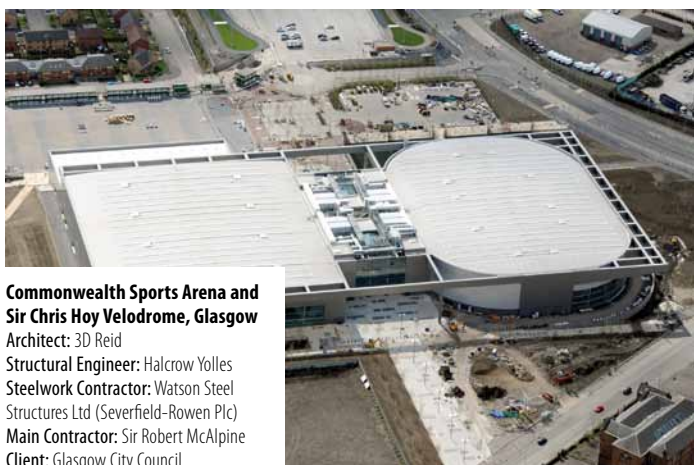
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Porth Teigr Bridge
Outer Lock Crossing, Cardiff Bay
 Architect: Studio Bednarski Ltd
 Structural Engineer: Flint & Neill Ltd
 Steelwork Contractor: Rowecord Engineering Ltd
 Main Contractor: Vinci Construction UK Ltd
 Client: Igloo Regeneration Ltd



Commonwealth Sports Arena and Sir Chris Hoy Velodrome, Glasgow
 Architect: 3D Reid
 Structural Engineer: Halcrow Yolles
 Steelwork Contractor: Watson Steel Structures Ltd (Severfield-Rowen Plc)
 Main Contractor: Sir Robert McAlpine
 Client: Glasgow City Council



Ticket Hall, Farringdon Station, London
 Architect: Atkins
 Structural Engineer: Atkins
 Steelwork Contractor: Bourne Construction Engineering Ltd
 Main Contractor: CoLOR JV
 Client: Network Rail

Bus Station, Slough
 Architect: Bblur Architecture
 Structural Engineer: Buro Happold
 Steelwork Contractor: S H Structures Ltd
 Main Contractor: McLaren Construction Ltd
 Client: Slough Borough Council



