

Structural Steelwork in Action

This special report examines the crucial role played by structural steelwork and the specialist supply chain in UK construction.

Special Report

27|10|11 >>

New Civil Engineer in association with BCSA and Tata Steel



TATA STEEL



Steel's safety focus pays off

Safety

Steel construction's inherent safety benefits are being captured by projects large and small. Buildings, bridges and structures of all kinds routinely benefit from the massive safety improvements in recent years that have made steel construction one of the safest sectors.

The award from the Royal Society for the Prevention of Accidents (RoSPA) to the British Constructional Steelwork Association (BCSA) of the first trophy for trade associations and similar bodies for fostering safety among their small and medium sized members is a recent recognition of the steel sector's efforts to spread a safety-first culture among all steelwork contractors.

The success of the BCSA's efforts can be seen in a consistently creditable safety performance with reportable accidents in the sector reduced by 60% since 2000, well ahead of the government's Revitalising Health and

Safety campaign for a 10% fall over 10 years. There have been no falls from height in the last two years for which figures are available.

The off site fabrication, trial erections and partial assemblies of structural sections that typify modern steel construction are all well known factors that help safety without special efforts from main contractors or others in construction supply chains. With steel construction there is less need for working at height and on site construction programmes are reduced. Steel is delivered to site when needed, reducing the hazard of on site storage – a safe steel site is also a tidier site.

Some of the safety features that come as standard with steel construction, such as having edge protection installed on the ground before sections are lifted into place, also benefit later site operations.

What are the on site practices that make steel construction a safe option?

One of the keys is the Safe Site Handover Certificate, a BCSA initiative that addressed a lack of appreciation on behalf of some site managers of the need for precautions like ensuring proper access for trailers, setting aside safe areas for loading and unloading.

"The quality of traffic routes is important and ground conditions have

CANTILEVERS MAKE ROADS AND RAIL SAFER



to be sufficient to support the weight of traffic like mobile elevated work platforms and mobile cranes," says BCSA safety manager Pete Walker.

Working from platforms, standard use of fall arrest systems and edge protection systems all help reduce risks of falls from height. Loading and unloading innovations have been introduced by BCSA members and by Tata Steel. Lifting plans will be adopted on safe sites covering crane operations, to ensure all the risks are considered.

When a safe system of work is adopted across a site, areas below those where work is being carried out overhead will be kept clear. Areas will be cleared of combustible materials, especially during welding operations.

"The steel sector is showing the way to others with its approach to safety, with an emphasis on using highly skilled and trained specialist workforces on site as well as in the workshops," says Walker.

"The steel sector is showing the way to others with its approach to safety"

Peter Walker, BCSA

STEEL'S TEAMWORK ETHIC



When a number of different materials are being used on a particular project, teamwork has to come to the fore. Different trades have to work together and programme sequencing plays an important role, not just to ensure a job is completed on time, but also to maintain a safe working environment.

This has been the case on Park House, a prestigious retail and residential project occupying an entire 150m-long plot on the

Users of neighbouring buildings and infrastructure enjoy safety benefits when structural steel solutions are used. Cannon Place is an eight-storey 37,000m² commercial development built directly above the busy concourse at Cannon Street railway station and its London Underground entrance.

Train services continued throughout the construction programme, and this along with the fact that the site is bounded by busy streets and a scheduled ancient monument, meant the design had to incorporate suspended or cantilevering north and south elevations.

The design needed to avoid putting columns in "live" rail areas, minimise digging and cause as little disturbance to the adjoining thoroughfares as possible. Large

cantilevers were the answer, features best formed with structural steelwork.

The two 21m wide by 67.5m long cantilevers are substantial and an innovative construction solution was required. Temporary supports were ruled out as the station entrance could not have supported such structures as there are Underground lines below street level, and large props would have hindered pedestrians using the station.

