



# Steel quality gets exposure

An exceptional stadium, cathedral-like warehouse, awe-inspiring sculpture and technically challenging office development all proudly demonstrated steel's versatility in construction at the 43rd annual Structural Steel Design Awards

## AWARDS RUBY KITCHING

The American Express Community Stadium, Brighton & Hove Albion's new football ground was one of four award-winning entries in this year's Structural Steel Design Awards, which were held at Kings Place, London earlier this month.

The three other new structures that the judges felt equally worthy to stand alongside the iconic sports arena were Marks & Spencer Distribution Facility in Bradford; Cannon Place, London; and Antony Gormley's *Exposure* sculpture.

Five structures picked up Commendations: The St Botolph Building, London; ExCeL Phase 2; River Suir Bridge, Waterford; The Rose Bowl, Southampton; and The Hauser Forum, Cambridge, while Certificates of Merit went to the New Cross Gate Flyover, East London Line and the 2010 Festival of Speed Sculpture, Goodwood.

The awards, now into their 43rd year recognise the excellence achievable in structural and architectural design with the use of steel. Judges selected the 11 Award winning entries from a shortlist of 18, all of which scored highly in efficiency, cost effectiveness, aesthetics, sustainability and innovation.

Hero status was applied to each project for very different reasons: Brighton & Hove Albion's stadium was praised for being a large, efficient structure, which managed to sit elegantly and sympathetically in its rural surroundings, while the Marks & Spencer warehouse

demonstrated functionality at its finest, pushing the boundaries of column slenderness and lightweight construction.

The offices at Cannon Place displayed the sort of structural acrobatics possible only with steel when a development has only four main support locations, requiring the eight-storey development to hop, skip and jump across rail lines, an operational station and tube tunnels.

Antony Gormley's sculpture of a crouching man, entitled *Exposure*, is one of the most dynamic examples of modern craftsmanship combined with precision geometry and machine-accurate cutting.

At the awards ceremony, chairman of the judging panel and former director of British Standards David Lazenby said: "The skill, imagination and determination of these project teams is remarkable, at a time when the steelwork industry has inevitably been affected by the current economic climate.

"Technical boundaries have been extended on some schemes using the latest codes and technologies, thus providing new benchmarks for the future. All the teams can be proud of the outcomes, which are really praiseworthy, and the judges have been heartened by them."

The judging panel consisted of Gerry Hayter, Highways Agency; Martin Manning, Arup Fellow; architect Bill Taylor, Oliver Tyler, Wilkinson Eyre Architects and Joe Locke representing the steelwork contracting community.



**The four winning teams represented by project team leaders from the structural engineer, client, architect, steelwork contractor and main contractor (from top): Brighton & Hove Albion Football Club's American Express Community Stadium; Marks & Spencer warehouse, Bradford; Cannon Place, London; Exposure, Netherlands. They were joined by host Susanna Reid, BCSA president Jack Sanderson and Tata Steel Europe chief commercial officer Dr Henrik Adam**



# Steel innovation for rail and retail

Two projects used ingenuity and innovation to give a new twist to an existing development in London and a traditional structure in Bradford

## AWARDS RUBY KITCHING

<b>Project</b> Cannon Place
<b>Client</b> Hines
<b>Architect</b> Foggo Associates
<b>Main contractor</b> Laing O'Rourke
<b>Structural engineer</b> Foggo Associates
<b>Steelwork contractor</b> Watson Steel Structures

This "air-rights" office development in the City of London boasts some of the finest functional and aesthetic designs for contemporary steel construction in the UK. It is the sort of project which is relished by engineers who consider building on busy city centre sites – over an operating mainline railway station and century-old Tube tunnels – tasty fodder.

Cannon Place was completed earlier this year and involved demolishing an existing 1960s 15-storey office block down to first floor slab before building a new, more spacious steel-framed eight-storey building.

The rectangular site measures 67.5 m long on the north and south elevations and 87 m long on the east and west elevations. The central block is 67.5 m wide by 45 m long and supported at its corners by four 12 m x 12 m square steel-framed cores. Cores sit on a mixture of new and reused piles. Floors are of composite construction and are supported by 21 m long Fabsec beams which can accommodate building services.