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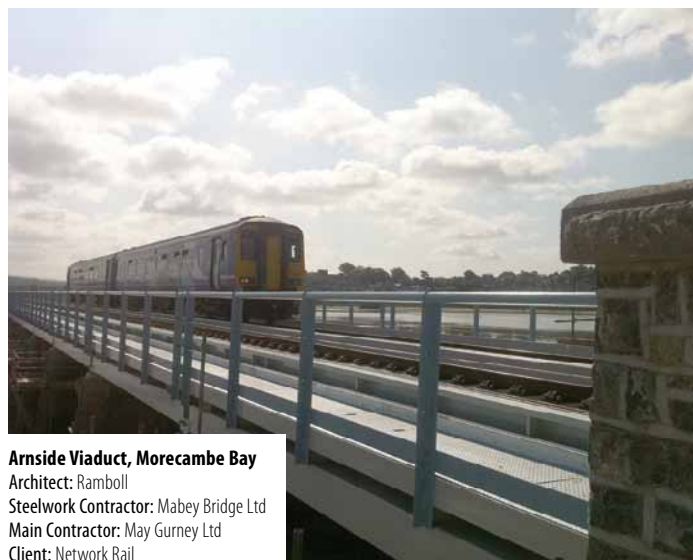
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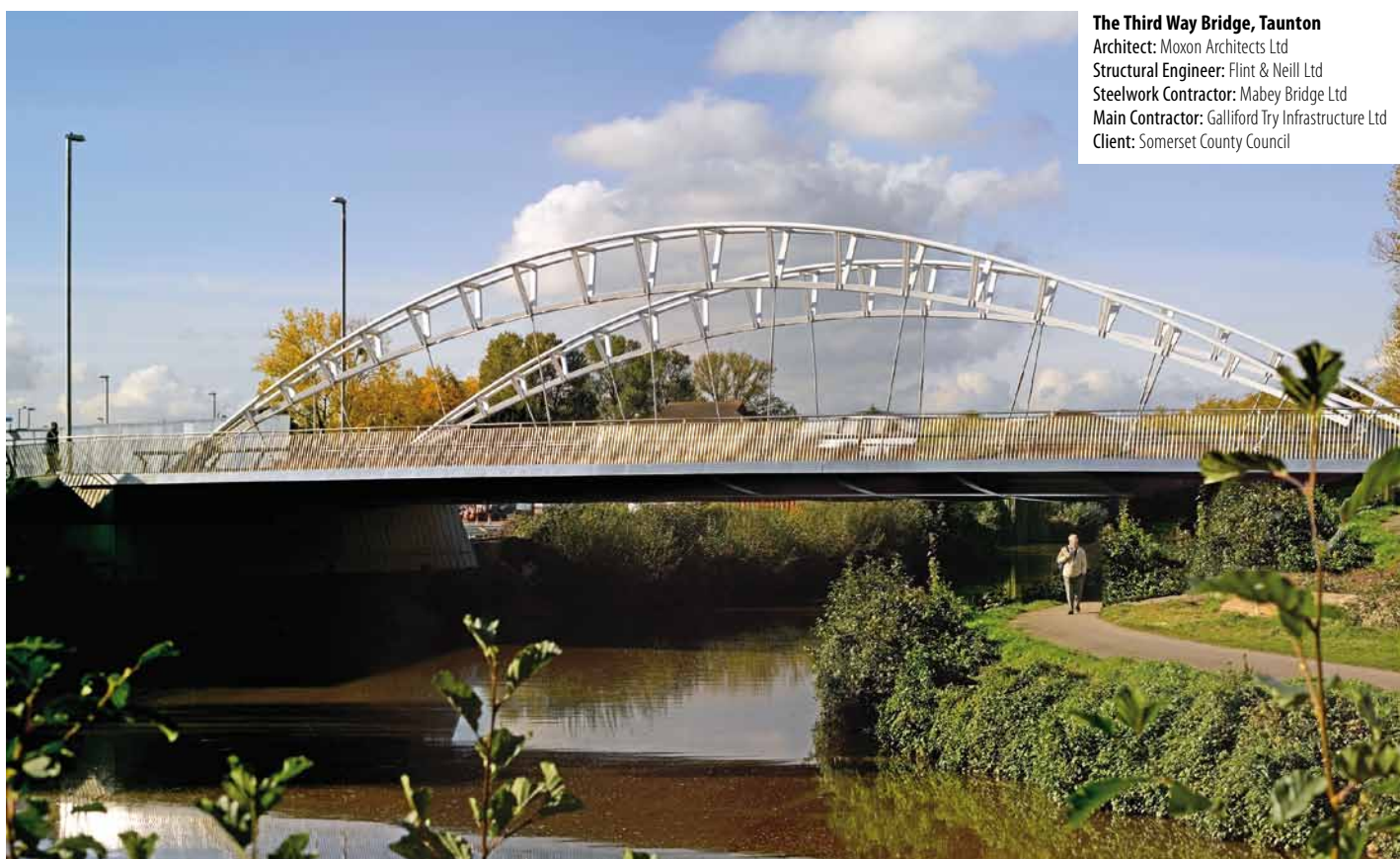
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St George's Grove, London

Architect: Hunters
 Structural Engineer: EOS Ltd
 Steelwork Contractor: EOS Ltd
 Main Contractor:
 Willmott Dixon Housing
 Client: Thames Valley Housing
 Association

**Arnside Viaduct, Morecambe Bay**

Architect: Ramboll
 Steelwork Contractor: Mabey Bridge Ltd
 Main Contractor: May Gurney Ltd
 Client: Network Rail

**The Third Way Bridge, Taunton**

Architect: Moxon Architects Ltd
 Structural Engineer: Flint & Neill Ltd
 Steelwork Contractor: Mabey Bridge Ltd
 Main Contractor: Galliford Try Infrastructure Ltd
 Client: Somerset County Council

**MediaCityUK**

Architect: The Fairhursts Design Group
 Structural Engineer: Jacobs Engineering
 Steelwork Contractor: William Hare Ltd
 Main Contractor: Lend Lease Construction (EAMA) Ltd
 Client: The Peel Group

**IQ Winnersh Footbridge**

Architect: Ramboll
 Steelwork Contractor: Littlehampton Welding Ltd
 Main Contractor: Littlehampton Welding Ltd
 Client: Segro