A procedure using hydraulically operated jacks positioned on each elevation was used. These units held the steelwork while deflecting the loads, which progressively increased, allowing all of the steelwork erection and lifting to be completed within the confines of the site's footprint, making the surrounding City of London streets safe and undisturbed from construction equipment.



south side of central London's Oxford Street.

Steelwork led the way on this project and a large steel transfer structure had to be completed to enable a concrete portion of the job to be formed. Once this transfer structure was erected on level two, concreting works for the residential portion of the building started to be constructed in tandem with the steelwork for the adjacent commercial floors.

"Teamwork between all of the on-site trades has played an integral

role in this project. Steelwork and concrete tie-in together at five levels, so working together is necessary for a speedy construction programme," explains Mace operations director Dean Emblin.

To help maintain a safe working environment for all of the follow-on trades, steelwork erection and metal decking has always maintained a two floor buffer zone. In this way the steelwork forms a crash deck and safety zone between the erection process and other trades working lower down the building.

SPEEDY BUT SAFE ERECTION

The safety procedures routinely put in place by all BCSA steelwork contractors is exemplified by an award recently given to William Haley Engineering. The Somerset-based contractor was awarded the Leo Gordon Marchant Safe Operative Award for June 2011 by Midas Construction.

Midas Construction gives this award to the sub-contractor which has shown excellence in its scope of works, especially with regards to safe working practices.

William Haley Engineering erected approximately 160t of structural steelwork on behalf of Midas Construction for a new Waitrose store and office in Exeter.

Midas was impressed with the speed of erection and the safe manner in which all of the steelwork was unloaded and erected.

Haley Engineering, like many other BCSA Member companies, uses positive lifting for all on-site steel. This method utilises brackets on all steel members for safe lifting, instead of traditional block and chains.

Lifting steel in this way reduces the risk of objects falling, there is less chance of damaging paintwork or other steelwork which in turn reduces working at height as there is no need to touch-up scratched paintwork.

Another procedure carried out on site at Exeter by William Haley Engineering was the use of exclusion zones.

All areas of the site where steelwork was being erected or stored were always fenced off from other on-site trades, thereby maintaining a safe working environment for all.

EDGE PROTECTION WORKS FOR NEW UNIVERSITY CAMPUS

Safety has been a core part of the curriculum at the new steel framed building for Liverpool's John Moores University, currently under construction on the city centre Mount Pleasant Campus.

The six-storey building incorporates three lecture theatres – large open spaces that required a number of transfer structures to form the necessary column free areas. This was one of the main reasons for choosing a steel frame.

Space is at a premium, with no room for potentially hazardous materials storage on site. As with many inner city construction sites, the project has an extremely tight footprint so all materials, including

steelwork, have been delivered on a "just-in-time" basis.

Most steelwork was delivered in erectable loads to avoid storage issues, but there was enough space on the ground floor slab for the transfer structures to be assembled before being lifted into place.

Steelwork contractor Billington Structures installed its easi-edge system across the project. This proprietary system is bolted or clamped to the main structural steelwork and erected at the same time. Edge protection can remain in place long after the steelwork contractor has completed its work, creating a safer environment for all the follow on trades.



Recovery round the corner

Overhead gantries

Nusteel Structures' steel sign gantries are among the most familiar structures to motorists on the UK's managed motorway network. Managing director Ivor Roberts, who has just become president of the British Constructional Steelwork Association (BCSA), tells NCE its members are anticipating a market recovery soon.

When you pass under a motorway overhead gantry carrying signs warning of road conditions ahead the chances will be that all that sophisticated information technology is supported on a structure that was manufactured and erected by specialist steel contractor Nusteel Structures.

Nusteel has manufactured sign gantries for the road network since the successful M42 Managed Motorway pilot scheme, and the principle is now being applied to a number of motorway sections nationwide.

Sign gantries for these schemes typically span both carriageways,

eliminating the need for traffic management and construction works in the central reserve. Span lengths have therefore increased to up to 70m.

