STEEL SPOTLIGHT: Structural Steel Design Awards 2015

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BCSA

City office finds space de

Its wedge-shaped profile is designed to protect views across London

Moorgate Exchange saw Severfield and Ramboll pool their expertise to find efficiencies and maximise lettable space for the client within tight planning restrictions

INTRODUCTION

The objective of the Structural Steel Design Awards (SSDA) is to '...recognise the high standard of structural and architectural design attainable in the use of steel and its potential in terms of efficiency, cost effectiveness, aesthetics and innovation.'

Fourteen projects made the shortlist in this, the 47th year of the SSDA. Judges presented five awards, three commendations and two certificates of merit at a gala ceremony held in Westminster on 1 July 2015.

The judging panel included: Chairman David Lazenby, representing the Institution of Civil Engineers; Richard Barrett and Joe Locke, representing the steelwork contracting industry; Professor Roger Plank and Martin Manning, representing the Institution of Structural Engineers; and Christopher Nash, Bill Taylor and Oliver Tyler, representing the Royal Institute of British Architects.

RUBY KITCHING

This 12-storey City of London office building has been designed to maximise its net lettable area while responding to specific planning constraints. Thus, its wedge-shaped profile is borne of a need to protect views across London and preserve rights to light for residents in the nearby Barbican development.

The building steps back from level 6 upwards, reducing the floor area from about 2,230m^2 at level 5 to 740m^2 at level 11 to comply with these planning requirements. It is also on these levels that tenants will be treated to generous landscaped roof terraces which set this development apart from most others in the square mile.

"The roof terraces provide a stunning 'fifth elevation' and combine many functions, including funicular tracks for the BMUs [building maintenance units], fire escape routes and habitat for diverse ecology," says Ramboll building structures director Alex Baalham.

The building comprises a double basement, ground floor reception, first floor trading area and, from level two, offices arranged around a central atrium. It has two circulation cores.

The building is steel-framed with cellular floor beams to allow services to run through the structural floor depth and, hence, reduce the thickness of the floor zone. Open plan office floorplates are based on a 15.5mx7.5m structural grid. Typical columns are 475mm diameter CHS (circular hollow sections) while the double height V columns at ground floor are concrete encased square hollow sections tapering from 900mm to 600mm.

Using a steel frame rather than concrete has reduced the overall floor zone, increasing the maximum number of storeys and increasing the net lettable space for the client due to fewer and smaller columns.

Concrete infilled CHS columns have been used to provide 90 minutes fire protection without the need for any external fire protection on all of the internal and perimeter columns.

Collaboration between Ramboll, Tata Steel, Severfield and Manchester University verified the behaviour of the columns under fire conditions, which allowed the minimum amount of intumescent paint to be used around connections.

"This work has resulted in columns significantly smaller than would have been achieved using traditional methods, and led to new industry design guidance on the subject," adds Mr Baalham.

Designing the frame in steelwork instead of concrete minimised the weight of frame and allowed a raft foundation to be adopted, which reduced the amount of concrete used in the substructure. Up to 50% of the cement within the raft was also replaced with GGBS [ground granulated blast furnace slag] to further increase the sustainability of the design.

The building was fully modelled in 3D from an early stage to ensure high levels of coordination throughout the project.

Other innovations included Ramboll's

AWARD:	MOORGATE EXCHANGE, LONDON
Architect:	HKR Architects
Structural Engineer:	Ramboll
Steelwork Contractor:	Severfield
Main Contractor:	Skanska UK Ltd
Client:	Blackrock

spite constraints

approach to floor dynamics: “Rather than increasing the weight of the floor beams to stiffen the floor plate, intermediate ‘dynamic stiffener’ beams were introduced to mobilise more of the mass naturally present within the floor structure to achieve a low response factor in a materially efficient way.

“This approach was key to achieving the large column-free spaces within tight floor zones [without significantly increasing the steel frame tonnage],” explains Mr Baalham.

COMMENDATION: HEATHROW TERMINAL 2B

Architect: Grimshaw

Structural Engineer: Mott MacDonald Ltd

Steelwork Contractor: Severfield

Main Contractor: Balfour Beatty Plc

Client: Heathrow Airport Ltd

T2B is a new satellite pier for Heathrow Terminal 2 and has been constructed on the largest airside site in Heathrow’s history.

It is a 520m long steel-framed rectilinear structure which accommodates 16 stands and sits above a two-level basement.