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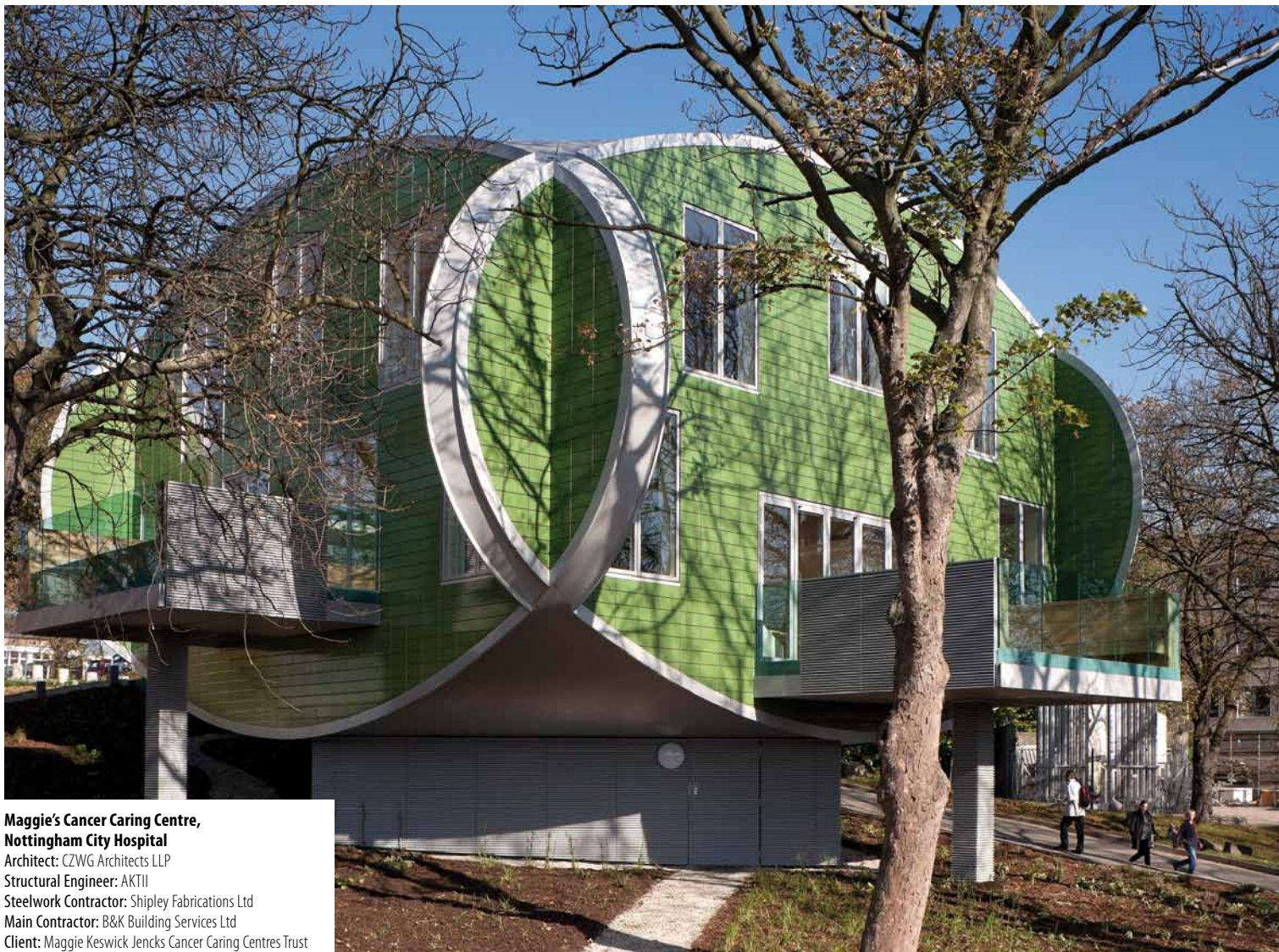
STRUCTURAL HOLLOW SECTIONS

**HOT
COLD**

50D BSEN 10210 S355J2H

50D BSEN 10219 S355J2H





**Maggie's Cancer Caring Centre,
Nottingham City Hospital**
 Architect: CZWG Architects LLP
 Structural Engineer: AKTII
 Steelwork Contractor: Shipley Fabrications Ltd
 Main Contractor: B&K Building Services Ltd
 Client: Maggie Keswick Jencks Cancer Caring Centres Trust

**Hot Finished
& Cold Formed
Structural
Hollow
Sections**

GRADE S355J2H

HOT

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The Balancing Barn, Thornton

