FEBRUARY 2010 VOL 18 NO 2

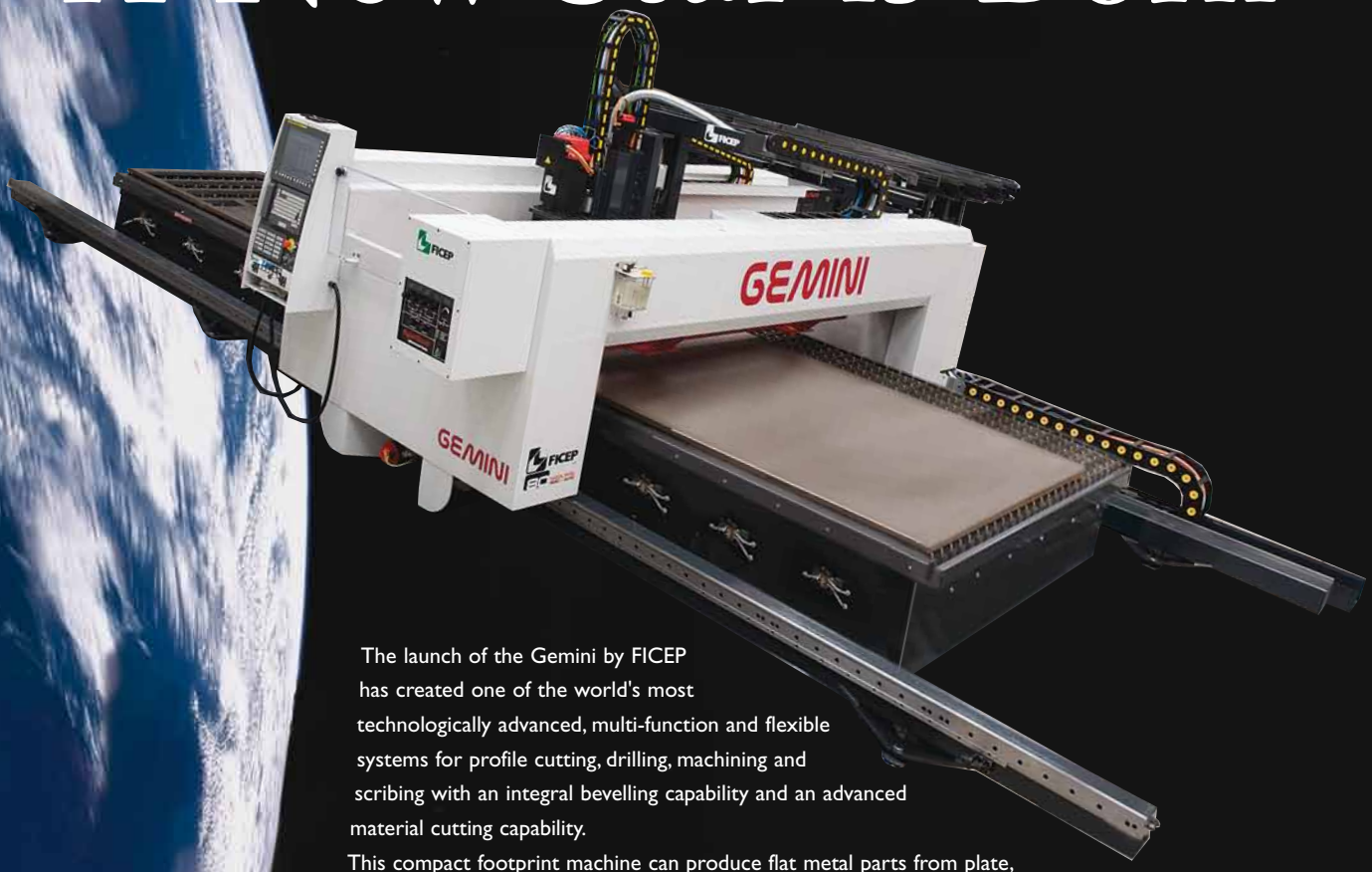
NSC

NEW STEEL CONSTRUCTION

www.new-steel-construction.com

Weston's super pier
Going well at Fontwell
Liverpool academy a winner
Viaduct creates Glasgow link

A New Star is Born



The launch of the Gemini by FICEP has created one of the world's most technologically advanced, multi-function and flexible systems for profile cutting, drilling, machining and scribing with an integral bevelling capability and an advanced material cutting capability.

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

Cover Image
The Grand Pier, Weston-super-Mare
Main Client:
Michelle & Kerry Michael
Architect: Angus Meek
Steelwork contractor:
William Haley Engineering
Steel tonnage: 900t

NSC NEW STEEL CONSTRUCTION
www.new-steel-construction.com

Not time to turn the taps off

The recession might not be quite over, but there seems to be agreement that at least an end to the worst is in sight. With financial meltdown averted and the huge stimulus given to economies by governments across the world seeming to have worked, attention now switches to when those taps can be safely turned off. Not yet, is the clear message from construction.

One confident voice that has been raised recently is that of Corus Chief Executive Kirby Adams, who was profiled in the Financial Times on 28 December and captured headlines with a call for government to boost investment in construction to drive the economy convincingly out of recession. But all the auguries point towards cuts in public sector investment over the coming years as the UK grapples with its large public sector debt; so any calls that can at least help counteract cuts as a solution to the economy's ills are more than welcome.

The UK's public sector debt as a percentage of gross national product isn't high by international standards, although it has grown faster in recent years – starting from a relatively low base - than others. So Mr Adams is right in suggesting that the UK has leeway to strike a balance between cutting debt and investing that doesn't devastate the construction industry. At least some key sectors for steel construction like health and schools look like escaping the axe, but others are more vulnerable.

Mr Adams said he was sure the first steps towards recovery had been taken in the steel manufacturing industry; demand is forecast to rise by 8% across Europe this year. This follows a 30% fall last year however, and construction is unlikely to lead the recovery. But it still looks like the corner might have been, or is shortly to be, turned.

This will have been done with very little direct government support for industry, as Mr Adams stressed when he called for government help for manufacturing generally. There is a lack of a coherent industrial strategy that would make the UK more attractive for manufacturers which needs to be addressed, he said. A healthy manufacturing sector would be good for construction. Many of the construction industry's clients as well as leading construction materials suppliers could be helped if even a fraction of the £76,000 million that has been used to support banks was used to rebuild the country's manufacturing base.

Whichever political party wins this year's general election will face tough choices, but support for the rebuilding of the UK's manufacturing base and investing in infrastructure, as the Corus chief says, has to find a way into any coherent plan for the future of a successful modern economy.

Nick Barrett - Editor

Carbon reduction scheme begins in April

The Government's Carbon Reduction Commitment (CRC), a scheme devised to enhance energy efficiency by addressing emissions not covered by climate change agreements, will come into force in April.

For those companies that qualify, CRC is a mandatory emissions trading scheme and will affect large organisations in both the public and private sectors.

"Qualification is based on half hourly electricity consumption during 2008," said Dr David Moore, BCSA Director of Engineering. "And the scheme could apply to many of the BCSA's larger steelwork fabricators."

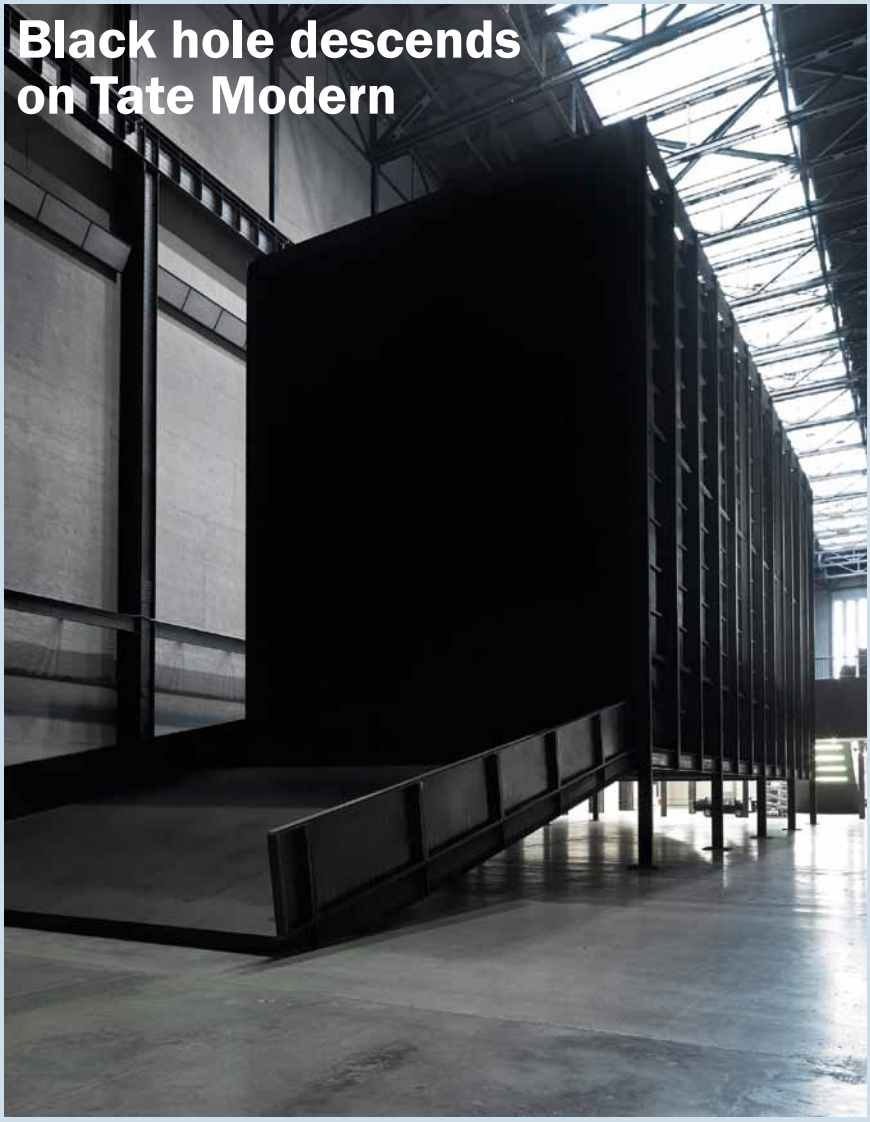
An organisation qualifies as a full participant in CRC if it has one half hourly meter (HHM) settled on the half hourly market, and its annual electricity consumption through all HHMs was at least 6,000MW.

Organisations which have an energy consumption of less than 6,000MW do not have to participate fully in CRC, however they do have to make an information disclosure.

"Any company that has a half hourly meter installed but hasn't yet collected its total energy consumption from such meters in 2008 should do so now," said Dr Moore. "Failure to register may lead to a fine when the scheme opens in April."

A copy of the CRC User Guide can be downloaded from: *http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/crc/user_guidance/user_guidance.aspx*

Black hole descends on Tate Modern



A vast steel container made entirely from Corus Advance sections is the eerie centrepiece of the latest exhibition at London's Tate Modern.

Measuring 13m high, 10m wide and 30m long, the steel container is mounted on a series of 2m high supports with one end open to the public and accessible via a ramp.

Designed by Polish artist Miroslaw Balka, and part of the Tate's 'How it is' series, the container invites people to enter it and experience the complete blackness within. The container has no internal lighting, but anyone walking into it can quickly turn around and observe other visitors outlined against light from the entrance.

The artist has long been obsessed with the fate of Poland's Jews during World War II, and the container is intended to evoke the suffocating and disorientating sensation of a cattle car or a gas chamber.

Steel provides hotel's architectural finish

The recently opened Grange St. Paul's Hotel in central London features an array of architectural steelwork to the atrium, the roof and scenic lift shaft.

Steelwork contractor Bourne Special Projects (BSP) installed two scenic bridges which span the 15m width of the atrium. Both structures are eight-storeys high and are supported by macalloy bars hung from a series of roof top trusses.

Howard Cox, BSP Director said: "Each of the bridges' eight levels were individually prefabricated and lifted into the atrium by tower crane."

BSP also installed a series of bowstring trusses - which span the atrium at roof level and support structural roof glazing .

"All of our steelwork is architectural and exposed. To achieve the best high-class finish featuring stainless steel pins and site welded heavy lift shaft sections was something of a challenge," summed up Mr Cox

British Standards

The BCSA has reminded its membership that next month (March) BSI will withdraw all British Standards that conflict with the Eurocodes.

A full list of superseded British Standards (more than 50) to be withdrawn is available from the BSI.

Members are also reminded that the Building Regulations in England, Scotland and Wales are expressed in functional terms and do not dictate the national design standard that should be used.

"Therefore withdrawn British Standards such as BS 5950 - structural use of steelwork in building - can continue to be used providing the designer can satisfy the checking authority that the approach satisfies the Building Regulations," explained Dr David Moore, BCSA Director of Engineering. A BSI committee responsible for BS 5950 has confirmed that it is safe to use this standard until at least 2014/15.

Meanwhile, Scottish ministers are currently considering a proposal to amend the guidance given in the Technical Handbooks that support the Scottish Building Regulations. A similar amendment in England and Wales was postponed until 2013.

The Building Standards Advisory Committee is currently considering guidance following a public consultation which closed last October. In the meantime, members wishing to use British Standards in Scotland may do so.