Based on lean design principles, the steel structure also forms the architectural language of the building.

“Detailed to be visually elegant and structurally efficient, the project takes advantage of modular prefabrication and eliminates unnecessary construction elements,” says Grimshaw partner Andrew Thomas.

A palette of exposed structural steel clad in large prefabricated panels and finished with profiled steel or toughened-laminated glass helps to create a highly engineered environment.

“Grimshaw’s aim was to create a clear and simplified experience for passengers passing through the terminal,” explains Severfield project manager Andrew Luter.

“This included simplifying the structure and connections so that instead of endplates and bolts being exposed, the columns disappeared into the floor.”

Building information modelling (BIM) was also used from an early stage in the design process and enabled efficient design and coordination of services with architecture and structure prior to prefabrication.

“The 3D environment allowed virtual testing of exposed steel connection details ahead of fabrication.

“Collaboration between architects, engineers and fabricators ensured composition and scale were kept in proportion with context.

“We also satisfied the client’s target of a 10% reduction in cost and 25% reduction in construction time over previous best practice for piers, with a ‘kit of parts’ design philosophy that utilised steel in many forms,” adds Mr Thomas.

Lift off for Imperial War'

The Imperial War Museum's new First World War Galleries centre around a revamped atrium complete with invisibly supported stairs that posed tricky access challenges for Bourne Steel

RUBY KITCHING

The new First World War Galleries form the first phase of modernising the Imperial War Museum in London, which dates from 1936.

The galleries' newly configured atrium reinvigorates this part of the museum to create a new centrepiece to display some of the museum's most iconic large objects. Galleries at every floor have been trimmed or extended as necessary to create a smooth line of balconies running up the sides of the atrium.

The five-storey atrium also features a new platform beneath the original atrium roof (a steel-framed barrel-vault) to protect exhibits from direct sunlight, as well as a new cantilevered staircase which runs the full height of the building.

Twenty full-height tapering vierendeel columns connect back to existing floor steelwork and support the high level platform from which the exhibits are suspended. In all, 370 tonnes of new steelwork have been added, although the vierendeels are now concealed within architectural precast concrete panels.

Galleries at every level around the atrium have also had a revamp and now correspond with the level at which the large iconic objects, such as a Harrier jet, Spitfire and V2 rocket, hang.

Accessing the atrium within the confines of the existing museum during the construction period was one of the project's biggest challenges, despite the building being closed to the public for much of the time.

"I'm quietly proud of what our team has achieved on this project: building a new five-storey structure with bespoke finishes within an existing five-storey atrium and connecting this new structure back to the existing structure while working to a tight programme in a listed building.

"This was only made possible by careful planning and co-ordination from day one with the design team and Lend Lease," says Bourne Steel construction director Charlie Rowell.

All material brought in and out of the atrium had to negotiate a 90 degree turn from the access way between existing concrete columns and the atrium space. This limited the length of incoming steelwork to 8m.

> **"The stairs take support from the central cantilevered landing and a discreet central cantilever support"**
>
> KEVIN CLARKE, BOURNE STEEL

Trusses, stair frames, link bridges and long columns all had to be spliced to fit into the building, which also meant substantial temporary support frames were needed to erect each structure.

"Working alongside other trade contractors in the restricted space, at the same time as allowing exclusion zones around lifting operations, was also a challenge," adds Bourne Steel project director Kevin Clarke.

Structural steel was considered the most

AWARD: FIRST WORLD WAR GALLERIES, IMPERIAL WAR MUSEUM, LONDON

Architect: Foster + Partners

Structural Engineer: BuroHappold Engineering

Steelwork Contractor: Bourne Steel Ltd

Main Contractor: Lend Lease

Client: The Trustees of the Imperial War Museum

s new atrium


The new atrium at the Imperial War Museum

suitable material for the job to match the existing exposed steel frame. The majority of the steelwork has been finished with intumescent paint, with areas that are visible in the final condition being matched to the finish of the existing steelwork.

The high level platform is made up of beams and trusses which have twelve specialist lifting lugs welded to their underside to support the iconic objects.

For Bourne Steel project director Kevin Clarke, the most interesting aspect of the project was the main feature stair that appears to have no visible means of support.

"This necessitated constructing the stairs on a temporary frame of structural steel until they were fully site-welded and stable. The stairs take their support from the central cantilevered landing and a discreet central cantilever support at half landings".