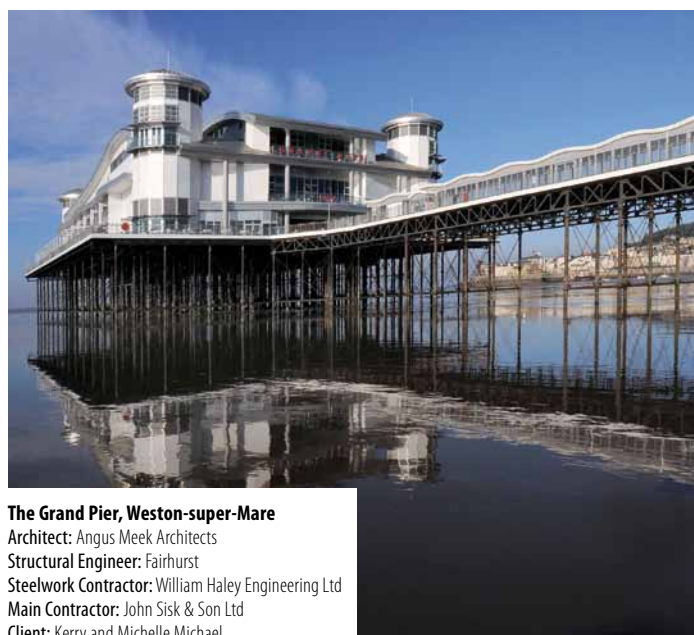
Architects: MDRV

Mole Architects

Structural Engineer: Jane Wernick Associates Ltd

Main Contractor: Seamans Building Ltd

Client: Living Architecture

**The Grand Pier, Weston-super-Mare**

Architect: Angus Meek Architects

Structural Engineer: Fairhurst

Steelwork Contractor: William Haley Engineering Ltd

Main Contractor: John Sisk & Son Ltd

Client: Kerry and Michelle Michael

The Royal Welsh College of Music and Drama, Cardiff

Architect: BFLS

Structural Engineer: Mott MacDonald

Steelwork Contractor: Morgans of Usk

Main Contractor: Willmott Dixon

Client: Royal Welsh College of Music and Drama



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Steelwork for 150-ft bridge is erected in one weekend



Above: The first three half-girders in position

Below: Three separate views of the full span of the bridge



Four hundred tons of structural steelwork for a 150-ft.-long steel bridge over Birmingham's Inner Ring Road were erected within 34 hours last autumn.

The bridge will form a link between two sections of the £5 million Birmingham Bull Ring project – the largest air-conditioned multi-level shopping centre in Europe, due for completion by late 1963.

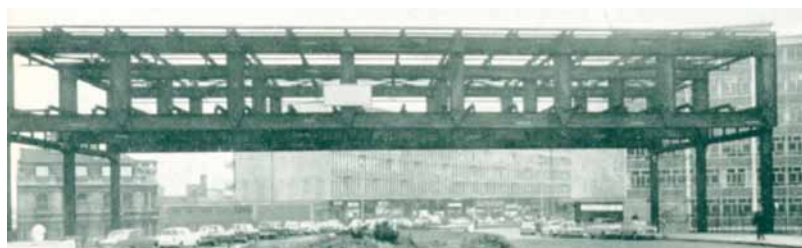
Erection was carried out by teams of steelwork erectors working in relays to a carefully timed hour-by-hour construction schedule. Work began at 8pm on Saturday 7 October. Working through the night, the steel erectors had the first main girder in position by 11pm and five other girders were erected in position by 6am on Monday 9 October – before the traffic began to flow again in the busy street.

The main bridge beams are formed by three Vierendeel steel girders, 150 ft long, 17 ft 9 in high and 3ft wide, each weighing over 100 tons. The girders were delivered in halves and hoisted into parallel positions, three above each carriageway of

the road. They are supported at either end by steel stanchions founded on reinforced concrete, each pair of half girders meeting at the centre line of the bridge on temporary trestles and supporting structures which were later removed to give the 150-ft clear span.

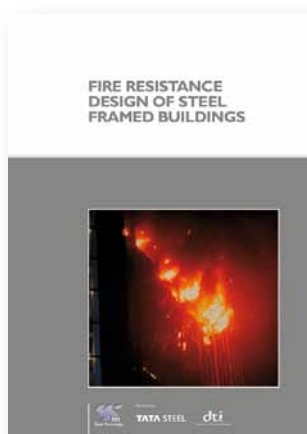
The inner ring road links the sites of the planned department store block adjoining the New Street Station and the main part of the multi-level shopping centre. The new bridge will eventually be built into the new buildings on either side of the inner ring road and will accommodate a covered shopping mall joining the two parts of the scheme. A similar steel frame for a second bridge in the Bull Ring project was built in April over the southern carriageway of the Ring Road at the Bull Ring end of the old Market Hall site.

The bridge was designed by the chief civil engineer's department of John Laing and Son Limited, in conjunction with Septimus Willis and Associates, Consulting Engineers.