Machinery investment meets client demands

CMC UK has made its first investment in FICEP machinery with the installation of a semi automatic SCS 100L sawing line.

The machine has been installed at the company's new 17,372m^2 warehousing and office facility in Cardiff and is intended to meet the demands of its growing presence in the region.

CMC said it decided to use FICEP as its preferred supplier after evaluating many other sawing solutions. FICEP installed two smaller NC saws when the company opened for business in 2008.

Stephen Paul, UK Operations Manager said: "CMC UK purchased the larger saw as a result of FICEP's huge investment on technology which was clearly demonstrated when visiting their factories in Italy. To date we have received excellent back-up which is also a vital requirement in today's economy with the ever increasing demands our customers place upon us."

London 2012 Handball Arena taking shape

The Olympic Handball Arena is on track to be completed by summer 2011 as the first elements have begun to rise out of the ground.

Work is underway on the 1,000t steel frame for the structure, which is being fabricated by Watson Steel Structures. The steelwork is on schedule to be complete by this summer when work will also have started on the roof and external cladding, with a distinctive copper layer added later in the year.

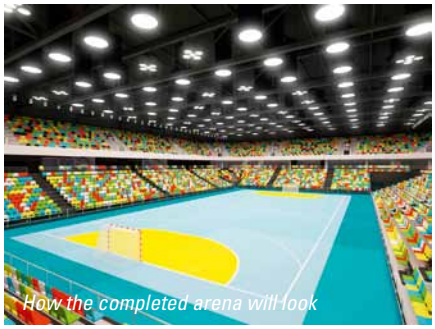
Foundations for the arena are now complete and these required 200 concrete columns to be installed. Prior to the steel frame being erected 10m high precast concrete walls will be lifted into place.

Once complete the venue will host a series of test events during 2011. During the Games it will seat up to 7,000 spectators and host qualifying games for the handball competition as well as modern pentathlon fencing and goalball during the Paralympic Games.

After the Olympics, the sustainable arena will become a multi-sports venue with retractable seating for around 6,000 spectators and flexible facilities catering for training and competition for all levels of indoor sport.

Olympic Delivery Authority Chief Executive David Higgins said: "We are right on track to deliver a distinctive Handball Arena that will provide a great experience for competitors and spectators during the Games and offer a new sustainable and flexible facility for local people to enjoy a wide range of sports in legacy."

Work underway on the Handball Arena



How the completed arena will look

AROUND THE PRESS

Financial Times
28 December 2009
Corus chief calls for big spending push in UK
Britain should shrug off worries about its huge government deficit and prepare to spend 'tens of billions of pounds' on infrastructure investment to push the economy out of recession according to Kirby Adams, chief executive of Corus.

Construction News
7 January 2010
Reasons to be cheerful
The steelwork for London's Shard skyscraper is now visible above ground, and the structure will be the tallest building in the UK by the end of the year.

New Civil Engineer
7 January 2010
Scottish space programme
Removal of the masonry wall (Edinburgh Royal Museum) made way for the installation of the permanent steelwork for each entrance. When this was in place, site workers removed the steel needles and props before the core holes were infilled. New permanent steel support columns and beams have also been added.

New Civil Engineer
7 January 2010
Saltire Awards
M8 Harthill footbridge replacement; the striking 70m span helical truss structure weighing 230t with a 2.5m wide deck incorporates 12 tubular steel members wrapped around the structure.

The Times
17 January 2010
Giant horse statue designed to ride out bomb attack
A £5M giant statue of a white stallion, which will greet Eurostar passengers arriving in Britain, is to be made bomb-proof.... The horse will be built from two steel frames. An internal one will carry the weight of the statue and a second will support wire mesh panels.

Project Scotland
December 2009
Over and under as M74 takes shape
'Our aim is not just to build and erect these bridges but also cause as little disruption to these vital transport links as possible. By using steel we are able to erect the bridges along with the necessary formwork and edge protection overnight and quickly."

Demand increases for Corus CPDs

The number of requests for Corus in-house Continuing Professional Development (CPD) seminars has shown a steep increase since last year when a central contact point was set up.

The upsurge in demand has resulted in Corus introducing a dedicated CPD page on its website, which clearly highlights what courses are available and what training opportunities are on offer.

"The fact that the seminars are now clearly visible on our website has helped increase demand further," said Neil Tilley, Corus Manager Construction Advisory Service. "We've also noticed a much wider selection of professionals requesting seminars, such as architects wanting to learn more about weathering steel and graduates interested in design issues."

There are 16 seminar topics available (see page 22 for a full list and explanation) and they can be tailored to suit individual requirements or projects.

"We can tailor the subjects to suit a company's requirements, and ensure that an appropriate level of technical content is achieved," added Mr Tilley.

The bespoke seminars are free of charge, last approximately 50 minutes and can be delivered at a time and date to suit the attendees.

British Library opens automated storage space

The British Library has officially opened its new £26M Additional Storage Building (ASB) at Boston Spa, Yorkshire.

Housed within a large steel frame, which required 800t of structural steelwork and was erected by James Killelea, there are 262 linear kilometers of shelf space for the national collection.

The project, managed by Capita Symonds, is the first of its kind to incorporate automated storage and retrieval systems, optimum environmental controls and low oxygen fire prevention technology in a single building.

The ASB, constructed by Allenbuild, is also one of the most air-tight buildings in the UK, with a leakage rate specification of no more than 0.5m³ of air per sq m of wall area per hour.

It will house low-use material including patent specifications, books and newspapers in 144,000 storage containers.

Corus provides building envelope for steel storage

Corus Panels and Profiles has supplied 10,400m² of Trisomet® 333 System - its new insulated composite roofing product - for the construction of Rainham Steel's new steel storage facility in Scunthorpe.

The new facility has the capacity to hold 75,000t of steel - enabling Rainham to more efficiently service the UK, European and world markets. The project's cladding contractor used the Corus' 80mm and 60mm Trisomet® 333 System for the roof and walls of the building in Corus' Colorcoat LG pre-finished steel.

Mark Clemson, Commercial Director Building Envelope, Corus Panels and Profiles said: "Performing to the highest standards of thermal performance and air-tightness, specifying Trisomet® 333 System can enable a finished building to achieve an air tightness performance as low as 3m³/hr/m² as well as a BREEAM excellent rating. Furthermore, with its environmentally friendly zero ODP insulation core, the system can be fully recycled once the building reaches the end of its useful lifespan – properties which contribute to making this one of the most sustainable building envelope systems currently available on the market."

SCI launches extension to design software

SCI has launched a new version of its Eurocode 3 stainless steel design software which now covers the design of laser welded and hot rolled stainless steel sections. An electronic database of Montanstahl hot rolled and laser welded section sizes is integrated into the software.

Nancy Baddoo, SCI Manager, Materials said: "Unlike carbon steel, there has never been a standard range of section sizes in stainless steel, making it challenging to design in a material which is favoured for its excellent corrosion resistance and strength. Montanstahl produce stainless sections in the same sizes as European and US standard carbon steel sections, thus making it easier for designers to move from designing in carbon to stainless steel."

The software now covers the design of hot rolled and laser welded channels, I sections, T sections and angles (equal and unequal), as well as cold formed and hollow sections. The online section database containing more than 500 section sizes allows users to select a particular section from the Montanstahl range for use in the design software.

City banks on steel

A new headquarters building for Rothschild merchant bank is currently under construction in the City of London.

Situated opposite the bank's current premises on St Swithin's Lane - which it has occupied since the early 19th Century - the 16-storey steel framed structure is being constructed by Bovis Lend Lease.

Steelwork contractor for the project is Rowen Structures and it has erected 1,900t of steel for the job, along with a further 300t of Corus Bi-steel.

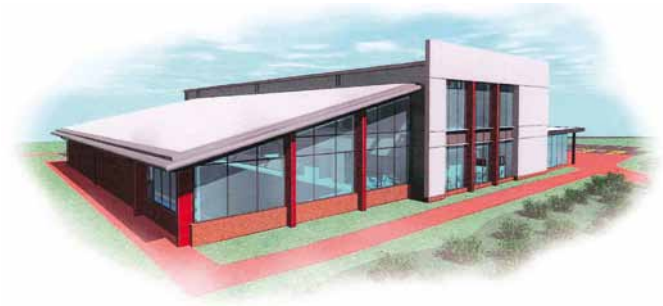
The building contains two Bi-steel structures, one core beginning at level 11 and extending up to the top floor, and another larger L-shaped shear wall which starts at lower ground floor and goes up to level 10.

Other notable features of the project include a double-height lobby which will be fully glazed along two elevations affording views of the adjacent St Stephen Walbrook Church.

To help create a large open plan lobby a major transfer structure has been erected along one elevation. This 4m deep truss supports 15-storeys of the building along one grid line.

"Because of its size the truss had to be brought to site in 12 sections," explained Andrew Henstock, Rowen Structures' Project Manager. "The top boom in three sections, the bottom boom in one piece and eight diagonals."

New community leisure centre



Work has started on a new community leisure centre in St Helens, Merseyside which will feature a five-lane, 25m swimming pool with a large changing room area.

Designed by Pozzoni architects with ISG undertaking the main contractor role, the two-storey steel framed structure is being built on the site of the former Queens Park Leisure Centre which was previously demolished.

The steelwork contractor for the project is EvadX and it is due to commence its work, which also includes installing precast stairs and metal decking, during February.

Additional facilities within the new Queens Park Leisure Centre include a spacious dance studio, with sprung timber flooring and a large fitness suite, boasting the very latest cardiovascular and free weights training equipment.

A viewing and vending area will be located at ground floor level, as well as a community meeting room and a number of administrative offices.

NEWS IN BRIEF

The BCSA and Corus have commissioned **Atkins** to develop a carbon footprint tool specifically for steel bridges. The tool will be a simple spreadsheet for estimating the construction and maintenance CO_2/energy of a steel composite bridge based on preliminary design quantities.

Billington Structures' work at the Richmond Centre at Catterick took the top prize at the Project of the Year Award ceremony at Birmingham's Metropole Hotel that showcased some of the biggest projects in the defence sector. The £600,000 project included the manufacture of 300t of steel to create a single storey Mess building at the garrison.

SCI is offering training courses on Eurocode preparation which can be arranged 'in-house' at your own premises or as a group with a number of companies. Courses are: Steel Building Design to EC3 - one day course; Essential Steelwork Design - two day course; an EC4 Composite Design - one day course. For more information and to book a course contact Jane Burrell Tel: 01344 636500 or email *education@steel-sci.com*

'Masterplanning science and technology parks' is a new BRE guide published by **IHS BRE press**. It offers comprehensive guidance on the masterplanning process, sustainable development for technology parks as well as including case studies showing how sites have been developed. The guide costs £120 and is available from *Brepress@ihs.com* or Tel: 01344 328038.

St John Ambulance has launched a new course aimed at helping small to medium sized businesses understand the basic processes involved in making their workplace legally compliant. It says 15% of businesses have never carried out an assessment to determine risks within the workplace and therefore how to protect staff. Prices for the course start at £270. For details call 08700 104065 or visit *www.sja.org.uk*

All change at Newport Station

Newport Station in South Wales is currently in the middle of a redevelopment programme with new passenger concourse buildings and footbridges under construction.

Architect for the project Grimshaw, said the town is bisected by railway tracks and as a result each half of Newport has its own character. Grimshaw's design embraces this divide, creating two new concourses, north and south, both linked by a large footbridge.

Working on behalf of main contractor Galliford Try, SH Structures is supplying all steelwork for the two circular concourse buildings, the footbridge as well as all access stairs.

The spiral form of the station is said to mirror the journey taken within the connecting bridge and back down onto the platforms. Grimshaw says the use of an ETFE wrap over a steel structure not only creates a very bright and airy space but also, due to the lightness of the material, means the building requires minimal support structure. The multi-million pound project is scheduled for completion in time for the Ryder Cup which will be held at nearby Celtic Manor from 27 September 2010.

Curved bridge for Dublin motorway upgrade

A major road widening scheme is underway along the M50 motorway, the Republic of Ireland's busiest road. A number of junctions are being redesigned, one of which is junction N3 which has involved the construction of a new 115m-long steel bridge.

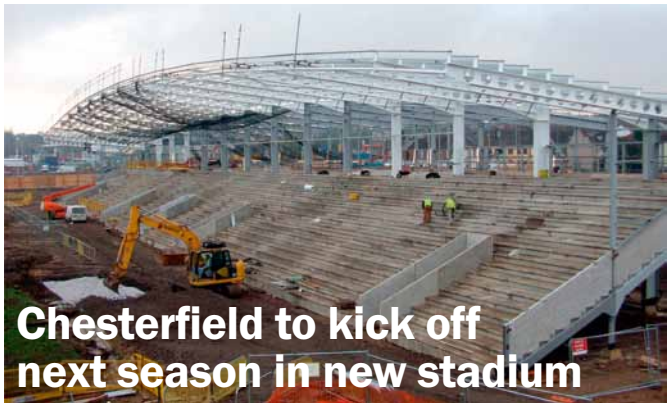
Due to the geometry of the new junction the bridge incorporates a curve and has a maximum skew of 60 degrees to the M50. This required a torsionally stiff deck and therefore a pair of trapezoidal box girders was selected for the main beams.

Structural engineer for the project Hewson Consulting Engineers, said using steel beams meant that road closures were kept to a minimum as large sections were brought to site and lifted in to place.