COMMENDATION: MILTON COURT, GUILDHALL SCHOOL OF MUSIC & DRAMA, LONDON

Architect: RHWL Arts Team

Structural Engineer: WSP Cantor Seinuk

Steelwork Contractor: William Hare Ltd

Main Contractor: Sir Robert McAlpine Ltd

Client: Heron Land Developments

Milton Court is a new performance and teaching facility for the Guildhall School of Music & Drama, London.

It is a six-storey building with double basement located in the City of London. Half of the building's footprint rises a further 30 storeys above Milton Court to form a luxury residential tower known as The Heron. Both Milton Court and The Heron were developed as a single project.

Milton Court comprises a 609-seater concert hall, two theatres, rehearsal rooms, office space, a television studio suite, a lobby and bar as well as an impressive roof garden.

The concert hall and one of the theatres, known as the studio theatre, had to be designed and built to meet very high acoustic performance requirements. This involved constructing them using an additional internal steel frame, encased in concrete with walls constructed out of dense blockwork – creating a 'box in a box'.

This created challenges for the project team. For example, since construction of the residential tower had advanced beyond the roof level of Milton Court, erection of the studio theatre's steelwork frame had to be erected within an already enclosed structure.

As a consequence, early coordination was required to ensure the timely supply of lifting beams and lifting lugs, which had to be cast into the theatre roof slab when it was being cast to facilitate erection of the structural steel later in the programme.

"One of the most interesting aspects of the project was the box-in-box construction, with the internal structure being acoustically isolated from the outer structure via individually designed acoustic bearings," explains William Hare project manager Adrian Wild.

"Acoustic isolation also had to take into account the effects of the [nearby] London Underground system. Each acoustic bearing had to be individually designed to suit the required loading and respective frequency."

Futuristic design for mul

Derby's new 5,000-seat venue combines eye-catching architecture with complex engineering to cater for a huge range of applications

RUBY KITCHING


IMAGE COURTESY OF BOWMER & KIRKLAND

This multi-sports indoor arena is a London Olympics legacy project and packs in 12 badminton courts, fitness studios and a 250m long cycling track.

Designed for a range of other indoor sporting as well as non-sporting events (such as exhibitions and concerts), this eye-catching arena can also accommodate up to 5,000 spectators. The venue consists of a main sports hall at ground floor and a dramatic indoor cycling track clinging to the perimeter of the building at first floor.

"Very few velodromes in the world have this form and careful consideration was given to its design. The challenge was to provide an efficient and lightweight structure," says Arup associate director John Read.

"The structure includes cantilevers to the inner edge to achieve the architect's aspiration for the track to float over the infield and also to maximise useable space on the floor of the arena.

"This was achieved whilst also providing a structure that was suitably stiff to minimise noticeable vibration during cycle races. Wherever possible, the curved shapes were formed by faceting steel members in order to minimise fabrication costs."

The building is located next to Derby County FC's Pride Park Stadium and sits on a former landfill, so the building's design and construction had to take into account poor ground conditions and contamination. Precast driven piles were used for the structure's foundations to avoid bringing contaminated arisings to the surface.

In terms of energy and carbon reduction, the strategy focused primarily on the building fabric and achieving a well-insulated and airtight construction. In addition, the high efficiency central heating and hot water plant is supplemented with a combined heat and power (CHP) unit. It has achieved a BREEAM rating of Very Good.

The building itself is diamond-shaped in plan with curved corners and also has a curved roof. Its façades are clad in horizontal strips of aluminium which mimic the board pattern of the velodrome track. Corrosion protection to the steelwork was achieved through combining factory-applied corrosion primer protection and onsite finishing coats, including intumescent paint as necessary.

The roof structure spans 85m to clear the sports hall and cycling track. "Steel was the natural cost-effective choice to give a lightweight and readily erectable structure minimising foundation loads, and with the flexibility to span long distances and support event rigging and lighting," explains Mr Read.

The sculptural structure and need to accommodate a variety of uses within a tight budget could only have been achieved using a steel-framed structure, he continues: "Steel allowed us to achieve raking tubular columns and a cantilevering front to the building façade, support curved 'eyelid' windows and a sloping freeform cladding envelope that

AWARD: DERBY ARENA
Architect: FaulknerBrowns
Structural Engineer: Arup
Steelwork Contractor: Billington Structures Ltd
Main Contractor: Bowmer & Kirkland
Client: Derby City Council

"Steel allowed us to achieve raking tubular columns and a cantilevering front to the building façade"
JOHN READ, ARUP

ti-use arena

The building is diamond-shaped with curved corners and a curved roof

projects beyond the ground level footprint.