Publications

Fire resistance design of steel framed buildings (P375)



Fire resistance is a key requirement for most steel framed buildings. Beams and slabs are required to provide a certain level of load bearing resistance in defined fire situations, slabs are also required to provide insulation and structural integrity in order to limit the spread of fire.

This new publication provides a general overview of the fire design requirements for steel and composite structures and provides;

- An overview of the fire design of steel and composite structures in accordance with the Eurocodes
- An introduction to the basis of design for fire situations and the criteria that need to be met.
- An explanation on how to determine the heat flux transferred to the members and how to determine their resistance at elevated temperatures.

This publication also notes that the Eurocodes cover both simple and advanced calculation models and gives in-depth guidance on the use of the simple model.

Full Price £50. (BCSA and SCI Member price £25.00)

Catalogue number	P375
ISBN	978-1-85942-203-8
Author	W I Simms
Pagination	104 pp
Format	A4
Publication date	2012




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AD 369

Steel bearing piles: Pile driving formulae and driving resistance

This Advisory Desk Note provides guidance on the use of pile driving formulae commonly encountered when considering the design and installation of steel bearing piles.

SCI publication P156 *Steel Bearing Piles Guide*, published in 1997, and the more recent P335 *H-pile Design Guide*, published in 2005, both present guidance on the installation and testing of steel bearing piles. In Section 7 and Section 8 of these respective publications, it is stated that 'the installation of steel piles is a specialist activity, calling for foundation engineering knowledge and experience ...'

The emphasis of these Sections is how to estimate the size and type of hammer required, or to estimate the driving resistance that needs to be overcome. Historically, making these estimates involved the use of a pile driving formula and, by way of an introduction to this topic, the Engineering News formula was mentioned in the SCI publications.

The Engineering News formula, and others of a similar nature, relate the movement of the pile resulting from a blow from the hammer at the end of driving to the static resistance or load-carrying capacity of the pile. It should be noted that when this was introduced in 1888, knowledge of soil mechanics and pile resistance was very much in its infancy and, even with the recommended safety factor of 6, the accuracy of this formula was poor.

Since then, better formulae such as that devised by Hiley have been developed but these still have limited accuracy, particularly when long piles are involved or when piles are driven into clay.

Clause 7.5.2.1 of BS 8004:1986 (now withdrawn) gives useful guidance. It states that: 'The Hiley formula is one of the more reliable [methods]'. However it advises that 'Driving formulae are not directly applicable to deposits such as saturated silt, mud, marl, clay and chalk; they should be used with caution in any soil if on re-driving after a period of rest the resistance has decreased' and it draws attention to the limited accuracy of even the better formulae. It suggests that 'If as a result of test loadings on a given site a correcting coefficient can be applied to the formula, the results should then be of reasonable reliability for that particular site'.

Similar advice is also found in clause 7.6.2.5 (2) of BS EN 1997-1, which replaces BS 8004; it states: 'If pile driving formulae are used to assess the ultimate compressive resistance of individual piles in a foundation, the validity of the formulae shall have been demonstrated by previous experimental evidence of acceptable performance in static load tests on the same type of pile, of similar length and cross-section, and in similar ground conditions.'

If sufficient supporting information on the pile-driving system is known (hammer properties,

efficiencies etc.), the soils under consideration are appropriate to the formula to be used, and test results are available for the pile/hammer/soil combination, then pile driving formulae may be considered. If the Hiley formula is used, care must be taken to quantify the various factors in the formula in order to maximise the accuracy of the calculation but it must be appreciated that the accuracy will still be limited.

In SCI's opinion, a pile-driving formula should not be used as a stand-alone solution. Where a formula is used, the values given by the chosen formula should be checked against calculations of end bearing and friction capacity, based on the soil conditions and properties, and/or the results of static test loads or dynamic pile tests.

References

Biddle, A.R., *Steel Bearing Piles Guide* (P156), SCI, 1997
Biddle, A.R., *H-pile Design Guide*, (P335), SCI, 2005
BS 8004:1986, *Code of practice for foundations*. BSI (Withdrawn)
BS EN 1997-1:2004 *Eurocode 7. Geotechnical design. General rules*. BSI.

Contact: **Ed Yandzio**
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Email: **advisory@steel-sci.com**

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Steel wire for the reinforcement of concrete products. Specification

BS 4483:2005

Steel fabric for the reinforcement of concrete. Specification

PD 6688-1-2:2007

Background paper to the UK National Annex to BS EN 1991-1-2

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Tel: 020 7747 8121 Email: gillian.mitchell@steelconstruction.org

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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.