Most of these portal gantries are designed by Gifford, and the construction and installation programme has benefited hugely from the advantage of offsite manufacture in lightweight steel.

Modular components for the truss type structures can be manufactured in advance and called off when needed, reducing project timescales. Just in time manufacture suits the specific requirements for some schemes however, and Nusteel has manufactured and installed 37 gantries in as little as nine weeks when required, as on the M1 Junctions 6A to 10.

Installation is fast with minimal disruption to traffic, using only partial road possessions when required.

Nusteel managing director Ivor Roberts has recently started a two year tenure as president of the British Constructional Steelwork Association and has fingers crossed for an overdue market recovery.

"The economic background remains tough for steelwork contractors," he admits, "and I could have asked for a more favourable economic climate. I remain optimistic for the future though. As an industry we are in reasonably good shape, and as an association the BCSA is confident that the corner has either been or is about

Long span: Prefabricated long span steel structures are ideal for motorway applications



"The BCSA is confident that the corner has either been or is about to be turned"
Ivor Roberts, BCSA president

to be turned, so I am hopeful that my two year presidency will be remembered for ending when we were well into a recovery, rather than having started in a downturn.

"Steel has a 70% share of the multi storey building frames market and almost all single storey industrial buildings are built with steel. I don't see the relative competitive advantage of steel changing in the near future so when the recovery comes we can expect to play a full part in it."

Nusteel has a 57 year history in steel





In place: One of the long span motorway gantries



On its way: A prefabricated gantry section is transported to site

construction. The company, originally called South Coast Welders, was founded by Robert Benson, a Royal Engineer, on his return from wartime service. As well as being a major supplier of information support gantries Nusteel is a specialist in design, manufacture and installation of all types of road and rail bridge.

Nusteel has a workforce of 75 and turnover of around £10M, operating a nationwide service from modern, purpose built workshops and design office on a 4ha site at Lympe, near Hythe in Kent. A 135m long fabrication workshop allows the longest span structures to be efficiently catered for. Sign gantries for the M25 are typically 53m long, and Nusteel can produce up to eight of these structures at a time. The longest M25 gantry, believed to be the longest in the UK, was 70m, moved in three sections and

assembled on site prior to installation. To accommodate the very long spans that Nusteel manufactures, the company has its own dedicated slip road at a junction off the nearby A20 where it is allowed to control the traffic lights to get the abnormal loads out onto the road network with minimal disruption.

Investment in surface treatment processes, including shot-blasting, metal spraying and multi-coat paint systems, means that all of the processes needed for projects can be provided on one site. Nusteel maintains its own fleet of purpose made transport equipment that allows directly employed installation teams to efficiently deliver and erect long span structures throughout the UK and Northern Ireland.

The company also has a long track record on a wide range of other types

70m

Longest gantry supplied to the M25

135m

Length of Nusteel's fabrication workshop

"When the recovery comes we can expect to play a full part in it"

Ivor Roberts, BCSA president

of project such as some of the external steelwork on the Lloyds Building in London. Passenger links at ferry berths and airports are an important market.

As well as overseeing a hoped for recovery in construction demand, Roberts' ambitions for his presidency include encouraging more steelwork contractors to join the BCSA. "I am sure most members would agree with me that they have benefited hugely from membership, not least by being part of a close knit business community whose members are willing to help each other out with advice and support. That community extends to include the national steel producer, Tata Steel, who are working with BCSA under a joint market development agreement that is a shining example of supply chain cooperation and a key element of our sector's return to good health."

Making the right choice

Choosing a steelwork contractor

Steelwork construction is a highly sophisticated, partly factory based off site construction process that as a modern method of construction delivers a range of benefits like enhanced safety and sustainability and more certainty in construction programmes.

Key to reaping these benefits is selection of the right specialist contractor for the project and knowing how best to work with it.

Modern steelwork contractors undertake all aspects of design, fabrication and erection of steel structures to the highest standards worldwide, delivering a quality assured product that is fully certified and tested before it arrives on site.