"Slender members could also be detailed for the structural deck that cantilevers 4m at first floor level to support the infield run-off zone to the track."

The scheme was developed using 3D computer models which allowed steelwork contractor Billington Structures to ensure the steelwork was fully integrated with architectural layouts and building services.

In particular, three glazed apertures taking the form of sleepy 'eyelids' in the cladding and façade structure had to be detailed carefully to achieve the architect's vision.

"Working together with the architects and engineers, Billington Structures were able to bring an innovative and futuristic design to life with an ambitious steel structure," comments Billington Structures project manager James Hindley.

The project was also completed on budget and ahead of schedule.

COMMENDATION: GREENWICH REACH SWING BRIDGE, LONDON

Architect: Moxon Architects

Structural Engineer: Flint & Neill Ltd

Steelwork Contractor: S H Structures Ltd

Main Contractor: Raymond Brown Construction Ltd

Client: Galliard Homes Ltd

Until the construction of this new footbridge, the Thames Path – a pedestrian route along the river – was interrupted by the muddy Deptford Creek, forcing pedestrians to divert to a busy A road to continue their journey.

The creek is where the River Ravensbourne joins the Thames and the new footbridge connects the east side of the creek, where a new residential development at Greenwich Reach is taking shape, to the west.

The cable-stayed bridge has a 44m long main span across the creek, which is supported by a single mast (and main concrete pier below deck) and central stay cables. A short 8m back span containing a 120 tonne counterweight balances the structure with two pairs of backstays supporting the tip of the mast.

Concealed in the machine room within the main concrete pier is a 3.7m diameter slewing ring bearing with a set of four electric motors which allows the bridge to 'swing' clear of the navigation channel onto the east bank if a vessel needs to pass.

Flint & Neill director Ian Firth comments on the innovative mast: "It consists of an arrangement of flat plates to create a very transparent form. Two flat vertical plates carried the compression loads in the mast and were prevented from buckling by inclined intermediate stiffeners. This arrangement allows the mast, the most visually significant part of the bridge, to become an item of visual interest, as well as creating an efficient way to locate the stay cable connections."

Since the bridge lies entirely over the bank of the river in its open position, most construction activities could take place on dry land, before the bridge was swung into place on the permanent drive system to close the gap.

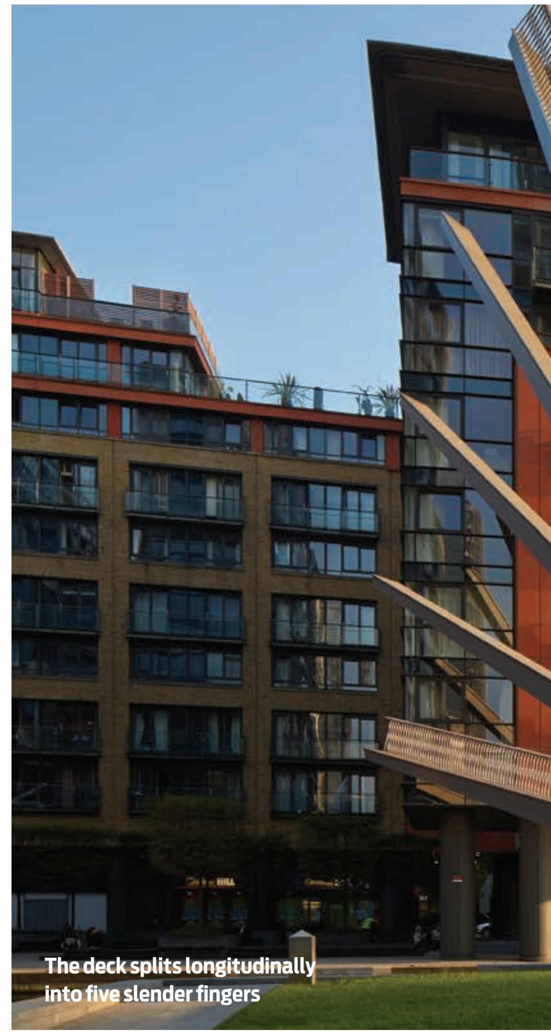
"Seeing the completed bridge swing across the river for the first time was definitely a project highlight," says Galliard Homes senior project manager David Rogers. "The logistics of construction and delivery in a fully occupied residential development was the main challenge".