The new bridge, fabricated and erected by AMSE and requiring 550t of steel, has two spans both with a

deck width of 13m and supported on a central pier.

The entire steel bridge was erected during four night time road closures involving tandem lifts with a 700t capacity mobile crane and a 350t capacity unit.



Chesterfield to kick off next season in new stadium

Chesterfield FC is playing its final season at the Saltergate ground as work is progressing on schedule on the new B2net Stadium which is due to open for the 2010/11 season.

The new 10,338 all-seater stadium is being constructed by GB Building Solutions, with the structural steel frame and precast terracing supplied and erected by Robinson Construction.

Rob McGann, Robinson Contracts Manager said: "We've erected 730t of structural steelwork which includes the decking to the corporate facilities for the project, terracing, steps and stairs covered by 15m-long cantilevered Westok tapered rafters, all within the agreed 12 weeks programme."

The new stadium is located on the outskirts of Chesterfield adjacent to the A61 on a site previously occupied by the Dema Glass factory. The project forms part of a wider regeneration scheme which also includes a number of retail developments.

Diary

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

2 February 2010
Steel Connection Design
Birmingham

4 February 2010
Steel Building Design to EC3
Manchester

9 February 2010
Steel Frames & Disproportionate Collapse Rules
Sheffield

10 February 2010
Preparation for Eurocodes
Joint with ISE/London

23 & 24 February 2010
Essential Steelwork Design (2 day)
Bristol

25 February 2010
Floor Vibrations
Manchester

4 March 2010
Steel Building Design to EC3
Gloucester

9 March 2010
Stability of Steel Framed Buildings
Nottingham

11 March 2010
ISE Stability of Steel Framed Buildings
Joint with ISE/London

18 March 2010
EC4 Composite Design
Birmingham

23 March 2010
Steel Connection Design
Darlington

30 March 2010
Steel Building Design to EC3
Edinburgh

Going good for steel

A new architecturally prominent three-storey grandstand is set to turn Fontwell Racecourse into one of Sussex's main conference and exhibition venues.

Work is underway at Fontwell Racecourse in West Sussex to create a new three storey grandstand featuring hospitality boxes, a restaurant for 250 people and a multi purpose exhibition hall on the ground floor with catering and betting facilities. The structure will also feature a terrace area providing a mixture of seating and standing for a further 1,200 spectators.

Work at the picturesque south coast racecourse began last Summer with the demolition of an old 1920s stand, which cleared the footprint for the new and bigger structure. By October the groundworks, which included the installation of retaining walls at one end of the footprint to help level out a sloping site, had been completed and steelwork erection was able to commence.

During this time and in fact throughout the construction programme Fontwell's fortnightly race meetings have continued unaffected by the works.

"We've had to coordinate our programme and work around the meetings," explains Brett Kanjurs, Buckingham's Project Manager. "On race days we normally stop working at 10am."

Aside from having to work around Fontwell's busy horse racing calendar, getting materials to site has proven to be quite a challenge. There are turnstiles and occupied buildings directly behind the new structure, effectively denying the site a lay-down area or a major access route.

The new stand is also positioned directly in front of the track's finishing line and as this important part of the grass course must be left untouched by construction vehicles, most materials including steelwork, have been lifted over the track from the centre of the course.

"We've used two cranes for the project, one 80t capacity crane to lift steel over the course and another smaller 35t crane positioned next to the structure to erect the material," explains Ian Burchnall, Contracts Manager for steelwork contractor D.A Green & Sons.

"A sort of cantilever off of another cantilever creates a suspended floor for the accommodation levels."

An access route to the centre of the course has been opened up to the construction team via a public car park on the far side of the track from the new stand. Deliveries can cross the grass track at this one designated point and then proceed to a point opposite the new stand.

"When steelwork is delivered we've always had the larger crane on site," says Mr Burchnall. "While the smaller 35 tonner is small enough to gain access onto the site's footprint."

As well as steelwork erection, D.A Green has also been responsible for installing two precast lift shafts

Clockwise from above

Above: The architectural vision for the new stand

Right: All steelwork had to be lifted over the course by a 80t capacity mobile crane to prevent damage to the race track

Below left: The new stand will offer the best view of the course's finishing line

Left: There is no room for materials storage behind the new stand

Above left: One 35t capacity crane was able to be accommodated next to the project to erect all steelwork

FACT FILE
Premier Grandstand, Fontwell Park Racecourse, West Sussex
Client: *Northern Racing*
Architect: *AFL*
Main contractor: *Buckingham Group*
Structural engineer: *CampbellReith*
Steelwork contractor: *D.A Green & Sons*
Steel tonnage: *200t*
Project value: *£6.5M*

and the installation of all metal decking. The stand's stability is derived from bracing located around the lift shafts and stairwells.

Commenting on the design of the stand, CampbellReith Associate Julian Birbeck, says: "Steel is quick to erect as there is a tight programme and this swayed the decision to go with this material. We also wanted to keep the structure's frame as light as possible to minimise foundation costs.

"We were then able to work around a 10.8m x 4m grid pattern which suited the upper level's executive boxes as the column lines fall within the partition walls. On the ground floor, which has a larger footprint than the other floors an 8m grid is used as the area is an expo area and larger column free spaces were required."

The 4m grid pattern is also advantageous for the first floor which will house a large hospitality suite able to accommodate 250 people, making it one of the largest function suites for weddings and parties in West Sussex. The floor space can also be divided into 12 separate breakout rooms with the aid of sliding partitions. The ground floor and first floor will have more than 1,000m^2 of potential exhibition or function space.

The upper or second floor level, again based around the same 4m grid pattern, will have 12 hospitality boxes offering panoramic views over the course. Above this level the stand will have a Kingspan composite roof which overhangs along the front elevation by 2.6m.

"Steel has a better finish as there is plenty of exposed galvanised steelwork for the upper balconies and roof, both of which cantilever out from the main structure," says Mr Birbeck. "Steel lends itself to these architectural finishes."

One end of the new stand has an attached control tower which will have two upper floors to accommodate course stewards and the press. The tower itself is formed by a series of 16m-high columns, while half way up a cantilever structure - containing the press and steward's viewing gallery - juts out.

The tower presented a design challenge with its shape, which is driven by the need to provide floor space at high level, served by a single dedicated staircase. A double cantilever with a horizontal backspan form the lower floor of the tower, while the two-storey upper area is connected by a vierendeel truss with horizontal and vertical bracing taking loads back to the main structure.

The vierendeel truss is formed by two larger 8m long girders which are spliced together form one large vertical frame. "A sort of cantilever off of another cantilever creates a suspended floor for the accommodation levels," says Mr Burchnall.

Fontwell's new grandstand is scheduled to open for the Ladies Evening race meeting in August.

Community spirited school

NSC reports on the continuing National Academies framework in Liverpool where the new £24M Litherland High School for Sefton Council is under construction.

FACT FILE
Litherland High School, Liverpool
Main Client: *Sefton Metropolitan Borough Council*
Architect: *Sheppard Robson*
Main contractor: *Kier Northwest*
Structural engineer: *WSP*
Steelwork contractor: *The AA Group (TAAG)*
Steel tonnage: *700t*
Project value: *£24M*

Above: The school will have a number of facilities open to the local community

Below: Extra beams were added to accommodate a thicker slab

The National Academies framework programme is continuing across the country with a number of projects taking shape with aesthetically pleasing designs. New school buildings are intended to inspire students and not present a daunting image as many older establishments once did.

Nowhere is this more evident than in Liverpool, where NSC has already reported on two architecturally driven school projects (NSC February 2009, NSC September 2009) which will change the face of local educational buildings.

Another example of this school construction trend in Liverpool is the new £24M Litherland High School currently under construction for Sefton Council. With an architecturally eye-catching design, this steel framed project also has the wider local community at heart, as a number of facilities will be open to the general public.

These include a student run hair salon where members of the public will be able to have a trim, in and out of school hours. Other radical features of the school – which is due to open its doors in early 2011 – include outdoor classrooms for both art and science lessons, which will enable students to work from specially designed verandas situated on the upper levels of the predominantly three-storey structure.

The new Litherland High School is being constructed on land occupied by the current school. Approximately 25% of the existing buildings have had to be demolished by main contractor Kier to make way for the new structure. Kier has also erected some temporary teaching accommodation to allow the school to function as normally as possible during the construction programme.

"We are constructing the new building right up against the existing school buildings on a very tight site," explains Pat Mondino, Kier Divisional Design Manager. "This means we've always endeavoured to keep noise to an absolute minimum so not to disturb the pupils and we've even stopped work on one occasion because examinations were taking place."

When the school is complete and the students have decamped into their new state of the art facility, Kier will begin its final construction phase and demolish the remaining old buildings and temporary structures, landscaping this area into new sports fields.

Much of the demolition work will take place during school holidays, but by this time the construction team will be used to working around the school curriculum.

Work on site initially kicked off during June 2009, with the steel frame erection commencing three months later in September. Mr Mondino says the decision to go for a steel framed structure was driven by the tight programme as well as the site's confined nature and shape. "Steel has been quicker to erect than other possible options," he says. "While it also gives added flexibility to the overall design."

Aaron Wall, Structural Engineer for WSP agrees and adds: "Future requirements may change over time, by using steel the classroom configurations can be altered if needed, far more easily than if the structure had concrete walls."

To accommodate this in-built flexibility there is no bracing situated in the structure's classroom walls, with all stability derived from bracing located in stairwells. The exception to this is in the sports hall and main hall, where bracing is located within the walls as reconfiguration is unlikely in this part of the school.

Acoustics - the desire to limit noise penetrating through floors - has also played a significant role in the design of the school. In teaching areas extra beams to accommodate a thicker floor slab have been inserted within the standard grid pattern. This has not meant any extra tonnage to the overall

Top: Steel has been erected metres from the existing school buildings
Above: Steel model of the new school
Below: A steel framed solution was chosen for its speed of construction
Bottom: A glazed atrium will connect the project's two blocks

"Future requirements may change over time. By using steel the classroom configurations can be altered if needed, far more easily than if the structure had concrete walls."

project's steel content as lighter steel members have been used in these areas.

The site's shape, hemmed in next to the remaining old buildings and a boundary road, also played a role in the design. The structure is essentially made up of two wings, one a three storey teaching block which is curved in plan, and another rectangular block containing a sports and a main hall.

Both of the wings form one large structure and are connected by a two storey high glazed atrium.

"The design requirement for the school was based around clusters of classrooms and spaces dictated by their functions," adds Mr Wall.

In this way the three storey teaching block is based around a regular 7m by 7m grid pattern with all internal columns placed in partition walls or either side of a central passageway. The top or third floor of the block will house the school's science department and will include two outdoor verandas (for outdoor teaching, as previously mentioned) positioned at either end of the building.

The other wing will include a main hall incorporating a drama studio and production stage, dining room with two music rooms and an indoor sports hall. Positioned between these large open plan areas will be a two-storey sector containing practice rooms, changing rooms and a performance studio.

Summing up the project Head Teacher Jim Donnelly says: "The structure is awe-inspiring. We will have a 21st Century school based on the educational vision we gave to the architects and builders. This will boost our students' aspirations."

The original pier entrance was left unscathed by the devestating fire of 2008

Restoring a seaside institution

The Grand Pier at Weston-super-Mare will reopen this summer following a rebuilding programme after much of the original structure was damaged by a fire in 2008. Martin Cooper reports.

Nothing quite sums up or encapsulates the traditional British seaside as much as a pier. These iconic structures which jut out into the briny and offer everything from amusement arcades to concert halls and candy floss stalls to genteel promenades adorned with deckchairs are unfortunately not as common as they once were.

Since their Edwardian heyday many piers have fallen into disrepair or have even been demolished altogether, while others, most notably Southend, Southwould and Cromer live on as attractions enhancing their towns.

A fine example of the latter was the Grand Pier at Weston-super-Mare, Somerset which until a devastating fire in 2008 was one of the UK's best preserved and well known piers. Originally opened in 1904, the pier was supported on some 600 piles and stretched some 400m into the Bristol Channel.

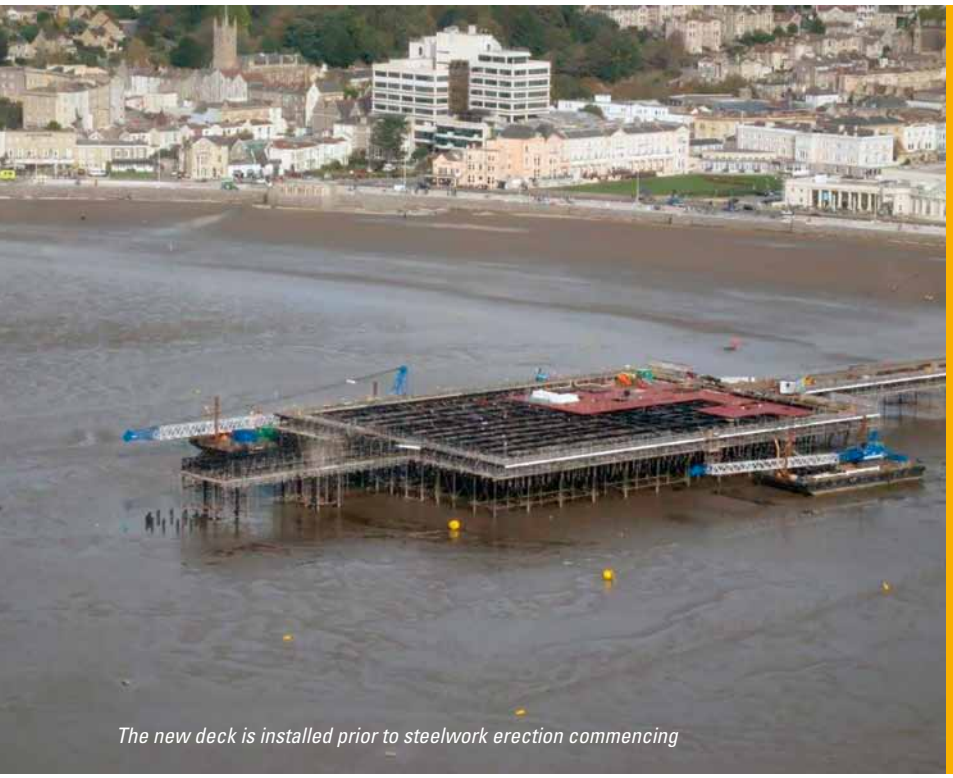
Disaster was not unknown to the pier as fire had struck before in 1930, when its original theatre was gutted. When it reopened after three years renovation a new pavilion housing a large undercover funfair had replaced the theatre and it was this structure which fell victim to the latest conflagration.