The real ingenuity in Cannon

Place lies in the design and construction of the two 67.5 m by 21 m blocks north and south of the central block which over-sail rail tracks. The north and south block's facades are made up of storey-high trusses which pick up the Fabsec floor beam loads and transfer them to fabricated box section X frames along the east and west facades. The X frames are, in turn, supported by composite steel structures below the cores. Fabrication of the X frames was carried out using 3D laser equipment and specially designed jigs to ensure a high level of accuracy, since they had to be site-bolted using exposed pinned connections with just 2 mm clearance. "Only steel would have allowed us to build to these sorts of tolerances – the building was built to precision like a piece of machinery," recalls business development manager Peter Miller for steelwork contractor Watson Steel.

Tube tunnels below these cantilevering blocks could not be loaded, so the north and south blocks could not be propped during construction. The solution was to connect the bottom boom of the façade truss back to strand jacks located at roof level of the completed central block.

"But as the blocks got higher and higher, they would deflect more and more due to their own weight. So we had to constantly adjust the cantilever to maintain 'perfect geometry' and take out the effect of gravity," he continues.

The geometry of the cantilever structure was closely monitored and the strand jacks adjusted to maintain its theoretical shape

while construction continued on the north and south blocks. When these were completed, the strand jacks were adjusted to transfer load back to the central block and create the final load case where the weight of the north and south blocks would balance each other out. This nail-biting process was precision planned and monitored to ensure successful load transfer.

Monitoring of the structure continued 12 weeks after load transfer and final readings showed that the level of the bottom boom of the truss was only millimetres away from its predicted final position and within the set tolerance.



The X frames were made using 3D laser equipment and specially designed jigs to ensure a high level of accuracy



The north and south blocks of Cannon Place cantilever over rail lines and transfer load to the X frames

## Project Marks & Spencer Distribution Facility, ProLogis Park, Bradford

Client ProLogis Developments

Architect Stephen George and Partners

Main contractor Winvic Construction

Structural engineer BWB Consulting

Steelwork contractor Barrett Steel Buildings

Warehouse design seldom deviates from the tried and tested model of the humble portal-framed shed. Unless, that is, the shed is a colossal 512 m long and 176 m wide and has no internal crossbracing. Opened in July 2010 and raising the benchmark in industrial design is the ProLogis Park Marks & Spencer warehouse in Bradford.

Although the span could easily be achieved using seven monopitched sections to make up each rafter, there was significant concern that the curve of the roof would be so shallow at the apex that ponding could occur. To limit this, rafters were pre-cambered to reduce deflection from the weight of the cladding or from snow or rain. Further design tweaks were also required in the purlins to ensure they did not twist along their length.

It was soon realised that an exceptional level of quality control would be required, especially when it came to locating purlins on rafters. In fact, each purlin would need to be pitched at the precise angle and height required along the rafter for the entire length of the building to achieve a smooth roof cladding profile. This was achieved by adjusting the



Erection of this Marks & Spencer warehouse in Bradford used 3,000 tonnes of steel and took just 12 weeks



The cladding material on the warehouse roof includes a concealed drainage channel

cleat detail between the purlin and rafter and resulted in more than 50 different details, some differing by just a few millimetres.

With so many variations and a tight programme, extra care was taken to label each purlin cleat with a unique reference number, which was also etched onto rafters in the factory.

Each rafter was delivered to the production line with its corresponding set of purlin cleats allowing the plater/welders to fabricate the rafters with zero error. The output rate was 300 tonnes of error-free fabrication each week during erection.

The frame was clad with 178 m long sheets of CA Group River Therm roofing material. The material is profiled to include a concealed drainage channel to divert water away from the roof and into the gutter.

"It was pretty spectacular seeing the single sheets of cladding rolled out across the entire span of the roof," says Dave Ward, managing director for main contractor Winvic Construction. "But the important technical aspect was to make sure the slope of the roof was maintained, even though it appeared to be virtually flat."

To maximise internal space, client Marks & Spencer specified that internal cross-bracing would not be allowed. Instead bracing elements had to be designed into the roof and walls, avoiding clashes with windows, doors and office spaces. "Steel is perfect for this type of building which requires long, clear spans and speedy construction," adds Mr Ward. Erection started in July 2009 and the main shed was in place in just 12 weeks.