S H Structures sales and marketing manager Tim Burton added: "The bridge presented a number of challenges; however, a collaborative approach achieved through architect, engineers and client working very much as a team made the process painless and enjoyable."

Steel fingers add drama

London's latest footbridge has demanded precision engineering to produce what is not simply a practical feat of engineering but an iconic artistic addition to a high-end neighbourhood

AWARD:	MERCHANT SQUARE FOOTBRIDGE, LONDON
Architect:	Knight Architects
Structural Engineer:	AKT II
Steelwork Contractor:	S H Structures Ltd
Main Contractor:	Mace Ltd
Client:	European Land & Property Ltd


The deck splits longitudinally into five slender fingers

RUBY KITCHING

This 3m wide footbridge spanning just 20 m across a section of the Grand Union Canal at Paddington Basin, London, can be described as a feat of theatrical engineering. Located as it is just a short distance from the end of the canal basin, the brief for this structure was purely to provide drama to this exclusive residential and commercial development.

Structurally, the crossing is a cantilever in its rest position (no drama here) but, should a barge need to pass under it, the deck splits longitudinally into five slender fingers which are raised using hydraulic jacks with an action similar to that of a traditional Japanese hand fan (lots of drama here).

The lowest finger is raised sufficiently to achieve the required 2.5m high by 5.5m wide clearance over the canal at mid-channel. Shaped counterweights assist the hydraulic mechanism and reduce the energy required to move the structure. The counterweights are 3m tall on the north quay and form the main visual interest of the bridge in its down mode.

Each beam/finger moves faster than the next to co-ordinate the fanning effect during the opening sequence. "The slow drama of the event is fantastic," says Knight Architects director Martin Knight.

"We wanted to express this drama for 99% of the time when the bridge is lowered and this informed the appearance of the counterweights used to reduce the energy required, which are each inscribed with their different weights and whose sculptural geometry informs the viewer as to how high the individual beams will raise."

This cantilever arrangement, fixed on the north end of the bridge, also suits constraints on land ownership which meant the bridge should be supported primarily from the north side, with only limited support provided on the south bank.

"One of the key objectives was to create a solution that was not only an engineering response, but a piece of art that would help to shape the identity of Merchant Square and contribute positively to the wider regeneration of Paddington Basin. An equally important objective was to ensure the design solution was practical and uncomplicated to maintain," says European Land & Property project manager Cameron Hodgson.

The bridge is made up of fabricated, 600mm wide trapezoid box girders that are tapered from 900mm deep at the pivot point on the north quay to 300mm at the tip on the other side. These lock together laterally to form a rigid, single deck.

Hydraulic cylinders and rotational bearings which operate the movement of the beams/fingers are housed in a concrete substructure beneath ground level, protected from the canal water by a drained sump.

Use of 3D CAD models and software analysis were essential to refining the design. These were shared by the architect and engineers to produce the optimum solution based on counterweight radius and tonnage and the position of the bridge's centre of gravity (which always had to be on the cantilever side to keep the hydraulic rams in compression).

"The design of the structure was developed in an iterative manner, using parametric solvers to determine the optimum geometry and plate thicknesses to minimise duty on the hydraulic system and the energy required to raise the bridge," adds Mr Knight.

> **"Fabrication had to be of the highest order, with attention paid to weld sequencing and dimensional control"**
>
> TIM BURTON, S H STRUCTURES

Other materials including aluminium and FRP were considered for the bridge, but none could achieve the structural performance cost effectively compared to steel.

Fabrication and installation of the footbridge presented a number of challenges to the project team. Achieving the tight at-rest tolerances for the fingers to create a flat, homogenous deck surface was one of the greatest challenges faced by the fabricator, recalls S H Structures sales and marketing manager Tim Burton.

"The nature of the deck meant that

to new bridge


© EDMUND SUMNER

fabrication had to be of the highest order, with meticulous attention being paid to weld sequencing and dimensional control to ensure the five deck fingers would nest together in an almost seamless fashion when installed on site," he says.

It achieved the tolerance of just a 0-3mm gap between the fingers when the bridge was at rest and spanning the canal.