After the fire a design competition for a new pavilion was held during the latter part of 2008 and was won by Bristol-based Angus Meek Architects. Its design, incorporating a 90m-tall observation tower was approved by the local authorities in early 2009.

Commenting on the effort to get the pier rebuilt, Kerry Michael, Co-owner of the Grand Pier, said: "From the day of the fire there had been no question that we wanted to get on with the reconstruction straightaway, the pier is a symbol of the town and has been a major draw for generations."

Prior to reconstruction beginning and main contractor John Sisk & Son starting on site, a complete survey of the remaining original structure had already been carried out along with a clear up operation of the damaged wooden superstructure. The 250m-long walkway (known as the waist) which connects the entrance on the beach to the pavilion was undamaged, while only the piles and steel deck beams which once supported the pavilion remained at the end of the pier.

Cranes on board barges erect the steelwork for the pier. They are too heavy to work directly off of the pier's deck



The new deck is installed prior to steelwork erection commencing

Delivering steelwork and accuracy

One major problem for the team was how to get the steel from the beach head to the end of the pier. Will Haley, General Manager of William Haley Engineering comments: "The heaviest steel piece weighed over 5t and the existing pier waist had a carrying capacity of 2t per axle. We proposed using light bogies separated mechanically so that the load would always be shared between two pier spans. By adopting this method, hundreds of thousands of pounds were saved by avoiding building a parallel causeway on which to run cranes."

Another vital part of the success of the steelwork programme was the fabrication accuracy says Niki Horton, William Haley Engineering Quality Manager. "Our aim was that what went down the pier was right first time. We did two 100% inspections of all steelwork and it succeeded. Out of nearly 3,000 pieces only three pieces needed work on site – and that was drilling holes. That's pretty good when you consider that the pieces were nearly all different."

FACT FILE
The Grand Pier, Weston-super-Mare
Main client: *Michelle & Kerry Michael*
Architect: *Angus Meek*
Main contractor: *John Sisk & Son*
Structural engineer: *W.A Fairhurst & Partners*
Steelwork contractor: *William Haley Engineering*
Steel tonnage: *900t*

The original piles and deck beams were refurbished and now support a new deck, and a total of 84 new piles were driven to bedrock 20m below beach level to support the new pavilion superstructure. Basically all horizontal loads are taken by the old piles, which are laced together with horizontal ties and diagonal bracing rods. The vertical loads from the new structure are supported on the new piles.

"A lot of detailing had to be done on this part of the design," explains Phil Ridge, Project Partner for W.A Fairhurst. "To accommodate the differential settlement between the original piles which support the deck, and only penetrate 5m or so into the soft silty clays which underly the beach, and the much longer stiffer new piles that support the superstructure. A steel collar and plate has been clamped around the new piles and bolted to the deck plates. This ensures that the deck can move differentially to the new piles while still providing lateral restraint."

The new deck is an innovative sandwich plate system which provided a flat surface on which plant equipment could operate and was installed (450t in total) by William Haley Engineering in just over four weeks.

Commenting on its initial project activities Richard Sutton, John Sisk's Contracts Manager, says: "Our first job was to get the main structural frame erected and organise the delivery of equipment. We wanted the structure, minus the tower, up and clad as quickly as possible."

Getting materials to a site 250m out in the sea and then assembling it obviously presented a host of unique challenges, which all swayed the decision to use steel. Mr Ridge says: "Steel was the only option for this job because of the location, it's lighter and more manageable."

Having cranes on moored barges in a tidal bay meant the steel erection had to be organised around the tidal movements.

Steel deliveries have all been made via the waist (see box story), but the only viable way of getting equipment on site was by sea. One 180t capacity Kobelco crawler crane and six cherrypickers were all loaded on to a barge at Cardiff Docks and made the short crossing of the Bristol Channel to the site. The cherrypickers have no problem manouevring on the pier's new deck, but cranes are too heavy and so the Kobelco unit operates via a barge moored off the north side of the pier. Another 80t crane is moored on the opposite side of the site on a 'jack-up' barge which affords it more reach.

Having cranes on moored barges in a tidal bay meant the steel erection had to be organised around the tidal movements as William Haley Engineering's Project Manager Matt Bryant

Above: All materials for the project including steelwork, scaffolding and cladding are delivered via the waist which connects the new pavilion to the beach front entrance

explains: "We couldn't use the cranes when the tide was in and the barges were floating. Working seven days a week, we managed our shifts around the tides as we had plenty of on-site floodlighting to allow work to carry on into the evenings when necessary."

Steel erection followed a regimented east to west sequence, working away from the waist and so allowing all follow-on trades early access to the site. The frame for the new pier pavilion has three spans, 14.5m, 18.5m and 14.5m, which provide the large open spaces for the intended rides and attractions. Cellular beams have been used for all of these spans supporting concrete floor slabs.

Four 20m high architectural towers are positioned in each of the four corners, while the floor plan consists of a ground floor (known as the Great Hall), a level one mezzanine, a second floor which only covers the front third of the structure and will house administrative offices, and a third level for plant.

"The design of the structure incorporates a portal frame running north to south (which is parallel to the beach) with diagonal bracing located east to west," explains Mr Ridge.

Interestingly the four architectural towers have had to be structurally hung from the first floor mezzanine level. This was necessary because new piles to take the towers columns couldn't be squeezed into the grid of existing piles.

Covering the pavilion is a curved wave-like steel roof formed with facetted steel beams and supported by a series of 1.5m deep trusses.

Also part of the main pavilion structure and attached to the main frame is another two-storey building known as the pier head. Supported on new piles driven between the refurbished original piles and located at the western end of the pier, this structure will house a function room and cafe as well as providing access to the observation tower.

The first floor of the pier head is formed by a storey deep truss which spans the 15m distance between the piles. Above this a more traditional column and beam formation creates the upper level.

A bridge link will allow access from the pier head to the 90m tall tower. This will be a new independent structure founded on steel piles and a reinforced concrete base frame designed to withstand the very high overturning forces produced by wind and wave action.

The steel frame will be made up of prefabricated elements which will be bolted together on site. This part of the project is scheduled to be completed by summer 2011, while the pavilion is due to open its doors to holiday-makers during this year's peak season of July.

Right: Working out at sea has meant dealing with plenty of winter storms

Right: Cellular beams are used to form the neccessary long spans of the Great Hall, while the steel deck allows cherrypickers to work on the pier

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FACT FILE
M74 Completion project, Glasgow
Client: *Transport Scotland, Glasgow City Council, South Lanarkshire Council, Renfrewshire Council*
Main contractor: *Interlink M74 JV, a joint venture comprising Balfour Beatty, Morgan Est, Morrison Construction, Sir Robert McAlpine*
Structural engineer: *Jacobs/Atkins JV*
Steelwork contractor: *Cleveland Bridge*
Steel tonnage: *19,000t*
Project value: *£445M*

Launching a viaduct

At 750m long the Port Eglinton Viaduct is the longest bridge on Glasgow's M74 Completion project. Crossing some of the city's busiest roads and rail lines, the structure's longest span will require a launching procedure to erect it over the West Coast Main Line.

Requiring approximately 14,500 tonnes of steel, the Port Eglinton Viaduct is a huge structure that will form an integral element of Glasgow's M74 Completion project. With 12 spans of varying length, the bridge not only crosses Eglinton Street one of the busiest roads into the city centre, but also the West Coast Mainline, the SPT Underground tunnels near West Street Station as well as the Paisley, and City & Union rail lines. It also passes through a very busy trading area where access for businesses has to be maintained and disruption kept to a minimum.

Constructing a bridge over all these vital transport arteries has required a huge amount of coordination between the project team members, the client and importantly Network Rail and Glasgow Councils traffic division.

Stephen Osborne, Project Manager for Cleveland Bridge says: "Our aim is not just to build and erect this bridge but also to cause as little disruption to these vital transport links as possible. By using steel we are able to erect the bridge, along with the necessary formwork and edge protection, overnight and quickly."

Working on behalf of the Interlink JV, Cleveland Bridge has been contracted to fabricate and erect the four main steel bridges for the project, which consist from west to east, the 232m-long M8 Eastbound Link Bridge, the 750m-long Port Eglinton Viaduct, the 186m-long Rutherglen Station Bridge and the Auchenshuggle Bridge across the River Clyde which will be 90m long.

Structural engineer for the project is a Jacobs/Atkins joint venture and it says steel was chosen for the major bridges because of economics and ease of construction. The structures span busy roads and railway lines and the client wanted to limit the time of possessions and closures. Steel bridge girders assembled off-site can be lifted into place overnight and thereby keep disruption to the general public to a minimum.

The 12 span Port Eglinton bridge is supported at each end by reinforced concrete abutments and at eleven intermediate locations by multiple circular reinforced concrete piers. The superstructure is made up of steel box girders with a reinforced concrete deck which is cast in-situ. Once the main superstructure is in place, follow on works will complete the parapets, waterproofing and road surfacing.

The engineer's comments are borne out by the fact that box girders for Port Eglinton are being

Left: The bridge will cross numerous roads and railway lines in south Glasgow

Above: Assembled and positioned box girders

Above right: The nose or tip of the westbound span to be launched in February

assembled close to the erection points at designated assembly yards. For the five spans already erected towards the end of last year, steel sections were delivered and pre-assembled into 30 girders each ranging from 50m to 70m long and weighing up to 200t.

Once the girders had been pre-assembled they were transported to the erection cranes - a distance of some 100m - by multi-axle trailers and were each individually lifted into position during a series of night time rail and road possessions.

The structure will launch forward at a rate of approximately 10m per hour

Lifting these huge steel girders into place required months of planning and the use of the UK's largest mobile crane, a 1,200t capacity Gottwald AK-680, which needed over 30 trucks to deliver it to site.

The longest span of the Port Eglinton Viaduct, at 120m long between Piers 9 and 10 which crosses the West Coast Main Lines and Eglinton Road, will be launched into position in two halves each weighing approximately 4,500t and measuring 200m long. First the westbound carriageway will be launched during February and then later on in the year the eastbound carriageway will be launched. Each carriageway is pre-assembled clear of the railway then launched independently during successive rail possessions.

The westbound section of bridge was pre-assembled over the last five months from 22 individual box girders. Each box girder is 4.5m deep, nearly 6m wide with an average length of 20m and weighing around 100t. These large girders had to be delivered to site in halves due to transport restrictions in the area. Once on site they were welded together to form a full open top box girder and then lifted onto 10m high temporary trestles, where further welding took place to join them all together to form a 200m long bridge section.

This section that spans the West Coast Main Line has its concrete deck constructed prior to launching so that work over the railway is kept to a minimum. The assembly of the launch was a logistical challenge due to the size of the girders, volume of materials and plant required to work in a very small area within a busy trading estate.

The weight of steel plus the concrete deck produces a launch weight of approximately 4,500t. Nearly 1,000t of temporary steel support trestles and ancillary temporary works were designed and fabricated specifically for the assembly and launching operation.

The 4,500t structure will be slid into position by two 418t capacity strand jacks while supported on a series of temporary trestles. For control purposes, one strand jack pulls and one restrains the structure. Slide friction is overcome by using a series of 400t capacity rollers which are located on the top of the support trestles. Due to the geometry and stiffness of the structure, the rollers are supported on hydraulically linked flat jacks in order to equalise and balance the loads in the support system which ensures the equipment is not overloaded.

"This method of launch control offers a very smooth, safe, sliding operation which can be controlled to within millimeters," explains Mr Osborne. "But what makes this launch different is that the structure is on a plan curve. We will have a series of rollers to guide the structure around the curve as it launches forward."

The structure will launch forward at a rate of approximately 10m per hour. With only two hour possessions permitted on the West Coast Main Line, the launch will take around 10 nights to complete.

"With a span of this length, size, weight and the access restrictions around the railway there was no real alternative than to pre-assemble the deck away from the railway and launch it," explains Mr Osborne. "This way the disruption to the railway has been significantly reduced to only a handful of night time possessions."