# Steel pushes the boundaries

Artists and architects alike have demonstrated the benefits of working with steel and highlight just how flexible it can be

## AWARDS RUBY KITCHING

<b>Project</b> Exposure
<b>Client</b> Municipality of Lelystad
<b>Artist</b> Antony Gormley
<b>Main contractor</b> Had-Fab
<b>Structural engineer</b> Haskoning Nederland BV
<b>Steelwork contractor</b> Had-Fab

Every so often an opportunity comes up to demonstrate just how far engineering design, fabrication and construction techniques can go. In the case of artist Antony Gormley's *Exposure* – a 25.6 m tall sculpture of a person crouching – it is 3D design and precision cutting that have enabled this complex and unique structure to be built.

Gormley – well known for his *Angel of the North* sculpture in Gateshead, England – completed *Exposure* in 2010 in Lelystad, The Netherlands for a competition. The 60-tonne sculpture, intended to be a new landmark for the area, is made up entirely of 5,000 machine-cut steel angle profiles of varying lengths and sizes. Angle sizes range from 60 mm x 60 mm to 200 mm x 200 mm steel sections.

### Computer artistry

Information from a computer model fed directly into the steelwork contractor's workshop because paper drawings were not suitable. But, being a totally unconventional form, the structure also required significant skilled workmanship – particularly in welding the seemingly chaotic node points, where up to 29 angle sections had to be located, bolted and welded in place. Gormley initially produced a plaster of Paris model of the sculpture, which was distilled



Artist Antony Gormley's sculpture of a crouching man is modelled on himself and inspired by transmission tower frames

through surveying and computer analysis into a wire model before undergoing structural analysis.

The detailing process took about 12 months to complete; computer software in the fabrication workshop helped determine the angles at which each member had to be cut and aided dimensional checks. Some 32,000 holes had to be punched or drilled in the angle profiles prior to connection – a measure of the labour intensity required. In addition, the accuracy with which the angle sections had to be cut to fit onto a node required complex machine cutting. To ensure a high level of quality control, the steelwork contractor built a new jig for the job and bolted and welded all node connections on site near Edinburgh, before shipping them to The Netherlands.

"We usually manufacture pylons and substations where every element has a square end and simple connections," admits Had-Fab managing director Simon Harrison. "But we worked on *Exposure* for five years and it became a challenge we didn't want to put down."

Initially, nodes were created in the yard, welded, then galvanized, but so confident was the steelwork contractor when it had built the first half of the sculpture,

that the second half was galvanized before being welded.

"Mr Gormley wanted angles welded at nodes. We were sometimes welding on welds and had to sequence the nodes very carefully," recalls Mr Harrison.

*Exposure* is made up of 547 nodes, of which the most complex, the heart node, weighs 280 kg. Construction took just seven weeks, requiring a laptop with the wire model of the structure, four steel erectors and mobile cranes.



The stadium's roof trusses were pre-assembled on the ground before being craned into place

<b>Project</b> American Express Community Stadium, Brighton
<b>Client</b> Brighton & Hove Albion Football Club
<b>Architect</b> KSS
<b>Main contractor</b> Buckingham Group Contracting
<b>Structural engineer</b> SKM (Europe)
<b>Steelwork contractor</b> Watson Steel Structures

Mimicking the undulations of the South Downs in East Sussex, Brighton & Hove Albion football club's new 22,500-seat stadium, featuring an elegant lightweight roof with impressive spans, is an astounding feat of quality engineering.

Completed in July 2010, the stadium roof uses just 4,200 tonnes of structural steelwork, equating to a roof weight of just 101 kg/sq m – said to be a new industry benchmark for this type of structure. The four grandstands making up the stadium are steel-framed structures, while the terraces use steel rakers and precast concrete units.

Much less conventional are the pair of steel arched trusses that support the roof on the eastern and western sides. The 43 m-wide eastern side and 55 m-wide western side are supported by arched and leaning 'Toblerone'-shaped trusses, each 170 m long and weighing some 350 tonnes. The smaller northern and southern ends of the roof are more conventional steel cantilever structures. All four sides are interconnected and

incorporate over 1,000 sliding bolted connections to enable the roof to continually flex during the life of the structure.