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Adey Steel Ltd	01509 556677				●	●	●	●		●	●			●	●		●	Up to £2,000,000
Adstone Construction Ltd	01905 794561			●	●	●										✓		Up to £1,400,000
Advanced Fabrications Poyle Ltd	01753 531116				●		●	●	●	●	●				●			Up to £800,000
Alex Morton Contracts Ltd	028 9269 2436			●	●	●	●		●	●	●			●	●			Up to £400,000
Angle Ring Company Ltd	0121 557 7241												●					Up to £1,400,000
Apex Steel Structures Ltd	01268 660828				●		●			●	●							Up to £800,000
Arramax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●						Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●			Up to £800,000*
ASD Westok Ltd	0113 205 5270												●			✓		Up to £6,000,000
ASME Engineering Ltd	020 8966 7150				●					●	●			●	●	✓		Up to £800,000*
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✓	●	Above £6,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●							●				Up to £2,000,000
Austin-Divall Fabrications Ltd	01903 721950			●	●		●	●		●	●			●	●			Up to £200,000
B&B Group Ltd	01942 676770			●	●	●	●	●		●	●	●		●		✓		Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●				Up to £400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●			●					✓		Up to £1,400,000
Barnshaw Section Benders Ltd	01902 880848												●			✓		Up to £800,000
BHC Ltd	01555 840006	●	●	●	●	●	●				●	●		●	●			Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●		✓	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●			Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●		✓	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●			●	●	●	●	●	●	●			●	●	✓		Up to £3,000,000
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●	●			●	●	✓	●	Up to £2,000,000
Cauntan Engineering Ltd	01773 531111	●	●	●	●	●	●	●	●	●	●	●		●	●	✓	●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●		✓	●	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✓		Up to £6,000,000
Cordell Group Ltd	01642 452406	●			●	●	●	●	●	●	●					✓		Up to £3,000,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●			Up to £800,000
D H Structures Ltd	01785 246269				●		●				●			●				Up to £40,000
Discairn Project Services Ltd	01604 787276				●					●	●				●	✓		Up to £800,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●			●					✓		Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✓		Up to £2,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✓	●	Up to £6,000,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●					✓	●	Up to £3,000,000
Fisher Engineering Ltd	028 6638 8521		●	●	●	●	●	●	●	●	●	●				✓	●	Above £6,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●			●							Up to £3,000,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●					●			Up to £800,000
Graham Wood Structural Ltd	01903 755991		●	●	●	●	●	●	●	●	●	●		●			●	Up to £6,000,000
Grays Engineering (Contracts) Ltd	01375 372411				●	●		●		●	●				●			Up to £100,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●		●		✓		Up to £3,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●			●			●			●	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✓		Up to £2,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✓	●	Up to £2,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●				✓		Up to £2,000,000
Henry Smith (Constructional Engineers) Ltd	01606 592121			●	●	●	●	●										Up to £3,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●			Up to £3,000,000
Hillcrest Fabrications Ltd	01283 212720				●			●							●			Up to £400,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	SCM	Contract Value (1)

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	SCM	Contract Value (1)
Hills of Shoburness Ltd	01702 296321									●				●	●			Up to £1,400,000
J Robertson & Co Ltd	01255 672855									●	●				●			Up to £200,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●				Up to £6,000,000*
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✓	●	Up to £4,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●						●	Up to £2,000,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✓		Up to £3,000,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●			Up to £1,400,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	●	Above £6,000,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●			Up to £800,000
Maldon Marine Ltd	01621 859000				●	●		●	●	●					●			Up to £1,400,000
Mifflin Construction Ltd	01568 613311		●	●	●	●	●				●							Up to £3,000,000
Newbridge Engineering Ltd	01429 866722			●	●	●	●								●	✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112						●	●	●	●						✓		Up to £4,000,000
On Site Services (Gravesend) Ltd	01474 321552				●		●	●		●	●				●			Up to £200,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●			Up to £400,000
Paddy Wall & Sons	00 353 51 420 515			●	●	●	●	●	●	●	●							Up to £6,000,000
Painter Brothers Ltd	01432 374400								●		●				●	✓	●	Up to £6,000,000
Pencro Structural Engineering Ltd	028 9335 2886			●	●	●	●	●	●	●	●			●	●	✓		Up to £2,000,000
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●			Up to £800,000
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●			Up to £1,400,000
REIDsteel	01202 483333		●	●	●	●	●	●	●	●	●	●		●				Up to £6,000,000
Remnant Plant Ltd	01594 841160				●		●	●	●	●	●				●	✓		Up to £400,000
Rippin Ltd	01383 518610			●	●	●	●	●										Up to £1,400,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	●	Above £6,000,000
S H Structures Ltd	01977 681931							●	●	●	●					✓	●	Up to £3,000,000
Severfield-Rowen Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	●	Above £6,000,000
Shipley Fabrications Ltd	01400 251480			●	●	●	●		●	●	●			●	●			Up to £1,400,000
SIAC Butlers Steel Ltd	00 353 57 862 3305		●	●	●	●	●	●	●		●	●				✓	●	Above £6,000,000
SIAC Tetbury Steel Ltd	01666 502792			●	●	●	●		●		●	●		●	✓		●	Up to £2,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●								●			Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●			Up to £800,000
TEMA Engineering Ltd	029 2034 4556	●														✓		Up to £1,400,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●	●			●			Up to £200,000
Traditional Structures Ltd	01922 414172		●	●	●	●	●	●	●		●	●		●		✓	●	Up to £2,000,000
Tubecon	01226 345261						●	●	●	●				●	●	✓	●	Above £6,000,000*
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●			Up to £4,000,000
W I G Engineering Ltd	01869 320515				●					●					●			Up to £200,000
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	SCM	Contract Value (1)