Below: Box girder being assembled in one of the project's yards

Corus in-house CPDs

Demand for Continuing Professional Development (CPD) training courses has accelerated as requests flood in for Corus in-house seminars.

Since March last year when a central contact point for these in-house seminars was set-up, Corus has seen an increase in the demand for these events, with over 100 being requested. The enormous amount of interest shown and increase in demand has led to the introduction of a dedicated CPD page on its website, setting out what courses are available and what training opportunities they offer.

There are 16 seminar topics available, ranging from steel grades, tubular joints, sustainabilty steel buildings, sustainable foundations to weathering steel bridges. Requesting a course couldn't be easier, simply fill in the online request form and one of Corus' team of regional technical managers will contact you to discuss your exact requirements.

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Alternatively contact: *ken.oliver@corusgroup.com*

List of courses:

Steel Grades

This seminar looks at the main steel material standards (EN 10210, 10219, 10025), and how to specify the correct type of steel to ensure the steel provided complies with the appropriate standard.

The physical differences between cold formed and hot finished hollow sections are discussed, together with their implications in terms of design.

This is followed by a full explanation of clause 2.4.4 of BS 5950 that covers the area of steel sub-grade selection, an area of the code that is misunderstood and often neglected.

Target Audience: Engineers/ Fabricators

Tubular Joints

This seminar is a practical introduction to tubular jointing, with worked examples illustrating best practice.

It is known that if not considered at the outset the sizing of members in tubular joints can cause significant difficulties later on in the design process.

This presentation provides some practical rules of thumb that can be used early on in design to ensure that member proportions are appropriate for both member and joint capacity.

Target Audience: Engineers/ Fabricators

Designing Steel Building for Fire

This seminar considers the functional requirements of the Building Regulations and the ways in which these can be met.

It will examine what happens in a real fire to a steel frame and describe the ongoing research work into whole frame behavior at Cardington and the resulting guidance that is available. Case studies incorporating the new design approaches will be shown.

The latest guidance on the behavior of single storey buildings in fire and the significance of boundary conditions will also be included.

Target Audience: Engineers/Fabricators/Architects

Corefast: Multi-Storey Steel Building Cores

This seminar explains how Corefast works and the type of projects that can benefit from the use of this innovative new approach.

The Corefast system is a new approach to creating building cores that uses Bi-steel panels that can be quickly and simply bolted together on site allowing the erection of a core in a matter of days rather than weeks.

Bi-steel is a Corus product that was developed some 10 years ago and has also been used very successfully in applications where safety and security are important priorities.

Target Audience: Engineers/Fabricators/Architects

Slimdek

This seminar will encompass the design, detailing and installation of the Slimdek shallow floor system.

By considering a typical floor bay, the seminar will illustrate the thought processes required to develop a scheme quickly and maximize the benefits of using Slimdek. The issues to be considered include the choice of edge beam, propping, internal ties, fire protection, slab penetrations; the effects of plan form on the economy of the design.

The seminar will also show detail typical construction details, and practical considerations for construction.

Target Audience: Engineers/Fabricators/Architects

Sustainable Steel Buildings

This seminar will seek to clarify what is meant by the phrase a "a sustainable building"

The seminar will look at the Government Sustainable Construction Strategy including its background, main features and implications. It will address how you measure sustainability including the the advantages and limitations of Carbon footprinting.

Other topics included within the seminar include thermal mass, design for deconstruction and the possible impact of new technologies.

Target Audience: Engineers/Fabricators/Architects

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Pre-finished steel for roof and wall cladding

This seminar highlights the role of pre-finished-steel in architecture and explains the importance of specifying both the pre-finished steel as well as the cladding system to generate the optimum final specification.

The seminar includes the definition and specification of a pre-finished steel product, performance statements and guarantees, maintenance requirements and how this impacts on building life cycle costs and sustainability considerations.

The seminar will also cover, aesthetic performance, robustness and Health and Safety.

Target Audience: Architects

Importance of air-tightness in non-domestic buildings

This seminar demonstrates where the air-leakage paths in the steel building envelope are, and shows that when correctly specified and installed, both built up and composites systems help meet the requirement ADL2A 2006, and although U values remain the same, significant improvements in air-tightness of buildings will have to be made if the required 23.5% to 28% reduction in CO_2 is to be met.

The seminar will include discussion on the relationship between the 2006 and the 2002 regulations & minimum expected levels of performance, the impact of air-tightness and its importance when demonstrating compliance and guidance on the use of pre-finished steel in the building envelope.

Target Audience: Architects

Discussing standing seam; 21st Century Design

This seminar is a forward thinking, practical seminar that provokes open discussion and audience participation adding a more bespoke element to the core syllabus of the content.

The seminar tackles the pertinent issues faced by the industry and offers a step by step guide through the building regulations and standards, sustainability and technical considerations all of which are fundamental to future system design and performance.

Target Audience: Architects

Part L2A: 200

The seminar provides an invaluable insight into headline issues addressed through Approved Document Part L:2006.

It covers the scientific and legislative background and requirements of Approved Document Part L: 2006 and explains the compliance method and workable solutions to meet part L.

Target Audience: Architects

Refurbishment Solutions

The seminar covers typical refurbishment solutions available and their financial, social, economic and environmental aspects.

The seminar also discusses various detailing, evaluation and assessment processes, relevant Building Regulations and how to achieve their requirements effectively.

Target Audience: Architects

Factory Tour – Insulated Panel Line at Shotton Works

The main objective of the tour is for the visitor to gain technical knowledge and understanding of the manufacturing process of the Corus Trisomet® 333 System. The state-of-the-art insulated panel production line is one of the most automated and efficient in Europe in terms of manning, yield loss,

energy use and volume output.
Target Audience: Architects

ComFlor® in Construction

This seminar provides an insight into the use of ComFlor® composite floor decks.

The seminar addresses the key issues to be considered when specifying a structural composite floor such as spanning, concrete usage, Health and Safety implications and acoustics.

Other topics include FibreFlor in construction, impact of building lifecycle costs, sustainability and environmental impact and case study examples.
Target Audience: Engineers/Fabricators

Steel bearing piles

The seminar considers the option of steel H piles for foundation construction. In addition to an overview of design issues and features that steel H piles offer, the topics of installation and durability - which are frequently raised as reasons not to use H piles - are discussed.

A brief consideration of the sustainability of steel piling concludes the seminar.
Target Audience: Engineers/Fabricators/Architects

Sustainable foundations

This seminar considers the case for steel in the ground from the sustainability point of view.

The fact that steel can be removed, refurbished, reused and recycled when the life of a structure comes to an end is demonstrated with practical examples. Innovative uses for steel elements which offer reduced construction time are also introduced.
Target Audience: Engineers

Steel intensive basements

Steel sheet piling has been used for many years as temporary works to create holes in the ground enabling the permanent structure to be built. Considering the sheet piling as permanent walls to the structure minimises the work to be carried out below ground and frequently offers substantial time and cost savings.

The seminar considers issues relevant to the construction of steel intensive basements including design, watertightness, durability, installation, aesthetics and material selection.

In all cases these talks will be suitable for engineers at all levels. They may be of interest to architects on the basis that sustainability features in all the talks to a greater or lesser extent and aesthetics is covered in the basements talk.
Target Audience: Engineers/Architects

Weathering Steel Bridges

Weathering steel is a high strength low alloy steel that in suitable environments forms an adherent protective rust 'patina', to prevent further corrosion. The corrosion rate is so low that bridges fabricated from unpainted weathering steel can achieve a 120 year design life with only nominal maintenance. Hence, a well detailed weathering steel bridge in an appropriate environment can provide an attractive, very low maintenance, economic solution in many locations.

This seminar, highlights the benefits of weathering steel bridges, describes the limitations, and comments on both the material availability and the appearance of such bridges.

It also provides advice on a range of issues including, design and detailing, fabrication and installation, inspection and maintenance, and remedial measures should corrosion rates exceed those anticipated at the design stage.
Target Audience: Engineers/Fabricators/Architects

Clarity brought to blind bolt resistances

Andy Smith of the SCI reports on a recent project to develop characteristic resistances of bespoke connectors, using the approach described in BS EN 1990.

Blind bolts

Blind Bolts

Blind bolts have been developed to enable easy connections to be made when access to one side of the connection is restricted, such as in a hollow section. A weighted toggle sits within the shaft of the bolt when it is inserted into the hole and will drop across the hole from the inside when the bolt is rotated through 90°. The bolts are manufactured in grade 10.9 material (yield strength of 900 N/mm², ultimate tensile strength of 1000 N/mm²) and are available in sizes from M8 to M24.

Due to the unique cross-section of the product, and the possible failure mechanisms relating to the toggle, the design rules according to BS 5950-1 or BS EN 1993-1-8 cannot be used without modification. Acting for the manufacturer, SCI commissioned a series of tests on the bolts and developed product-specific design rules using an analysis in accordance with BS EN 1990.

Testing programme

Tests were undertaken to establish the tensile resistance, shear resistance and bearing resistance of the bolts, as well as the combined tension and shear behaviour. In common with usual practice, the tensile resistance was determined by applying a compressive force to an assembly consisting of two "U" shaped blocks bolted together across their tips. Tests were undertaken on three different bolt sizes – M10, M20 and M24.

Shear tests were undertaken across the slotted region of the bolt for the three different bolt sizes to establish the relationship between the shear area and the resistance. The shear resistance of the threaded region is well established, but tests across this plane were carried out for the M10 size to verify the established design rules for use with blind bolts.

The performance of the bolts in combined bending and shear was established by applying a tensile force to a rig that allows the bolt to be angled, as shown. M10 and M20 bolts were tested at angles of 30°, 45° and 60°.

Bearing tests were performed with plate thicknesses of 6 mm, 10 mm and 15 mm, and steel grades of S275 and S355. The majority of these tests failed due to shear of the bolt, but a sufficient number failed through bearing to develop design rules for the bolts.

In addition to the tests on the bolts themselves, coupon tests were performed to establish the strength of the bolt material. Cylindrical samples were cut from the bolts and subjected to a tensile test to establish the yield and ultimate tensile strengths.

Above: Bolt failure from bearing test.
Right: Combined tension and shear test

Establishing design rules from test data

The test data was used to calibrate the design rules in BS 5950-1 and BS EN 1993-1-8 to be specific to the product. For the tensile resistance, the test results were first normalised to the nominal yield strength using the observed yield strength. These resistances were then compared to the nominal tensile strength calculated using the equation from Eurocode 3 with the minimum cross sectional area (which is the area in the slotted region where the pin is located). This comparison is shown in Figure 1.

The graph shows consistency between the three different bolt sizes, but a gradient of less than 1.0 for the line of best fit that passes through the origin. For each of the 14 successful tests, a correction factor was calculated as the ratio of the normalised maximum load to the nominal resistance and then these were used to establish a characteristic correction factor using the statistical methods in BS EN 1990, Annex D. This resulted in the following equation for the tensile resistance of blind bolts:

$$F_{t,Rd} = \frac{F_{t,Rk}}{\gamma_{M2}} = \frac{0.537 f_{u,nom} A_t}{\gamma_{M2}}$$

where $f_{u,nom}$ is the nominal ultimate tensile strength of the bolt material (1000 N/mm² in this case), A_t is the tensile area of the bolt and γ_{M2} is the partial factor, defined as 1.25 in the UK National Annex. This is the same equation as found in

BS EN 1993-1-8 for the tensile resistance of a bolt, but with a k_2 factor of 0.537, rather than the 0.9 or 0.63 for standard bolts or countersunk bolts respectively. The mean test result, the characteristic tensile resistance (which is a 95% confidence limit) and the design tensile resistance are shown in the following table for the three bolt sizes tested.

Bolt size	$F_{t,Rm}$ (kN)	$F_{t,Rk}$ (kN)	$F_{t,Rd}$ (kN)
M10	16.87	16.16	12.93
M20	78.03	72.28	57.82
M24	114.43	102.89	82.31

An equivalent equation was developed for design to BS 5950-1, where a tensile strength of p_t = 430 N/mm² is used in place of the value given.

A similar analysis was conducted for the shear resistance of the bolts, and this found that the characteristic correction factor on the Eurocode equation was greater than 1.0. Rather than giving an improvement over the Standard-defined values, the rules from BS EN 1993-1-8 were adopted without modification, so the resulting design equation is:

$$F_{v,Rd} = \frac{F_{v,Rk}}{\gamma_{M2}} = \frac{\alpha_v f_{ub} A}{\gamma_{M2}}$$

where α_v is taken as 0.5 when the shear plane passes through the threaded region and 0.6 when the shear plan passes through the unthreaded region, and A is taken as the shear area of the shear plane in question. The mean, characteristic and design resistances for the slotted region of the bolts for the three sizes are as follows:

Bolt size	$F_{v,Rm}$ (kN)	$F_{v,Rk}$ (kN)	$F_{v,Rd}$ (kN)
M10	32.05	23.78	19.02
M20	148.04	95.13	76.10
M24	257.20	131.71	105.37

The test results also showed an enhancement over the resistances to BS 5950-1, so the rules defined in that Standard were adopted unaltered.

For the combined tension and shear tests, the intention was simply to validate the current design rules:

To EC3: $\frac{F_{v,Ed}}{F_{v,Rd}} + \frac{F_{t,Ed}}{1.4F_{t,Rd}} \leq 1.0$

To BS5950: $\frac{F_s}{P_s} + \frac{F_t}{P_t} \leq 1.4$

The test results were split into their tension and shear components and compared to the mean tension and shear resistances from the pure tension and shear tests. These results were then plotted to enable comparison with the rules from the Standards. This comparison is shown in Figure 2.