Each 'Toblerone'-arched roof truss is leaning outwards and, therefore, has a natural tendency to deflect outwards and downwards, which displaces the primary rafters in the same directions. The lateral movement of the rafters is restrained by a catenary member in the plane of the roof, which runs between the rafters, outside the line of the arched truss and transfers the tension back to bracing members and foundations. To prevent the lateral loads being transferred into the terrace, the rafters are supported by double-pinned tubular struts.

The 20 MN thrust at the ends of each roof truss are transferred to the permanent concrete thrust walls by bearings, each of which weighs 7 tonnes, and engineered to cater for rotation of the trusses as they flex. Structural engineer SKM's technical director Nick Ling says, "The key to the design of this stadium was to find ways of simplifying the structural form while maintaining the

strong architectural intent. We avoided major transfer structures except in critical areas, where we used the steel structure expressively to allow elements to be incorporated into the internal spaces."

Erection involved pre-assembling the structure on the ground and then craning it into place to minimise temporary works, while ensuring the temporary stresses induced within the lightweight roof did not exceed permissible limits. The long arched roof trusses were delivered to site and assembled into three sub-sections, each weighing 120 tonnes. These were then lifted onto a pair of 20 m-high temporary trestles located at third points on the concrete terracing.

Only when the entire roof structure was complete could the temporary trestles be de-jacked and removed, allowing thrust blocks to take the load. This was carefully controlled, with each stage of the depropping process monitored against predicted loads and movements.

### THE 2012 AWARDS

To find out more about next year's Structural Steel Design Awards go to [www.steelconstruction.org](http://www.steelconstruction.org).

Entries for the 2012 awards can now be submitted for projects completed and ready for occupation or use during 2010/11. Previous entries are not eligible. The awards aim to celebrate excellence in steel construction, particularly in its potential for efficiency, cost effectiveness, aesthetics and innovation in the UK and the Republic of Ireland. Closing date: 2 December 2011.



# Structurally sound

Innovative use of steel helped these complex and challenging projects to stand out

## COMMENDATIONS RUBY KITCHING

- Project** The Rose Bowl
- Client** The Rose Bowl
- Architects** The Miller Partnership; EPR Architects
- Main contractor** Andrew Scott
- Structural engineer** Ian Black Consulting
- Steelwork contractor** Rowecord Engineering

Home to Hampshire Cricket Club, the Rose Bowl has recently acquired 5,000 extra seats to take the capacity of the ground to 25,000, following the construction of two new stands last year.

The main features of these stands, which flank and complement the existing iconic main pavilion, are the sickle-shaped steel canopy members made from standard beam sections and steel plate.

“The sickle element was chosen to reflect the semi-rural site occupied by the Rose Bowl,” explains Miller Partnership partner Alan Cadger. “However, it isn’t a bolt-on piece of decoration – it is structural and creates an organic framework for the facilities to fit underneath.”

The sickle members form the main support elements for the roof canopy and continue down to the ground along the back of the stands, acting as part rafter and part column. Each stand is made up of a two-storey building, terraces plus the canopy.

Architectural requirements deemed that the sickle member should appear independent of the two-storey building. Vertical bracing was only possible longitudinally in the line of columns mid-span of the terrace rakers, and between the sickle columns to the rear of the



building. No vertical bracing was permitted radially, or in the walls of the ‘back of house structure’ due to the numerous openings and glazed areas.

Three-dimensional modelling software was used to analyse the entire structure and determine a stability system which satisfied these requirements.

Much collaboration and coordination was required between members of the design team to achieve a simple frame solution and to avoid the need for significant moment connections.



**The Rose Bowl's new stands can be identified by the sickle shaped roof canopy support members, formed from universal beam sections and steel plate**

- Project** The Hauser Forum
- Client** Turnstone Estates
- Architect** Wilkinson Eyre Architects
- Main contractor** Willmott Dixon
- Structural engineer** Mott MacDonald

The Hauser Forum is a mixed-use development at Cambridge University. It is made up of the Broers Building office block and the Cambridge Enterprise Building (CEB). The structures consist of a high volume of exposed steelwork and, within the CEB, a double-height, fully glazed café, which cantilevers 11 m over water.