Transporting the steel fingers to site was another dramatic act, since Merchant Square has limited access due to the tall buildings and canal basin. "The solution was to load the five deck sections onto a barge from a quay further up the canal network and then towing it to site ready to be installed by a barge mounted crane," adds Mr Burton.


© JACK HOBHOUSE

Merit: Kew House, Richmond

Architect: Piercy&Company

Structural Engineer: Price & Myers

Steelwork Contractor: Commercial Systems International

Main Contractor: Tim & Jo Lucas

Client: Tim & Jo Lucas

This family home in Kew, London, is a project which was driven by the architect and client's shared interest in a 'kit-of-parts' approach to construction and the self-build possibilities emerging from digital fabrication.

The client, Tim and Jo Lucas, are structural engineers and also took the role of main contractor on the project, directly employing a site team plus specialist sub-contractors.

Located in a conservation area, the site is just 18m wide and 10m deep and the building footprint extends right up to the perimeter of the site. Coupled with the suburban tree-lined setting and no further land available to store materials or plant, a prefabricated steel-framed scheme was the preferred option to keep disruption to neighbours to a minimum.

"Using steel allowed large yet highly intricate prefabricated building parts to be made off-site whilst the basement was being built. These elements were craned onto the perimeter from within our site so as not to disturb the neighbours," explains Price & Myers partner Tim Lucas.

The house itself is made up of a single basement and two gable-ended two-storey volumes. Bedrooms occupy the first floor while living areas and a kitchen occupy the ground floor.

The basement is a play room and workshop. Connecting the two blocks is a glazed circulation module which contains steel stairs, a first floor link bridge and a plywood slide down into the basement.

The roof and façades of the two volumes are made from 4mm thick weathering steel, strengthened with internal mild steel stiffeners. Ten roof shell modules were craned into place and welded together on site to create the watertight enclosures.

Mr Lucas adds: "The highlight of the project was use of digital design and fabrication to minimise and optimise the use of material, creating a high quality, digitally crafted structure and fit out."

Lakeside retreat proves

A pavilion surrounded by lake and countryside called on extensive prefabrication and close attention to detail

RUBY KITCHING

The pavilion is connected by a 42m long bridge

© DENNIS GILBERT

Located on a small island in the centre of a lake in the grounds of Wormsley Estate in the Chiltern Hills, the Island Pavilion connects to its surrounding countryside via an ethereal footbridge.

The estate is also home to the 2012 SSDA-commended Opera Pavilion which hosts performances by the Garsington Opera during the summer months. It will be during this period that the Island Pavilion is used for entertaining. The single-storey Island Pavilion measures 8m by 15m on plan and is 4m tall. It consists of a fully glazed main room for entertaining, with cellular units to the rear for back-of-house facilities.

The bridge is approximately 42m long by 2.1m wide and appears to skim the surface of the lake, but is actually supported by a steel structure below the water line. The concept for the building was to reinterpret the classical tradition of pavilions for the 21st century while taking full advantage of modern design, fabrication and building techniques.

Designed, detailed and built with a strong desire for technical and aesthetic excellence, the pavilion and footbridge have taken structural and product design a step forward.

This achievement, says Sheetfabs director Dave Mason, is attributed to the collaborative effort made by the project team to closely coordinate the design process from concept to installation, leaving no stone unturned.

The pavilion utilises an illuminated, acoustically transparent ceiling, insulation-filled structural members and a patented integrated roof and rear wall stainless steel cladding system. The structure is formed from three-pin portal frames at 3m centres, made from bespoke stainless steel sections for the rear and top elements. This allows the front members to be much slimmer pin-ended stainless steel Circular Hollow Section (CHS) columns, minimising their visual impact on the fully glazed façade.

The bespoke elements are trapezoidal in cross-section with a shorter flange at the bottom, allowing the 'web' side-walls to taper from top to bottom. The bottom flange is inset so that the side walls 'wrap' around the lower flange plate to form smooth curved edges.

The project team explored the effect of varying the thicknesses of 'flange' plates and 'web' side walls at design stage.

"The fabricator advised on the most cost-effective way of achieving the architectural requirements, and also the limitations on bend radii of the different plate thicknesses," recalls Momentum director Stephen Fisher.

"Exposed connections were meticulously detailed to balance the structural and aesthetic requirements with those of constructability. The architect demanded the highest quality finish to the steelwork, which was met by the fabricators who provided an almost sculptural level of finish," he adds.