This plot shows that all of the test results fell outside of the design envelopes for both the Eurocode and British Standard, so the current rules can be adopted for the blind bolts. Making the comparison using the mean test results incorporates a suitable factor of safety as the design resistances will be used in the equations in practice.

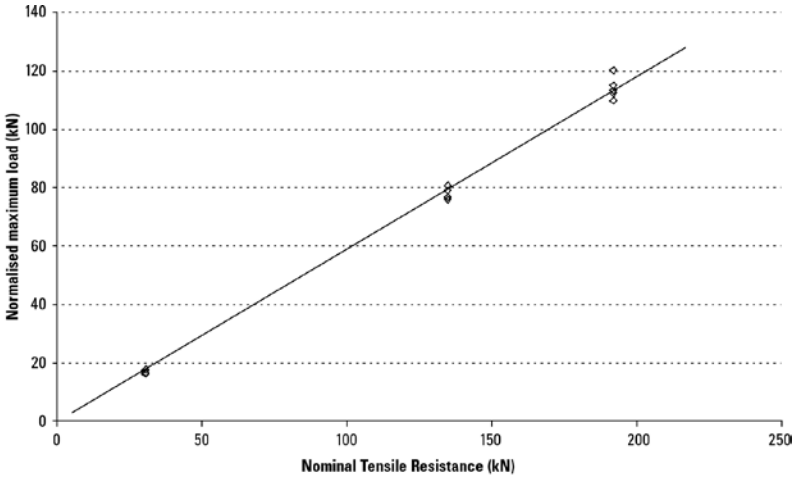

Figure 1: Comparison between nominal and observed tensile resistances

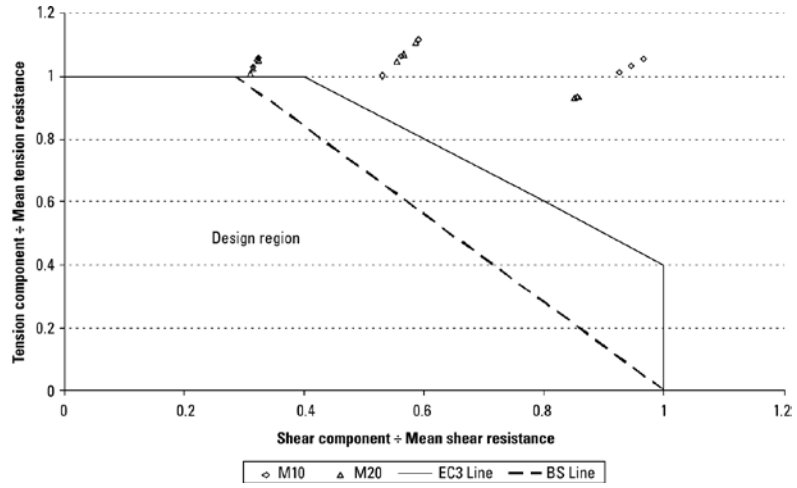

Figure 2: Combined tension and shear test results

The bearing resistance is defined in different ways to the Eurocodes and British Standards. In BS EN 1993-1-8, the bearing resistance is the ultimate strength of the connection, and the analysis showed that there is no change to the design rules in the Standard as the presence of the slot appears not to have an effect. The design equation is therefore:

$$F_{b,Rd} = \frac{k_1 \alpha_b f_u dt}{\gamma_{M2}}$$

where k_1 and α_b are factors that take into account the geometry of the plate and hole, f_u is the ultimate tensile strength of the plate material, d is the diameter of the hole and t is the thickness of the plate. The mean, characteristic and design resistances for the tests that failed in bearing rather than in shear are as follows:

Bolt size	Plate thickness (mm)	Steel grade	$F_{b,m}$ (kN)	$F_{b,Rk}$ (kN)	$F_{b,Rd}$ (kN)
M20	6	S275	144.6	97.8	78.2
		S355	168.1	115.9	92.7
M24	6	S275	177.4	119.1	95.3
		S355	204.8	141.3	113.0
	10	S275	267.9	198.5	158.8
		S355	289.5	235.4	188.3

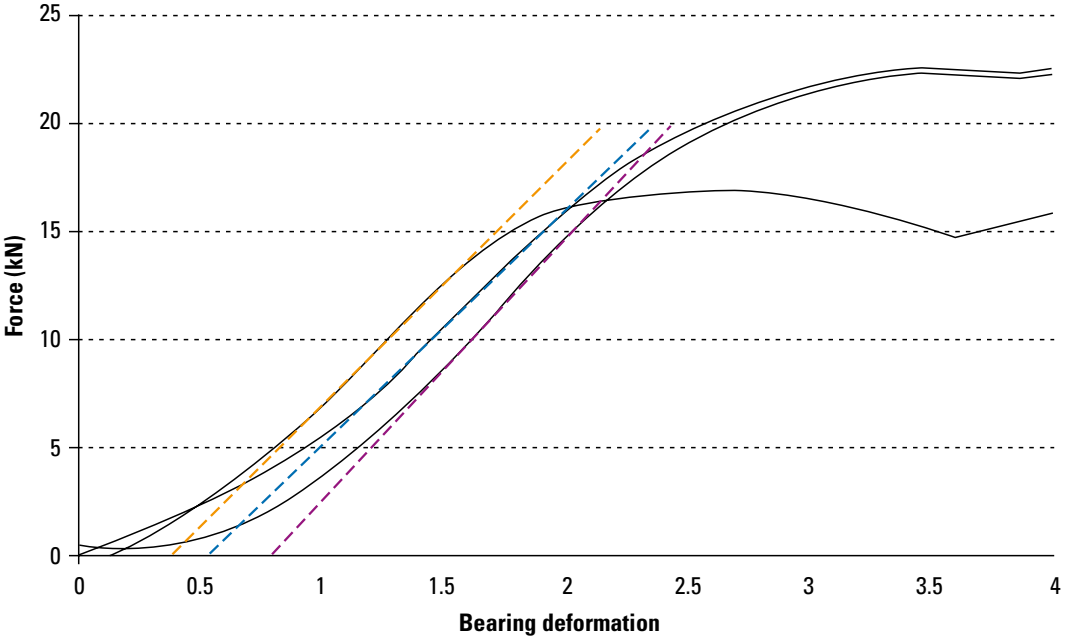

Figure 3: Initial gradients for M10 bolts in 6 mm S275 plate

For design to the British Standards, the bearing resistance is a serviceability limit, allowing a maximum deformation under working loads of 1.5 mm. For each test, the gradient of the slope after bedding in was determined, as shown in Figure 3.

The bearing capacity of each test was calculated by multiplying the gradient by the deformation limit (1.5 mm) and a factor of 1.5 that accounts for the difference between design load and working load (taken as the average of the dead load and live load factors). All of these capacities were significantly lower than the bearing resistances to Eurocode 3 shown above. A modified version of the BS 5950-1 equation was used to calibrate the bearing capacity:

$$p_{bs} = k_{bs}(d\text{-}c)t_p p_{bs} \leq 0.5 k_{bs} e t_p p_{bs}$$

where k_{bs} = 1.0 for standard clearance holes, d is the diameter of the bolt, c is the width of the slot, tp is the thickness of the plate, p_{bs} is the bearing strength of the connected part and e is the end distance. This equation was used to develop a nominal bearing capacity for each test, and the results were plotted as shown in Figure 4.

Comparison of the bearing capacities from tests with the nominal bearing resistance

As the vast majority of the test results are above or close to the unity line, the bearing capacity is effectively a serviceability limit, and the bearing resistances are significantly lower than the ultimate design bearing resistances given by the Eurocodes, it was decided that the modified equation given above could be applied for design to the Eurocodes.

The design equations for blind bolts have been developed to be consistent with the current rules in both the Eurocodes and British Standards, and can be applied for other sizes of blind bolts within the range tested as long as the proportions are similar. More information on blind bolts, including all of the design properties, is available from *www.blindbolt.co.uk*. The test results and design values given above should give confidence in the values that are quoted, and enable the designer to use them without further modification.

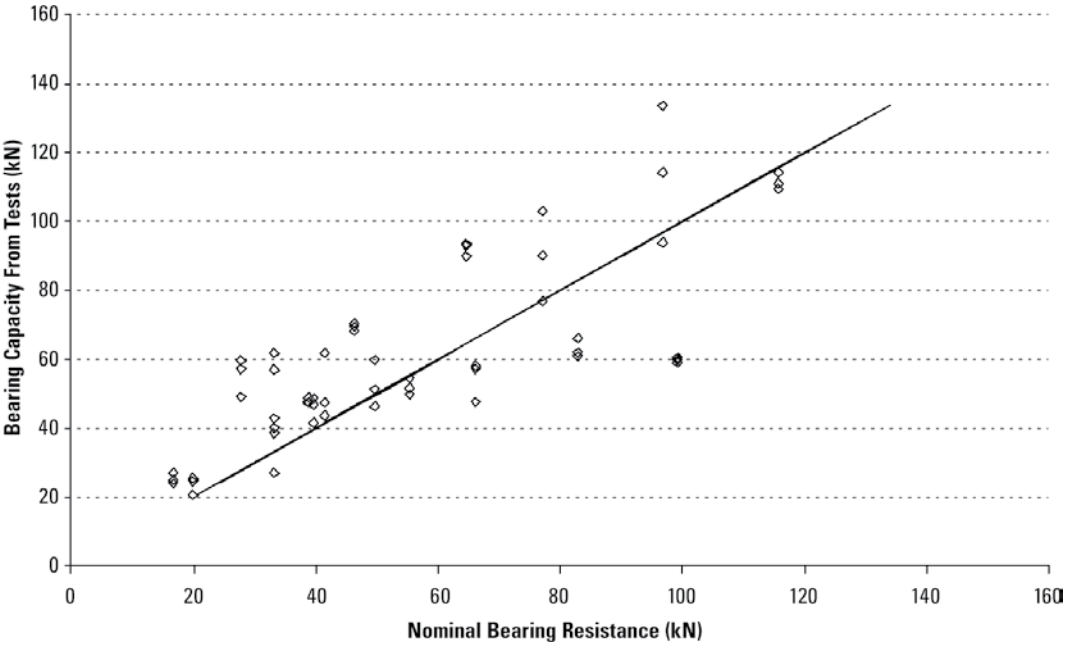

Figure 4: Comparison of the bearing capacities from tests with the nominal bearing resistance

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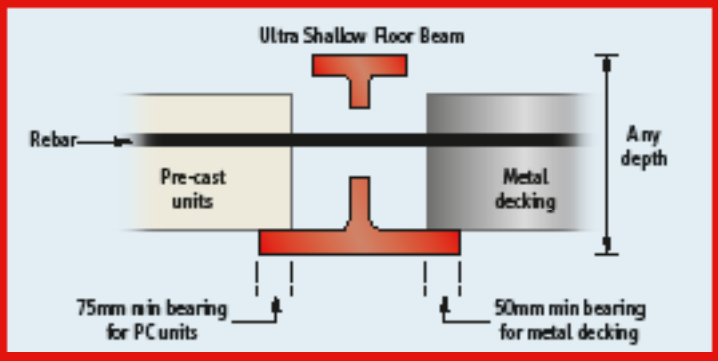

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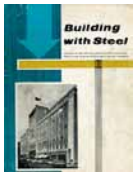

Building with Steel, the BCSA's *'informative journal relating to the progress of and developments in the Constructional Steelwork Industry'* was first published in February 1960. The magazine summarised the previous fifteen years of steel construction with this gallery…

Eminent post–war buildings in steel

ASSOCIATED ELECTRICAL INDUSTRIES LIMITED

Grosvenor Place, London SW1

The building is the headquarters of the important and massive A. E. I. Group.

ARCHITECTS: *Wimperis, Simpson & Fyffe*
CONSULTING ENGINEERS: *R. T. James & Partners*

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY

Lower Regent Street, London SW1

A notable example of post war design.

JOINT ARCHITECTS: *Trehearne & Norman Preston & Partners; Leslie C. Norton*

BANK OF LONDON & SOUTH AMERICA LIMITED

Queen Victoria Street, London EC4

The City of London contains many buildings of outstanding architectural merit, most of the using steel as a structural medium.

ARCHITECTS: *Victor Heal & Smith*

3M HOUSE

Wigmore Street, London W1

This is a typical mid-20th century building and possesses all the advantages of the period.

ARCHITECTS: *C. H. Elsom & Partners*
CONSULTING ENGINEERS: *Clarke, Nicholls & Marcel*

FLEETWAY HOUSE

Farringdon Street, London EC4

Bearing a famous name in journalistic history this building was designed and built for Fleetway Publications Limited.

ARCHITECTS: *Ellis Clarke & Gallannaugh*

FOUNTAIN HOUSE

Fenchurch Street, London EC3

An outstanding contribution to the City of London.

ARCHITECTS: *W. H Rogers*
CONSULTING ENGINEERS: *G. A Dodd & Partners*

BUCKLERSBURY HOUSE

Lower Regent Street, London SW1

By far the most prominent building in the City of London today. Rebuilding is still proceeding on the site which was devestated during the war.