Meeting vibration limits, for occupant comfort and deflection limitations for the proposed curtain walling system, was a challenge – as was construction of the cantilevering café. The cantilever was achieved by using large steel trusses with Macalloy tension rods for diagonal members.

The cantilever was erected on temporary props with a pre-camber of 35 mm to counter overall dead load movements and to leave it with an aesthetically pleasing slight upward camber. Once the floor slab had been poured, the Macalloy rods in each elevation were stressed to lift the structure off its temporary seating. Props could then be removed. The final measured tension in the rods was within 4 per cent of predicted values.

Construction tolerances had to be considered carefully in the cantilever prior to curtain wall installation. Since the building had to be made watertight before it was fully loaded to allow follow on trades to work, ballast had to be applied to the cantilever to mimic final load criteria to prevent damage to the glazing.

“The trick was to reconcile how we wanted to build the structure – to put the cladding on last and how the others wanted to build it – putting the cladding on first to make it watertight,” says Mott MacDonald associate Steve Buckley.

**The café cantilevers 11 m from the main building and had to be built with a pre-camber of 35 mm to counter downward deflection**

- Project** St Botolph Building
- Client** Minerva
- Architect** Grimshaw Architects LLP
- Main contractor** Skanska Construction UK
- Structural engineer** Ove Arup & Partners
- Steelwork contractors** Severfield-Reeve Structures; CMF

This City of London office building has just 13 floors but has been designed and built with the grandeur and attention to detail expected from some of the landmark skyscrapers that occupy this part of the capital.

Long spans, flexible, uninterrupted space and a keenness to expose the structure led to steel being the obvious choice of material for the St Botolph Building. Close working relationships between the design team and steelwork contractors meant that off-site detailing was also maximised, and on-site operations such as drilling were almost entirely omitted.

Main floor construction consists of a 690 mm deep fabricated beam of varying web and flange thickness to suit loads and spans of up to 16.5 m. A large proportion of the steelwork in the building is visible, especially in the central passenger lift core where very tight construction and positional tolerances had to be achieved under four separate design packages; primary steel, architectural steelwork, cladding and lifts.

“All the steelwork [in the central core] was architectural, so we put a lot of time and effort in to make sure each [exposed] single pin connection worked within its tight tolerances – there was very little scope for adjustment,” says Severfield-Reeve Structures deputy managing director Jim Graham.

Innovative use of steel extended to the temporary works also. Temporary steel assemblies built on the eighth floor transferred the load carried by four tower cranes directly into the superstructure. This allowed the lower crane mast sections to be removed, so that completion and fit-out of the floors below could commence early.



- Project** ExCeL Phase 2
- Client** ExCeL London
- Architect** Grimshaw Architects LLP
- Main contractor** Sir Robert McAlpine
- Structural engineer** McAlpine Design Group
- Steelwork contractor** Severfield-Reeve Structures

Conference and exhibition centre ExCeL 2 is an extension to the original building creating 92,900 sq m of flexible space in London’s Docklands. It was constructed in 22 months and just ahead of *X Factor* auditions, which it was prebooked to host. The halls boast clear spans of 87 m with a similar structural composition to the original building, mast assisted trusses.

This skeleton was erected in just four months and protected from the elements just six weeks later. The original structure has been improved upon by placing groups of masts more visibly in the centre of the hall rather than at the



**Anti-clockwise from top: at the St Botolph Building, tight construction tolerances for the scenic lifts had to be met across four different design packages; at ExCeL phase 2, steel lent itself to the architectural requirement for numerous cantilevers and large column-free spans; the single upturned Y-shaped tower on the River Suir Bridge supports the cable-stayed deck**

perimeter. These masts also support demountable hall partitions and inflated ETFE rooflights. Construction involved building the masts first, followed by the trusses.

McAlpine Design Group project design leader Matthew Allen believes building the masts centrally in ExCeL Phase 2 rather than at the perimeter made it more of a challenge. “The temporary condition when only one half of the truss was up created another loadcase which had to be considered. In the permanent condition, though, the trusses balanced out better and there was no reliance on tensioning bars, [as

on phase 1],” he says.