Corporate Members

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

Company name	Tel	Company name	Tel
Balfour Beatty Utility Solutions Ltd	01332 661491	Roger Pope Associates	01752 263636
Griffiths & Armour	0151 236 5656	Sandberg LLP	020 7565 7000
Highways Agency	08457 504030	SUM Ltd	0113 242 7390
Kier Construction Ltd	01767 640111		



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	4 Steel producers	7 Safety systems	SCM Steel Construction Sustainability Charter
2 Computer software	5 Manufacturing equipment	8 Steel stockholders	● = Gold, ● = Silver, ● = Member
3 Design services	6 Protective systems	9 Structural fasteners	

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
AceCad Software Ltd	01332 545800	●									
Albion Sections Ltd	0121 553 1877	●									
Andrews Fasteners Ltd	0113 246 9992									●	
ArcelorMittal Distribution – Birkenhead	0151 647 4221								●		
ArcelorMittal Distribution – Bristol	01454 311442								●		
ArcelorMittal Distribution – South Wales	01633 627890								●		
ArcelorMittal Distribution – Scunthorpe	01724 810810								●		
ASD metal services	0113 254 0711									●	
Austin Trumanns Steel Ltd	0161 866 0266								●		
Ayrshire Metal Products (Daventry) Ltd	01327 300990	●									
BAPP Group Ltd	01226 383824									●	
Barnshaw Plate Bending Centre Ltd	0161 320 9696	●									
Barrett Steel Ltd	01274 682281								●		
BW Industries Ltd	01262 400088	●									

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
Cellbeam Ltd	01937 840600	●									
Cellshield Ltd	01937 840600								●		
CMC (UK) Ltd	029 2089 5260								●		
Composite Profiles UK Ltd	01202 659237	●									
Computer Services Consultants (UK) Ltd	0113 239 3000	●									
Cooper & Turner Ltd	0114 256 0057									●	
Cutmaster Machines UK Ltd	01226 707865					●					
Daver Steels Ltd	0114 261 1999	●									
Development Design Detailing Services Ltd	01204 396606			●							
Easi-edge Ltd	01777 870901								●		●
Fabsec Ltd	0845 094 2530	●									
FabTrol Systems UK Ltd	01274 590865	●									
Ficep (UK) Ltd	01924 223530					●					
FLI Structures	01452 722200	●									●



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	MB Moving bridges
PG Bridges made principally from plate girders	RF Bridge refurbishment
TW Bridges made principally from trusswork	AS Ancillary structures in steel associated with bridges, footbridges or sign gantries (eg grilles, purpose-made temporary works)
BA Bridges with stiffened complex platingwork (eg in decks, box girders or arch boxes)	QM Quality management certification to ISO 9001
CM Cable-supported bridges (eg cable-stayed or suspension) and other major structures (eg 100 metre span)	SCM Steel Construction Sustainability Charter (● = Gold, ● = Silver, ● = Member)