ARCHITECTS: *Campbell Jones & Sons*
CONSULTING ENGINEERS: *J. L. Wheeler & Jupp; Hurst Peirce and Malcolm*

The Printing Works, London E14

For: The Financial Times Ltd

Architects:
Nicholas Grimshaw & Partners Ltd

Structural Engineers:
J Robinson & Son (Consulting Engineers) Ltd

Steelwork Contractor:
Conder Structures

Main Contractor:
Bovis Construction Limited

The site is at the former East India Dock, London Docklands.

Two state-of-the-art printing presses, which were already on order had to be accommodated in a new printing hall. Associated with this were publishing, production facilities, bulk paper storage and despatch areas amounting to a total of 14,000 sq m (150,000 sq ft). The building had to be ready to receive the printing presses within twelve months of the initial briefing session and completed ready to start printing six months later.

The building is a clear statement of its internal organisation with the two large and intricate printing presses visible to commuters on the A13 through a 16 metre high 92 metre long glazed wall. To achieve this large glazed screen within the context of the building a special glazing and structural system was developed within the very tight programme. This included modelling and testing of full scale prototypes.

One of the aims of the development is that the building will not only fulfil its function but become a landmark and identify The Financial Times with the overall Docklands development.

The steel-framed building was designed with the economy of industrialised building techniques in mind. Both a fast construction time and a flexible building capable of future expansion have been achieved. The building configuration allows for a doubling of printing facilities. The glazed walls utilise a frameless structural glazing system and the remaining areas are clad in a specially developed and tested panel system using super-plastic aluminium.

The structure contains over 1500 tonnes of structural steel, much of it being complex fabrication. Thirty aerofoil columns each 16.5m long, were erected around the perimeter of the building, with lattice columns and roof trusses up to 20m long used in other areas.

Three gangs of erectors working to an erection sequence of 21 phases completed the programme in only 10 weeks.

Judges' Comments:
Structural steel was chosen to provide not only economy and speed, but also to create an elegant and pleasant working environment. The facade, in particular the glazed wall, is ingenious and very successful although the same attention to detail is not reflected in the interior of the building

AD 342
Stainless steel fasteners

The purpose of this Advisory Desk Note is to provide guidance on the specification and selection of stainless steel fasteners for use in non-preloaded structural connections. The requirements for chemical composition and mechanical properties of stainless steel fasteners are specified in BS EN ISO 3506 *Mechanical properties of corrosion-resistant stainless steel fasteners*. The Standard was revised at the end of 2009 and now comprises four separate Parts: BS EN ISO 3506-1 covers bolts, screws and studs; BS EN ISO 3506-2 covers nuts; BS EN ISO 3506-3 covers set-screws; and BS EN ISO 3506-4 covers self-tapping screws.

In this Standard, bolts, screws and studs are designated by a letter followed by three numbers, e.g. A2-70 or A4-80. The letter refers to the group of stainless steel: austenitic (A), martensitic (C) or ferritic (F). The letter is followed by a number (1, 2, 3, 4 or 5) which reflects the corrosion resistance; 1 representing the least durable and 5 the most durable. The final two numbers denote the property class, which describes the mechanical properties of the bolt, screw, stud or nut (see Table 1).

For most structural applications, it is generally recommended that austenitic bolts grade A2 or A4 and property class 70 or 80 are used. Steels of grade A2 have equivalent corrosion resistance to grade 1.4301 (304). Steels of grade A4 contain molybdenum and have equivalent corrosion resistance to grade 1.4401 (316). Property class 70 fasteners are made from cold drawn bar. Property class 80 fasteners are made from severely hard cold drawn bar, with mechanical properties similar to carbon steel and alloy steel grade 8.8 steel bolts to BS EN ISO 898.

The following alternatives may be considered for particular applications:

- A duplex composition (designated FA which stands for ferritic-austentic) is mentioned in Annex B of BS EN ISO 3506-1 and it is likely that this group of stainless steels will be included in future revisions of the Standard.

Property Class	Bolts, Screws & Studs		Nuts [1]
	Ultimate tensile strength [2] (N/mm^2)	Stress at 0.2% permanent strain (N/mm^2)	Proof load stress (N/mm^2)
50	500	210	500
70	700	450	700
80	800	600	800

Notes:
(1) Nominal height ≥ 0.8 *d* where *d* is the nominal thread diameter (bolt diameter)
(2) The tensile stress is calculated on the stress area.

Table 1: Mechanical properties of austenitic grade bolts, screws, studs and nuts to BS EN ISO 3506

- Steel grade A1 is suitable for machining. Due to high sulfur content, the steels within this grade have lower resistance to corrosion than corresponding steels with normal sulfur content. Care should be exercised if Grade A1 bolts are being considered.
- The less common grades A3 and A5 are stabilised versions of A2 and A4 respectively and can be used as alternatives to A2 or A4 in applications where there is a risk of intergranular corrosion.
- Low carbon variants can be specified for A2 and A4 fasteners (e.g. A4L) with improved resistance to intergranular corrosion, particularly when welded (they are rarely used in practice).
- Property class 50 represents steel in the annealed condition and will be non-magnetic (unlike property classes 70 and 80, which may demonstrate some magnetic properties). If class 50 fasteners are specified with machined threads, they may be more prone to thread galling than those in the higher property classes.
- Although not included in the Standard, property class 100 bolts and nuts are available up to size M20 (stress at 0.2% permanent strain = 800 N/mm^2 and ultimate tensile strength = 1000 N/mm^2).
- Additionally, duplex bolts and nuts are available in grade 1.4462 with mechanical properties in accordance with property class 80 and superior corrosion resistance to austenitic fasteners.

When choosing a stainless steel fastener, consideration should be given to matching the strength and corrosion resistance of the bolts and parent material. To avoid the risk of bimetallic corrosion (see Advisory Desk 339), stainless steel bolts should always be used when connecting stainless steel members. Stainless steel bolts are also suitable for connecting galvanized steel and aluminium members.

Expressions for shear, tension and bearing resistances of stainless steel fasteners are given in:

Design Manual for Structural Stainless Steel, Third Edition, Euro Inox and SCI, 2006
Available from *www.euro-inox.org* or *www.steel-stainless.org/designmanual*
Structural Design of Stainless Steel, P291, 2001
Available from *www.steelbiz.org*. Paper copies may be ordered from Steelbiz or directly from SCI.

Guidance on the grade of fasteners to use in swimming pool environments is available on the BSSA web site (*www.bssa.org.uk*).

The above guidance includes information provided by Stainless Steel Fasteners Ltd (*www.ssfast.co.uk*).

Contact: N R Baddoo
Tel: 01344 636525
Email: advisory@steel-sci.com

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New and Revised Codes & Standards

(from BSI Updates January 2010)

BRITISH STANDARDS

NA to BS EN 1993-6:2007
UK National Annex to Eurocode 3. Design of steel structures. Crane supporting structures.
No current standard is superseded

BS EN PUBLICATIONS

BS EN 10349:2009
Steel castings. Austenitic manganese steel castings
No current standard is superseded

PUBLISHED DOCUMENTS

PD 6688-1-4:2009
Background information to the National Annex to BS EN 1991-1-4 and additional guidance
No current standard is superseded

PD ISO/TR 10809-1:2009
Cast irons. Materials and properties for design
No current standard is superseded

CORRIGENDA TO BRITISH STANDARDS

BS EN 10269:1999+A1:2006
Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties
CORRIGENDUM 4
Also incorporates Corrigenda 1, 2 & 3 and Amendment 1

SPECIAL ANNOUNCEMENTS

BS 5950-1:2001
Structural use of steelwork in building. Code of practice for design. Rolled and welded sections

BS 5950-4:1994
Structural use of steelwork in building. Code of practice for design of composite slabs with profiled steel sheeting

BS 5950-6:1995
Structural use of steelwork in building. Code of practice for design of light gauge profiled steel sheeting

BS 5950-8:2003
Structural use of steelwork in building. Code of practice for fire resistant design

BS 5950-9:1994
Structural use of steelwork in building. Code of practice for stressed skin design

These documents have been reviewed and confirmed without change by the UK committee B/525/31. These documents are superseded by the Eurocodes EN 1993 and are due to be withdrawn in March 2010 when the Eurocodes will be fully implemented

BRITISH STANDARDS UNDER REVIEW

BS EN ISO 8044:2000
Corrosion of metals and alloys. Basic terms and definitions

BS EN ISO 8501-1:2007
Preparation of steel substrates before application of paints and related proucts. Visual assessment of surface cleanliness. Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings

BS EN ISO 8504-1:2001
(BS 7079-D1:2000)
Preparation of steel substrates before application of paints and related products. Surface preparation methods. General principles

BS EN ISO 8504-2:2001
(BS 7079-D2:2000)
Preparation of steel substrates before application of paints and related products. Surface preparation methods. Abrasive blast cleaning

BS EN ISO 9934-1:2001
Non-destructive testing. Magnetic particle testing. General principles

CEN EUROPEAN STANDARDS

EN 1993-1-3:-
Eurocode 3. Design of steel structures. General rules. Supplementary rules for cold-formed members and sheeting
CORRIGENDUM 1.
November 2009 to EN 1993-1-3:2006

Steelwork contractors for buildings

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

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

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

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
A C Bacon Engineering Ltd	01953 850611			●	●		●										Up to £1,400,000
ACL Structures Ltd	01258 456051			●	●	●	●				●				●		Up to £3,000,000
Adey Steel Ltd	01509 556677				●	●	●	●		●	●			●	●		Up to £3,000,000
Adstone Construction Ltd	01905 794561			●	●	●											Up to £4,000,000
Advanced Fabrications Poyle Ltd	01753 531116				●		●	●	●	●	●				●	✓	Up to £800,000
Andrew Mannion Structural Engineers Ltd	00 353 90 644 8300		●	●	●	●	●	●			●	●		●		✓	Up to £3,000,000
Angle Ring Company Ltd	0121 557 7241												●				Up to £800,000
Apex Steel Structures Ltd	01268 660828				●		●			●	●						Up to £800,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●		●	●					Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●		Up to £800,000*
ASD Westok Ltd	01924 264121												●				Up to £6,000,000
ASME Engineering Ltd	020 8954 0028				●					●	●			●	●	✓	Up to £1,400,000*
Atlas Ward Structures Ltd	01944 710421		●	●	●	●	●	●	●	●	●	●		●	●	✓	Above £6,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●		●							●			Up to £2,000,000
AWF Steel Ltd	01236 457960				●				●	●	●			●	●		Up to £100,000
B D Structures Ltd	01942 817770			●	●	●	●				●			●			Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✓	Up to £2,000,000
Barnshaw Section Benders Ltd	01902 880848												●			✓	Up to £800,000
Barrett Steel Buildings Ltd	01274 266800			●	●	●	●									✓	Up to £6,000,000
Barretts of Aspley Ltd	01525 280136			●	●	●				●	●			●	●		Up to £3,000,000
BHC Ltd	01555 840006	●	●	●	●	●	●							●			Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Bone Steel Ltd	01698 375000	●	●	●	●	●	●			●	●	●		●		✓	Up to £6,000,000*
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Browne Structures Ltd	01283 212720				●			●							●		Up to £400,000
Cairnhill Structures Ltd	01236 449393				●	●	●	●		●	●			●	●	✓	Up to £1,400,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●			●	●		●		✓	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 502277	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000*
CMF Ltd	020 8844 0940				●		●	●		●	●				●		Up to £6,000,000
Cordell Group Ltd	01642 452406	●			●	●	●	●	●	●	●					✓	Up to £3,000,000
Cougar Steel Stairs Ltd	01274 266800														●		Up to £6,000,000*
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●		Up to £1,400,000
Crown Structural Engineering Ltd	01623 490555			●	●	●	●		●		●			●		✓	Up to £800,000
D A Green & Sons Ltd	01406 370585		●	●	●	●	●	●	●	●	●	●		●	●	✓	Up to £6,000,000
D H Structures Ltd	01785 246269				●						●						Up to £200,000
Deconsys Technology Ltd	01274 521700				●					●				●	●		Up to £200,000
Discain Project Services Ltd	01604 787276				●					●	●				●	✓	Up to £1,400,000
Duggan Steel Ltd	00 353 29 70072		●	●	●	●	●	●			●					✓	Up to £6,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✓	Up to £6,000,000
Emmett Fabrications Ltd	01274 597484			●	●	●	●							●			Up to £1,400,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✓	Up to £3,000,000
F J Booth & Partners Ltd	01642 241581			●	●		●				●				●	✓	Up to £4,000,000
Fisher Engineering Ltd	028 6638 8521		●	●	●	●	●	●	●	●	●	●				✓	Above £6,000,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**Contract Value (1)**