"The best way to ensure that a steelwork contractor can deliver what you hope for – one that has made the right investments in areas like 3D modelling, numerically controlled fabrication machinery, quality processes and safety training – is to select one from the British Constructional Steelwork Association's (BCSA's)

membership listings," says BCSA director of engineering David Moore.

BCSA members include all the UK's major steelwork contractors and many of the medium and smaller sized companies, all producing steelwork in line with the National Structural Steelwork Specification, an assurance that steelwork will be built accurately, economically and safely. Most steelwork contractors have comprehensive certification of their operations through initiatives like the Steel Construction Certification Scheme, covering areas like quality management, environmental management, occupational health and safety management, factory production control and CE marking.

Moore says: "Most clients and principal contractors compile preferred lists of tenderers for steelwork. The simplest way for contractors to be sure that the tenderers are suitable for the type of work is to use the BCSA member listings or the Register of Qualified Steelwork Contractors for Bridgework."

"All BCSA members have to pass tough qualifying procedures including financial probity"

David Moore, BCSA



Quality controlled: Modern steelwork construction is highly sophisticated and partly factory based

SELECTING A STEELWORK CONTRACTOR

The steel construction sector is one of the most transparently competitive parts of the construction industry. The BCSA has over 100 members, so there will always be a healthy competitive response to any tender invitation. The starting point is BCSA's own member lists.

All BCSA's steelwork contractors are assessed each year and categorised according to technical competence and financial capability.

"The listings tell you all you need to know about particular steelwork contractors in terms of what size of projects they are judged to be capable of undertaking and the types of work they do," explains BCSA director of engineering David Moore. "All BCSA members have to pass

tough qualifying procedures including financial probity, which can be important in the market conditions of the past few years."

As well as using the BCSA's main member list for prequalifying, there is a Register of Qualified Steelwork Contractors Scheme for Bridgeworks (RQSC) which is administered by the BCSA and open to any steelwork contractors with a fabrication facility in the European Union.

The Highways Agency recognises the benefits the RQSC Scheme offers in procuring and undertaking structural steelwork.

It is an Agency requirement that all contracts involving structural steelwork are undertaken by a contractor with appropriate RQSC registration.



HOW TO FIND A STEELWORK CONTRACTOR

Selecting a steelwork contractor is made easier with the simple to use search function on the www.steelconstruction.org website.

"The categories in the website listings give guidance on what type of steelwork a company is competent to undertake, which relates to the company's work facilities, its track record and its technical and management experience," explains BSCA director of engineering David Moore.

"From that profile you can match your tender list to the particular demands of your project."

The list also classifies companies by suggesting a maximum contract

value that they should handle.

Guidance is given on the size of steelwork contract which the company has the financial and management resources to undertake. If a project lasts longer than a year, the value is the proportion of the steelwork contract to be undertaken within a year, which gives confidence that the project is not too large for companies selected for a tender list to handle.

For a full list of categories of work that steelwork contractors can undertake see boxes below

■ To source a steelwork contractor according to a required project class and category visit www.steelconstruction.org/directories.html.

STEELWORK CONTRACTORS FOR BRIDGEWORK

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

FG Footbridge and sign gantries
PG Bridges made principally from plate girders
TW Bridges made principally from trusswork
CM Cable-supported bridges and other major structures

BA Bridges with stiffened complex platemwork

MB Moving bridges

RF Bridge refurbishment

AS Ancilliary structures in steel associated with bridges, footbridges or sign gantries

QM Quality management certification to ISO 9001

SCM Steel Construction Sustainability Charter

SUSTAINABILITY CHARTER

Construction clients are increasingly looking for sustainable forms of construction and for companies which can demonstrate that they operate in "sustainable" ways.

Steelwork contractors can sign up to the BCSA's Steel Construction Sustainability Charter, launched in 2005 to help clients, specifiers and designers identify a "sustainable steel construction company".