Using steel ensured a minimum construction period, a lightweight cost-effective solution, and lent itself to the architectural requirement for cantilevers and large column-free spans.

- Project** River Suir Bridge, N25 Waterford Bypass, Ireland
- Client** CRG Waterford
- Architect** Yee Associates
- Main contractor** BAM – Dragados JV
- Structural engineer** Carlos Fernandez Casado
- Steelwork contractor** Mabey Bridge
- Lead engineer** Ove Arup & Partners

This 18 km dual carriageway in Ireland connects Cork to the port of Rosslare, and provides congestion relief on the main routes through the city of Waterford. The centrepiece of the Waterford bypass is an eye-catching 465 m long cable stayed bridge over the River Suir.

The cable-stayed design removes the need for intermediate supports or piers in the river during construction, and in its finished state, which would otherwise disrupt marine life and navigation. Main and back spans of the deck are supported by cables which fan out from the top of a 100 m tall tower situated on the south side of the river.

Construction involved erecting the upturned Y-shaped tower on land first, followed by building the bridge’s back span and then the main span. The 230 m-long main span was then erected by progressively cantilevering modular deck sections over the river and then connecting them back to the tower using cables.

“Steel was the chosen material because the erection methodology [using cantilevering deck sections] meant it was easier to build over water and easier to build accurately and quickly,” says architect Ron Yee.

Erecting one main deck steelwork module, installing and then prestressing cables and placing the precast concrete deck took seven days to complete.



# Projects pass test of merit

A rail bridge and a sculpture may be very different structures but both proved equally challenging

## CERTIFICATES OF MERIT RUBY KITCHING

**Project** New Cross Gate Flyover – East London Line  
**Client** Transport for London  
**Main contractor** Balfour Beatty/Carillion JV  
**Structural engineer** Scott Wilson  
**Steelwork contractor** Mabey Bridge

long. Top members are of varying length and weight.

The bridge steelwork was trial erected at the contractor's workshop where the deck crossbeams were machined to length to ensure a good fit within the end plate connections. Steelwork was delivered to the London site ahead of a planned closure of the busy line at New Cross Gate, on 10 May 2008.

The structure was pre-assembled and bolted adjacent to the tracks ahead of the possession. Site workers then poured the in situ concrete deck and, when it had gained sufficient strength, the structure was jacked up about 6 m to allow a self-propelled modular transporter (SPMT) to be positioned underneath.

The four lines of the London-Brighton tracks were covered up while the bridge was transported across using the SPMT. The bridge was then rolled across the tracks and lowered into position over new bridge abutments.

This Warren truss bridge has been designed to carry the reinstated East London Line over the London to Brighton rail line near New Cross Gate. The hefty 690 tonne steel structure is 75 m long and 8 m deep, and was installed in 2008 during a planned closure of the line.

The truss structure is made up of eight, 20 m-long longitudinal main girder sections, and 37 crossbeams which are 10 m long. Side trusses were formed by the main girder sections plus 36 diagonal struts which are 6 m



The 690-tonne steel structure is 75 m long and 8 m deep, and was installed in 2008 during a planned closure of the line



Last year's Goodwood Festival of Speed sculpture takes its inspiration from Alfa Romeo's Quadrifoglio and is made up of 175 m of tubular steel

**Project** Goodwood Sculpture 2010  
**Client** Gerry Judah for Alpha Romeo  
**Sculptor** Gerry Judah  
**Main contractor** Littlehampton Welding  
**Structural engineer** Capita Symonds  
**Steelwork contractor** Littlehampton Welding

The 2010 Goodwood Festival of Speed sculpture in Chichester, West Sussex, took the form of an elegant, scribble of a four-leafed clover supporting two Alfa Romeo cars in spectacular gravity-defying fashion.

At 18.5 m high and 25 m wide, the 12 tonne steel structure gave the impression of being made up from a single, continuous tube twisted and tied together, somewhat like a party balloon, yet strong enough to support the two cars at its "loose ends". In fact, 32 circular hollow sections (CHSs) of

323.9 mm diameter made up the illusion.

To achieve near perfect alignment for spliced sections on-site, the steelwork contractor developed an adjustable bracket that allowed the sections to be adjusted easily prior to being welded.