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●			●						Up to £3,000,000
Gibbs Engineering Ltd	01278 455253				●		●	●		●	●				●	✓	Up to £200,000
GME Structures Ltd	01939 233023			●	●		●	●		●	●			●	●		Up to £800,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●			Up to £1,400,000
Graham Wood Structural Ltd	01903 755991		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000
Grays Engineering (Contracts) Ltd	01375 372411				●			●		●	●				●		Up to £100,000
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●				✓	Up to £4,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●			●						Up to £2,000,000
Had Fab Ltd	01875 611711								●		●				●	✓	Up to £1,400,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✓	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●				●	●					Up to £2,000,000
Henry Smith (Constructional Engineers) Ltd	01606 592121			●	●	●	●	●									Up to £6,000,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●		Up to £4,000,000
Hills of Shoeburyness Ltd	01702 296321									●	●				●		Up to £800,000
J Robertson & Co Ltd	01255 672855									●	●				●		Up to £200,000
James Bros (Hamworthy) Ltd	01202 673815			●	●		●			●	●	●			●	✓	Up to £2,000,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●					●		●			Up to £6,000,000*
John Reid & Sons (Strucsteel) Ltd	01202 483333		●	●	●	●	●	●	●	●	●	●		●			Up to £6,000,000*
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●						Up to £1,400,000
Leonard Engineering (Ballybay) Ltd	00 353 42 974 1099			●	●	●	●				●						Up to £3,000,000
Lowe Engineering (Midland) Ltd	01889 563244									●	●			●	●	✓	Up to £400,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✓	Up to £3,000,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		Up to £1,400,000
Mabey Bridge Ltd	01291 623801	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Maldon Marine Ltd	01621 859000				●			●	●	●					●		Up to £1,400,000
Midland Steel Structures Ltd	024 7644 5584			●	●	●	●			●	●	●		●	●		Up to £2,000,000
Mifflin Construction Ltd	01568 613311		●	●	●	●	●				●						Up to £4,000,000
Milltown Engineering Ltd	00 353 59 972 7119			●	●	●	●	●									Up to £6,000,000
Newbridge Engineering Ltd	01429 866722			●	●	●	●								●	✓	Up to £1,400,000
Newton Fabrications Ltd	01292 269135			●	●	●				●	●	●			●	✓	Up to £4,000,000
On Site Services (Gravesend) Ltd	01474 321552				●		●	●		●	●				●		Up to £400,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		Up to £1,400,000
Paddy Wall & Sons	00 353 51 420 515			●	●	●	●	●	●	●	●					✓	Up to £6,000,000
Pencro Structural Engineering Ltd	028 9335 2886			●	●		●	●			●				●	✓	Up to £2,000,000
Peter Marshall (Fire Escapes) Ltd	0113 307 6730									●					●		Up to £1,400,000
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		Up to £1,400,000
Remnant Engineering Ltd	01564 841160				●		●	●		●					●	✓	Up to £400,000*
Rippin Ltd	01383 518610			●	●	●	●	●									Up to £2,000,000
Robinson Construction	01332 574711		●	●	●	●	●		●	●	●	●		●	●	✓	Above £6,000,000
Rowecord Engineering Ltd	01633 250511	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✓	Above £6,000,000
Rowen Structures Ltd	01773 860086		●	●	●	●	●	●	●	●	●	●		●			Above £6,000,000*
RSL (South West) Ltd	01460 67373			●	●		●				●						Up to £1,400,000
S H Structures Ltd	01977 681931						●	●	●	●							Up to £3,000,000
Severfield-Reeve Structures Ltd	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●		✓	Above £6,000,000
Shipley Fabrications Ltd	01400 231115			●	●	●	●		●	●	●				●		Up to £200,000
SIAC Butlers Steel Ltd	00 353 57 862 3305		●	●	●	●	●	●			●	●				✓	Above £6,000,000
SIAC Tetbury Steel Ltd	01666 502792			●	●	●	●				●	●				✓	Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●		●								●		Up to £2,000,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		Up to £800,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●	●			●		Up to £400,000
Terence McCormack Ltd	028 3026 2261			●	●		●	●								✓	Up to £800,000
The AA Group Ltd	01695 50123			●	●	●	●			●	●				●		Up to £4,000,000
Traditional Structures Ltd	01922 414172		●	●	●	●	●	●	●		●	●		●		✓	Up to £4,000,000*
W & H Steel & Roofing Systems Ltd	00 353 56 444 1855			●	●	●	●	●						●	●		Up to £4,000,000
W I G Engineering Ltd	01869 320515				●					●					●		Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✓	Up to £6,000,000
Watson Steel Structures Ltd	01204 699999	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000
Westbury Park Engineering Ltd	01373 825500	●			●			●	●	●	●				●	✓	Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●					✓	Up to £2,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●		●		✓	Above £6,000,000

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	Contract Value (1)

Associate Members

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

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

Company name	Tel	1	2	3	4	5	6	7	8	9
AceCad Software Ltd	01332 545800		●							
Advanced Steel Services Ltd	01772 259822								●	
Albion Sections Ltd	0121 553 1877	●								
Andrews Fasteners Ltd	0113 246 9992									●
ArcelorMittal Distribution – Bristol	01454 311442								●	
ArcelorMittal Distribution – Mid Glamorgan	01443 812181								●	
ArcelorMittal Distribution – Birkenhead	0151 647 4221								●	
ArcelorMittal Distribution – Scunthorpe	01724 810810								●	
Arro-Cad Ltd	01283 558206			●						
ASD metal services - Biddulph	01782 515152								●	
ASD metal services – Bodmin	01208 77066								●	
ASD metal services - Cardiff	029 2046 0622								●	
ASD metal services - Carlisle	01228 674766								●	
ASD metal services - Daventry	01327 876021								●	
ASD metal services - Durham	0191 492 2322								●	
ASD metal services - Edinburgh	0131 459 3200								●	
ASD metal services - Exeter	01395 233366								●	
ASD metal services - Grimsby	01472 353851								●	
ASD metal services - Hull	01482 633360								●	
ASD metal services – London	020 7476 0444								●	
ASD metal services - Norfolk	01553 761431								●	
ASD metal services - Stalbridge	01963 362646								●	
ASD metal services - Tividale	0121 520 1231								●	
Austin Trumanns Steel Ltd	0161 866 0266								●	
Ayrshire Metal Products (Daventry) Ltd	01327 300990	●								
BAPP Group Ltd	01226 383824									●
Barnshaw Plate Bending Centre Ltd	0161 320 9696	●								
Barrett Steel Services Ltd	01274 682281								●	
Bentley Systems (UK) Ltd	0141 353 5168		●							
Cellbeam Ltd	01937 840600	●								
Cellshield Ltd	01937 840600							●		
CMC (UK) Ltd	029 2089 5260							●		
Composite Metal Flooring Ltd	01495 761080	●								
Composite Profiles UK Ltd	01202 659237	●								
Computer Services Consultants (UK) Ltd	0113 239 3000		●							
Cooper & Turner Ltd	0114 256 0057									●
Corus	01724 404040				●					
Corus Ireland Service Centre	028 9266 0747								●	
Corus Panels & Profiles	01684 856600	●								
Corus Service Centre Dublin	00 353 1 405 0300								●	
Corus Tubes	01536 402121				●					
Corus Wednesfield	01902 484100								●	
Daver Steels Ltd	0114 261 1999	●								
Development Design Detailing Services Ltd	01204 396606			●						

Company name	Tel	1	2	3	4	5	6	7	8	9
Easi-edge Ltd	01777 870901							●		
Fabsec Ltd	0845 094 2530	●								
Ficep (UK) Ltd	01924 223530					●				
FLI Structures	01452 722260	●								
Forward Protective Coatings Ltd	01623 748323						●			
GWS Engineering & Industrial Supplies Ltd	00 353 21 4875 878									●
Hempel UK Ltd	01633 874024						●			
Hi-Span Ltd	01953 603081	●								
Hilti (GB) Ltd	0800 886100									●
International Paint Ltd	0191 469 6111						●			
Interpipe UK Ltd	0845 226 7007								●	
Jack Tighe Ltd	01302 880360						●			
Kaltenbach Ltd	01234 213201					●				
Kingspan Structural Products	01944 712000	●								
LaserTUBE Cutting	0121 601 5000								●	
Leighs Paints	01204 521771						●			
Lindapter International	01274 521444									●
Metsec plc	0121 601 6000	●								
MSW Structural Floor Systems	0115 946 2316	●								
National Tube Stockholders Ltd	01845 577440								●	
Northern Steel Decking Ltd	01909 550054	●								
Northern Steel Decking Scotland Ltd	01505 328830	●								
John Parker & Sons Ltd	01227 783200								●	●
Peddinghaus Corporation UK Ltd	01952 200377					●				
Peddinghaus Corporation UK Ltd	00 353 87 2577 884					●				
PMR Fixers	01335 347629	●								
PP Protube Ltd	01744 818992	●								
PPG Performance Coatings UK Ltd	01773 837300						●			
Prodeck-Fixing Ltd	01278 780586	●								
Profast (Group) Ltd	00 353 1 456 6666									●
Rainham Steel Co Ltd	01708 522311								●	
Richard Lees Steel Decking Ltd	01335 300999	●								
Rösler UK	0151 482 0444					●				
Schöck Ltd	0845 241 3390	●								
Site Coat Services Ltd	01476 577473						●			
Steel Projects UK Ltd	0113 253 2171		●							
Steelstock (Burton-on-Trent) Ltd	01283 226161								●	
Structural Metal Decks Ltd	01202 718898	●								
Structural Sections Ltd	0121 555 1342	●								
Studwelders Ltd	01291 626048	●								
Tekla (UK) Ltd	0113 307 1200		●							
Tension Control Bolts Ltd	01948 667700									●
Trailerpal Ltd	01743 446666							●		
Voortman UK Ltd	01827 63300					●				
Wedge Group Galvanizing Ltd	01909 486384						●			

Corporate Members

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

Company name	Tel
Balfour Beatty Utility Solutions Ltd	01332 661491
Griffiths & Armour	0151 236 5656
Roger Pope Associates	01752 263636
Highways Agency	08457 504030

Steelwork contractors for bridgework

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

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

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

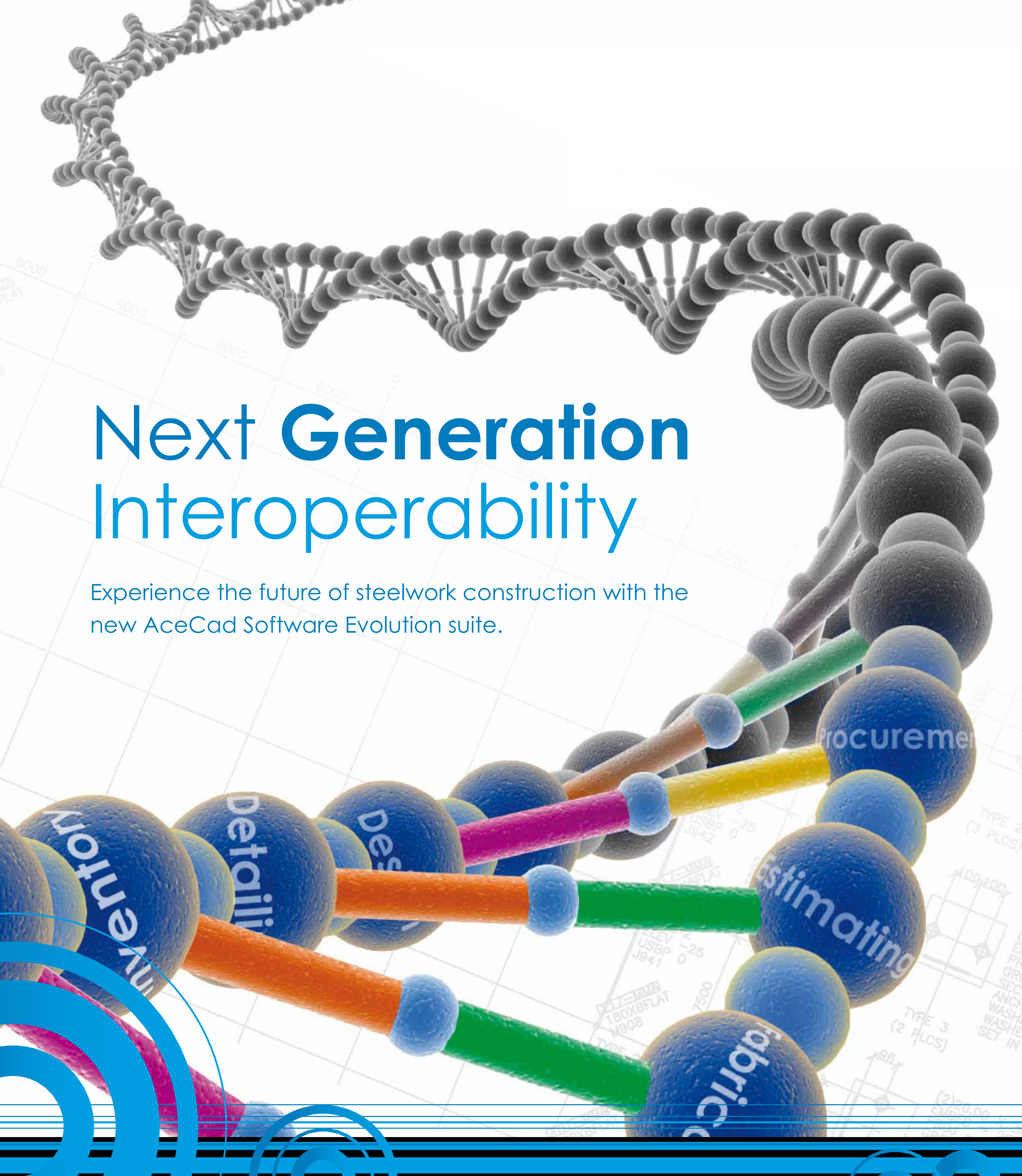
Notes

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

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

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

* Denotes membership of the BCSA



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