The Charter's aim is to develop steel as a sustainable form of construction in terms of economic viability, social progress and environmental responsibility. Key performance indicators benchmark the development of sustainable steel construction so Charter members can measure their own progress.

Charter member companies are assessed against 12 criteria including publishing a sustainability policy, monitoring progress towards sustainability, involvement with local communities on social issues, having accredited quality, health and safety and environmental management systems, and having a policy to question suppliers about their sustainability policies.

Charter members must achieve at least six requirements; for Silver at least nine requirements must be met and for Gold all requirements must be met.

■ Find out more about the Steel Construction Sustainability Charter visit www.steelconstruction.org/resources/sustainability/the-charter

STEELWORK CONTRACTORS FOR BUILDINGS

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

C Heavy industrial platemwork for plant structures, bunkers, hoppers, silos etc
D High rise buildings
E Large span portals (over 30m)
F Medium/small span portals (up to 30m) and low rise buildings (up to 4 storeys)
G Medium rise buildings (from 5 to 15 storeys)
H Large span trusswork (over 20m)
J Tubular steelwork where tubular construction forms a major part of the structure
K Towers and masts
L Architectural steelwork for

staircases, balconies, canopies etc

M Frames for machinery, supports for plant and conveyors

N Large grandstands and stadia (over 5000 persons)

Q Specialist fabrication services

R Refurbishment

S Lighter fabrications including fire escapes, ladders and catwalks

QM Quality management certification to ISO 9001

SCM Steel Construction Sustainability Charter



TARGET ZERO®

Guides now available

The Target Zero project has produced fully-costed guidance on the design of sustainable, low and zero carbon buildings. Reports are available for five building types covering their operational energy, embodied energy and achievement of higher BREEAM ratings.



Guidance for Schools

This Target Zero guidance report on a secondary school building is based on Christ the King Centre for Learning in Knowsley. The 9,637m² steel-framed building is based on

a 9m x 9m structural grid and was built by Balfour Beatty under the BSF programme. The school opened in January 2009. The depth of the classrooms, a requirement of the local authority, means that mechanical ventilation is required.



Guidance for Mixed Use buildings

This report is based on the Holiday Inn tower on the MediaCityUK development at Salford Quays. It is part of a large development that

will house the BBC, comprising 65,032m² of office space across five buildings, a 23,225m² studio block, 7,432m² of retail space and two residential blocks of apartments. The tower used for the study is attached to the main studio building and made up of offices space on the lower level with a hotel above.



Guidance for Supermarkets

This report is based on Asda's food store at Stockton-on-Tees, completed in May 2008. The building has a floor area of 9,393m² over two levels.

The retail floor area, including a 1,910m² mezzanine level is 5,731m². The remaining (back-of-house) accommodation comprises offices, warehousing, cold storage, a bakery and a staff cafeteria.



Guidance for Offices

This guidance study was based on One Kingdom Street, near Paddington Central railway station in London, completed by Development Securities in 2008. The building houses 24,490m² of open-plan office space on 10-floors, and was designed to achieve the maximum floor plate depth in line with the British Council of Offices guidance. The steel framed building is on a typical 12m x 10.5m grid, and comprises fabricated cellular steel beams supporting a lightweight concrete slab on a profiled steel deck.



Guidance for Warehouses

The warehouse study was based on the 34,000m² DC3 distribution warehouse at Prologis Park, Stoke-on-Trent. Completed in December 2007 it is currently leased by a large UK retailer. It is a four-span steel portal framed warehouse attached to a two-storey office wing, providing 1,400m² of space. This updated report now takes into account the feed-in tariffs for renewable energy sources introduced by government in April 2010.

To view or download the guides or to find out more information about reducing carbon emissions in construction visit www.targetzero.info

The experts who worked on the Target Zero guidance reports are on hand to answer your questions. There is no charge for this service, so contact us now on the Target Zero information line **01709 82 55 44**

TARGET ZERO®
INFO