The structure was also braced at eight contact points between the CHSs. Each of these connections consisted of a completely concealed 125 mm diameter pin. Setting out the holes accurately for these pins was a critical part of the fabrication process.

A screw-on point was created in the CHSs to get the pins through the pre-drilled holes. Conceived by sculptor Gerry Judah and sponsored by Alfa Romeo, the structure was completed in less than three months following final design approval.

With such a tight programme and high-quality finish, precision-cut sections and seamless connections were essential.

## OTHER SHORTLISTED ENTRIES

**Riverside Waste to Energy Plant, Belvedere, Kent**  
**Client** Cory Environmental  
**Architect** Jacobs Engineering UK  
**Main contractor** Costain Group  
**Structural engineer** Jacobs Engineering UK  
**Steelwork contractor** Bourne Steel

**Newport Station Regeneration, South Wales**  
**Client** Network Rail  
**Architect** Grimshaw Architects  
**Main contractor** Galliford Try  
**Structural engineer** Atkins  
**Steelwork contractor** SH Structures

**The Point, Lancashire County Cricket Club**  
**Client** Lancashire County Cricket Club  
**Architect** BDP  
**Main contractor** Morgan Sindall  
**Structural engineer** Capita Symonds  
**Steelwork contractor** Watson Steel Structures

**Museum of Liverpool**  
**Client** National Museums Liverpool  
**Design architect** 3XN Architects  
**Delivery architect** AEW Architects

**Bridge GE19, East London Line**  
**Client** Transport for London  
**Main contractor** Balfour Beatty/Carillion joint venture  
**Structural engineer** Benaim  
**Steelwork contractor** Mabey Bridge

**New South Bridge, A406 Hanger Lane**  
**Client** Transport for London  
**Main contractor** Vinci Construction UK  
**Structural engineer** Hyder Consulting  
**Steelwork contractor** Cleveland Bridge UK

**North Stand Redevelopment, Leicester Tigers**  
**Client** Leicester Football Club  
**Architect** AFL Architects  
**Main contractor** Galliford Try  
**Structural engineer** WRS Corporation  
**Steelwork contractor** Caunton Engineering

# Future in good hands

Teams from Sheffield and Bristol universities demonstrated "individuality and flair" in their winning designs for this year's Tata Steel/British Constructional Steelwork Association (BCSA) Student Awards

## STUDENT AWARDS RUBY KITCHING

The Tata Steel/BCSA Student Awards, organised by the Steel Construction Institute and supported by the Institution of Structural Engineers and the Institution of Civil Engineers, is a design competition which invites the brightest undergraduates – usually in their final year of study – to demonstrate talent and ingenuity in structural steel design.

Split into two categories – structures and bridges – the awards encourage these students to bring together robust and exciting schemes accompanied by thorough cost analyses, construction methods and environmental considerations.

Now in its 23rd year, the brief is as realistic and as tough as ever. This year's structures category involved the design of an iconic aquatics centre. The structure had to enclose multiple swimming pools as well as an ice rink.

The brief stipulated that heat extracted to create the ice should be used to contribute to the heating of the pools and that, since the complex would house both cold and hot volumes, the design should aim to minimise energy requirements by careful choice of orientation, structural form, thermal mass, insulation and glazing.

Located in a UK city outside London on a level brownfield site, the two-storey building design included a first floor café and ancillary rooms. Submissions comprised calculations and drawings.

The structures first prize went to a team from University of Sheffield, whose entry was described by the judges as, "well-presented with a very

clear artist's impression". The team included Andrew Cartlidge, Robert Philp, Daniel Pullan, Hannah Stotter and tutor Dr Buick Davison.

Judges commented that the scheme struck a good balance between practicality and ambition, and was very professionally executed. Second place went to University of Manchester, with Queens University Belfast collecting third prize.

## In the loop

The brief for the steel bridge category involved designing an elegant single carriageway road bridge across a loop in a river. A design sympathetic to its rural surroundings which could span across marshland and two stretches of 20 m wide river was required.

Environmental and constructional constraints were in abundance here since the area enclosed by the loop was a Site of Special Scientific Interest (SSSI) and was dominated by cliffs and woodland outside the loop. Access was not permitted to the SSSI and permanent construction was not allowed in the river or within 10 m of the riverbank.