Architect Robin Snell also comments on the aesthetic reasons for choosing stainless steel: "Matt bead blasted stainless steel was selected and used throughout the pavilion for its finish qualities, its minimal long-term maintenance requirements and in direct contrast to the highly polished stainless steel sculpture contained within [the pavilion]".

With the pavilion surrounded by water (between 1.0-1.5m deep) and 40m from the shore, deliveries and construction methods has to be carefully considered. The solution was to prefabricate many of the frame elements so that they could be craned onto the island from pontoons and then bolted together. Driven steel piles were also used as a cost-effective and practical foundation

AWARD: ISLAND PAVILION AND FOOTBRIDGE, WORMSLEY

Architect: Robin Snell and Partners

Structural Engineer: Momentum

Steelwork Contractor: Sheetfabs (Nottm) Ltd

Main Contractor: Mace Ltd

Client: Wormsley Estate

no mean feat

Merit: Weathering Steel House, Putney
Architect: Eldridge London
Structural Engineer: Elliott Wood
Steelwork Contractor: Suffolk Welding
Main Contractor: Famella

Sitting on the site of a former domestic garage on a tree-lined London street is the newly built home of two academics who specialise in historic metalwork. Not surprisingly, metal – and in this case steel and weathering steel – form a striking part of its design.

"Weathering steel was chosen because it blends with the existing brick buildings in the street without giving up any of its modern-ness," says the owner of the house.

The house comprises a three-storey building clad in weathering steel sheets interspersed with large glazed areas and a single-storey glazed building with a green roof at the rear.

The two areas are connected by a glazed corridor at ground level and a common basement. Its distinctive weathering steel cladding welded to a structural frame forms the primary structure for the main building.

"The ability to use the material both as the exposed finish and also as the primary structure enabled us to manipulate areas to create the large flush expanses of glazing, structural glass dormer windows and a cantilevering 'bay' over a basement roof light," explains Eldridge associate director Mike Gibson.

"Resolving complex structural connections where the structure is also the finish, whilst maintaining thermal separation between the external structural envelope and internal floor supports, was a difficult but rewarding process involving lengthy discussions and development with the structural engineer Elliott Wood and steel fabricator Suffolk Welding".

With the structure largely made up of prefabricated steel panels, construction was fast and progressed well despite the site's tight constraints and urban location.

Sections of weathering steel were delivered to site ready to be bolted and then welded together to form a weatherproof envelope very quickly.

"Challenges included building the house close to neighbours with only a 150mm gap on one side and having limited space on the street to store the panels during installation," comments Suffolk Welding director Ian Melton.

PHOTOGRAPHY BY LYNDON DOUGLAS @ FAMELLA

solution. They were linked by ground beams to form a stable base for the pavilion.

The bridge structure is a single 355mm CHS spanning between foundations (precast concrete spread footings measuring 1.6m x 3.3m x 0.3m) at 10.5m intervals.

Tapered I-beams were welded through the CHS at 2m centres to support structural Tee edge-members. A profiled aluminium deck cantilevers 300mm over the structural 'T' edge members, while a pairs of inclined CHS sections bolted down to the foundations provide lateral stability.

Limiting site activity by prefabricating the structure into portal frames, floor cassettes and secondary roof modules was a significant advantage when the tight six month construction period between November 2013 and May 2014 coincided with extremely wet weather. Estate manager for the client Patrick Maxwell says his project highlight, put simply, was "the delivery on time of a remarkable new building against a backdrop of working in very difficult circumstances".

Other finalists

RETAIL DEVELOPMENT PLATEAU, BARGOED

Architect: Holder Mathias Architects
Structural Engineer: Capita Symonds
Steelwork Contractor: Caunton Engineering Ltd
Main Contractor: Simons Construction
Client: Caerphilly Borough Council

TOTTENHAM HALE BUS STATION CANOPIES

Architect: Landolt + Brown Architects
Structural Engineer: Mott MacDonald
Steelwork Contractor: S H Structures Ltd
Main Contractor: Balfour Beatty
Client: Transport for London

ST JAMES'S GATEWAY, LONDON

Architect: Eric Parry Architects
Structural Engineer: Waterman Group
Steelwork Contractor: William Hare Ltd
Main Contractor: Lend Lease
Client: The Crown Estate

CITY CENTRE BUS STATION, STOKE-ON-TRENT

Architect: Grimshaw
Structural Engineer: Arup
Main Contractor: Vinci Construction Ltd
Client: City of Stoke-on-Trent