Notes

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

BCSA steelwork contractor member	Tel	FG	PG	TW	BA	CM	MB	RF	AS	QM	NHSS 19A 20	SCM	Contract Value ⁽¹⁾
B&B Bridges Ltd	01942 676770	●	●	●	●	●	●	●	●	✓			Up to £1,400,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	✓		✓	Up to £3,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●			●	●	✓		●	Up to £2,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	✓	✓	●	Above £6,000,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●		●	●	●	✓		✓	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●	●	●	●			●	●	✓		●	Up to £800,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	✓	✓	●	Above £6,000,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●		●	●	✓	✓	✓	Up to £4,000,000
Painter Brothers Ltd	01432 374400	●	●	●				●	●	✓		●	Up to £6,000,000
Remnant Plant Ltd	01594 841160	●	●	●				●	●	✓			Up to £400,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	✓	✓	●	Above £6,000,000
S H Structures Ltd	01977 681931	●		●	●	●			●	✓		✓	Up to £3,000,000
SIAC Butlers Steel Ltd	00 353 57 862 3305	●	●	●	●	●		●	●	✓		●	Above £6,000,000
Varley & Gulliver Ltd	0121 773 2441	●						●	●	✓		✓	Up to £4,000,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	✓	✓	●	Above £6,000,000
Non-BCSA member													
ABC Bridges Ltd	0845 0603222	●							●	✓			Up to £100,000
A G Brown Ltd	01592 630003	●						●	●	✓			Up to £400,000
Allerton Steel Ltd	01609 774471	●	●	●	●	●	●	●	●	✓			Up to £1,400,000
Cimolai Spa	01223 350876	●	●	●	●	●	●		●	✓			Above £6,000,000
Concrete & Timber Services Ltd	01484 606416	●	●	●		●	●		●	✓		●	Up to £800,000
Donyal Engineering Ltd	01207 270909	●						●	●	✓	✓	✓	Up to £1,400,000
Francis & Lewis International Ltd	01452 722200							●	●	✓		●	Up to £2,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●		●	●	✓			Up to £2,000,000
Hollandia BV	00 31 180 540540	●	●	●	●	●	●	●	●	✓			Above £6,000,000
Interserve Construction Ltd	0121 344 4888							●	●	✓			Above £6,000,000*
Interserve Construction Ltd	020 8311 5500	●	●	●	●		●	●	●	✓			Above £6,000,000*
Millar Callaghan Engineering Services Ltd	01294 217711	●						●	●	✓			Up to £800,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓			Up to £3,000,000
The Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	✓		●	Up to £2,000,000

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
Forward Protective Coatings Ltd	01623 748323						●				
Graitec UK Ltd	0844 543 888		●								
Hadley Rolled Products Ltd	0121 555 1342	●									●
Hempel UK Ltd	01633 874024						●				
Hi-Span Ltd	01953 603081	●									●
Highland Metals Ltd	01343 548855						●				
Hilti (GB) Ltd	0800 886100								●		
International Paint Ltd	0191 469 6111						●				●
Jack Tighe Ltd	01302 880360						●				
Jamestown Cladding and Profiling	00 353 45 434288	●									
Jotun Paints (Europe) Ltd	01724 400000						●				
Kaltenbach Ltd	01234 213201					●					
Kingspan Structural Products	01944 712000	●									●
Leighs Paints	01204 521771						●				●
Lindapter International	01274 521444								●		
Metsec plc	0121 601 6000	●									●
MSW	0115 946 2316	●									
National Tube Stockholders Ltd	01845 577440								●		
Northern Steel Decking Ltd	01909 550054	●									

Company name	Tel	1	2	3	4	5	6	7	8	9	SCM
John Parker & Sons Ltd	01227 783200								●	●	
Peddinghaus Corporation UK Ltd	01952 200377					●					
Peddinghaus Corporation UK Ltd	00 353 87 2577 884					●					
PPG Performance Coatings UK Ltd	01773 814520						●				
Prodeck-Fixing Ltd	01278 780586	●									
Rainham Steel Co Ltd	01708 522311								●		
Richard Lees Steel Decking Ltd	01335 300999	●									●
Structural Metal Decks Ltd	01202 718898	●									●
Studwelders Composite Floor Decks Ltd	01291 626048	●									
Tata Steel	01724 404040				●						
Tata Steel Distribution (UK & Ireland)	01902 484100								●		
Tata Steel Service Centres Ireland	028 9266 0747								●		
Tata Steel Service Centre Dublin	00 353 1 405 0300								●		
Tata Steel Tubes	01536 402121				●						
Tata Steel UK Panels & Profiles	0845 308 8330	●									
Tekla (UK) Ltd	0113 307 1200		●								
Tension Control Bolts Ltd	01948 667700						●		●		
Wedge Group Galvanizing Ltd	01909 486384						●				

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