University of Bristol's winning solution used a multi-arched open spandrel structure which the judges felt suited the site well. The team included Matthew Hickman, Thomas Carr, Owain Davies, Elliott Standfield and tutor Dr Adam Crewe.

"The scheme was very clearly explained and detailed using just one drawing," said the judges. They also commented that the report and calculations were well-presented and that alternative solutions were clearly discussed. The submission was also accompanied by a good construction programme and cost estimate.

Second place in the bridges category went to University of Southampton, with University of Liverpool collecting the third prize.

Tata Steel Europe chief commercial officer Henrik Adam said: "The finalists of this year's Student design awards are the best of another outstanding crop of entries from universities across the country. The excellence of their work leaves me in no doubt that the future of steel construction is in good hands."

Structures winner: University of Sheffield's iconic aquatic centre was praised for "striking a good balance between practicality and ambition"





# Industry drive is recognised

The BCSA's contribution in more than halving instances of reportable accidents has been rewarded

## HEALTH AND SAFETY RUBY KITCHING

Health and safety is one of those topics rarely received with joy when it crops up. But few would argue its importance and the great strides made in the past 10 years to improve the construction industry's track record.

The steel industry, represented by members of the British Constructional Steelwork Association, has achieved a 60 per cent reduction in reportable accidents over the past decade.

Driven by the trade association's health and safety committee, the BCSA has produced clear and poignant safety guidance which may have helped bring about this significant improvement.

In recognition of this, the Royal Society for the Prevention of Accidents (RoSPA) recently awarded the BCSA with the first ever SME Assistance trophy. RoSPA decided to create the new award to celebrate the exceptional work carried out by trade associations that offer health and safety advice and assistance to SMEs.

The BCSA's success is particularly notable as the award covers all sectors, not just construction.

### Safety improvements

One of the greatest improvements in steelwork erection safety has been in safer methods of handling steelwork and in working at height, according to BCSA health, safety and training manager Peter Walker.

"The increased use of mobile elevated work platforms, cherry pickers and wider use of nets have had an excellent effect on the industry," he says. "That and the fact that people are thinking about health and safety before a project gets to site, so that there is



The BCSA team with the RoSPA SME Assistance Trophy, back row left to right: Roger Steeper, BCSA marketing and communications manager; Stuart Price, secretary of BCSA Midland and Southern Region; Gillian Mitchell MBE, BCSA deputy director general and Dr Derek Tordoff, BCSA director general. Front left to right: Jack Sanderson, BCSA president; Peter Walker, BCSA health and safety manager; Tony Power, chairman of BCSA health and safety committee

proper planning and, essentially, room for safer working methods."

The numbers speak for themselves; the number of falls from height have decreased from 14 in 2005 to zero in 2009 and 2010. "Falls at the same level" and injuries from handling, lifting and moving' have reduced by 40 per cent over the four years to 2010.

"Our industry has invested in machinery, pre-fabrication techniques and off-site welding and cutting to reduce man-hours on site, which has, in turn, reduced accidents," adds Mr Walker.

He recalls that 10 to 15 years ago a construction site was a much more dangerous place but that now, thankfully, so many elements from hard hats and edge

protection to tool box talks are the encouraging safer practice.

But the biggest remaining challenge on health and safety, he believes, is when unforeseen issues arise on site and specialist contractors have to react in a way which gets the job done safely

Topics include guides to steel erection in windy conditions, management of site lifting operations and work at height during the loading and unloading of steelwork. Its guide to the management of accidents is designed to encourage detailed accident investigation and to help develop near-miss (or near-hit) reporting systems that enable preventative measures to be taken to reduce repeat incidents.

It also offers example documents for topics such as drug and alcohol policy and its implementation, risk assessments for working at height during loading and unloading steelwork and material for some 42 toolbox talks on erecting steelwork.

"What we were finding was that all our members had their own versions of how particular operations should be carried out. So, with the Health and Safety Executive, we worked out the safest way to do things," adds Mr Walker.

The BCSA also works with other trade organisations and HSE forums to contribute to and collate best practice information.

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