www.newsteelconstruction.com

NSC

Healthcare boost for Orkney

Vol 25 No 10 Nov/Dec 2017

New finance centre for Jersey

Conwy Council gets new home

Selfridges accessorises with steel

Energy plant serves Sandwich

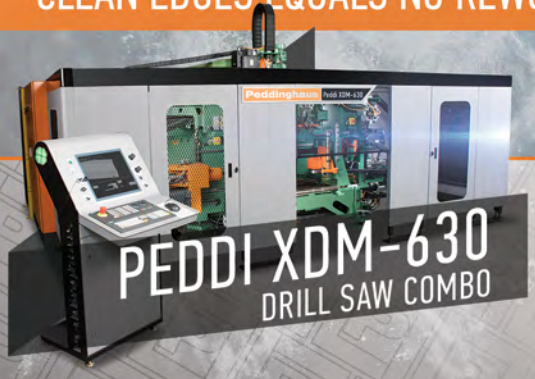
STRONGER THAN STEEL

MULTI-SPINDLE COPE MILLING

MILL ON BOTH FLANGES SIMULTANEOUSLY

COMBINE WITH HIGH SPEED CARBIDE DRILLING, TAPPING, COUNTERSINKING AND MITER SAWING

CLEAN EDGES EQUALS NO REWORK



WATCH VIDEOS HERE

www.peddinghaus.com/uk/xdm

Peddinghaus

www.peddinghaus.com | info@peddinghaus.com | +44 1952 200 377

Cover Image
International Finance Centre, Jersey (IFC 5)
Main client: Jersey Development Company
Architect: MJP Architects
Main contractor: Camerons
Structural engineer: Waterman Structures
Steelwork contractor: Elland Steel Structures
Steel tonnage: 675t
Photo: Richard Kalvis

Nov/Dec 2017
Vol 25 No 10

EDITOR
Nick Barrett Tel: 01323 422483
nick@newsteelconstruction.com

DEPUTY EDITOR
Martin Cooper Tel: 01892 538191
martin@newsteelconstruction.com

PRODUCTION EDITOR
Andrew Pilcher Tel: 01892 553147
admin@newsteelconstruction.com

PRODUCTION ASSISTANT
Alastair Lloyd Tel: 01892 553145
alastair@barrett-byrd.com

COMMERCIAL MANAGER
Fawad Minhas Tel: 01892 553149
fawad@newsteelconstruction.com

NSC IS PRODUCED BY BARRETT BYRD ASSOCIATES ON BEHALF OF THE BRITISH CONSTRUCTIONAL STEELWORK ASSOCIATION AND STEEL FOR LIFE IN ASSOCIATION WITH THE STEEL CONSTRUCTION INSTITUTE

The British Constructional Steelwork Association Ltd
4 Whitehall Court, Westminster, London SW1A 2ES
Telephone 020 7839 8566
Website *www.steelconstruction.org*
Email *postroom@steelconstruction.org*

Steel for Life Ltd
4 Whitehall Court, Westminster, London SW1A 2ES
Telephone 020 7839 8566
Website *www.steelforlife.org*
Email *steelforlife@steelconstruction.org*

The Steel Construction Institute
Silwood Park, Ascot, Berkshire SL5 7QN
Telephone 01344 636525 Fax 01344 636570
Website *www.steel-sci.com*
Email *reception@steel-sci.com*

CONTRACT PUBLISHER & ADVERTISING SALES
Barrett, Byrd Associates
7 Linden Close,
Tunbridge Wells, Kent TN4 8HH
Telephone 01892 524455
Website *www.barrett-byrd.com*

These and other steelwork articles can be downloaded from the New Steel Construction Website at *www.newsteelconstruction.com*

JAMESTOWN

www.jamestownprofiling.com

email: info@jamestownprofiling.com tel: +353 45 434 288

STEEL for life HEADLINE SPONSOR

Your Partner In Steel

CE BCSA SCCS UKAS

Steel construction the smart choice

Nick Barrett - Editor

The steel construction sector was well placed to respond to the government's objectives to make the use of Building Information Modelling (BIM) widespread across the construction industry, as it had already been making strong use of digital methods of construction for many years. Players in some other parts of the construction sector are reportedly struggling to keep up with the introduction of digital methods of construction like BIM; and the signs are that they will have to run a lot faster to keep up in future.

As we see in this month's Headline Sponsor article by Trimble, digital methods of construction are being taken to a new level with the introduction of mixed reality and holographic technology. The pace of change in the technologies available to the sector is dramatic.

Mixed reality creates a collaborative work environment, giving designers and construction teams the ability to blend real world objects with digital content in real time, and interactively. Physical and digital information is shared, allowing users to interpret and use physical and digital information about real world objects – or what are to become real world objects once designed and constructed. The technology spans the virtual and physical environments.

The promise being held out by this technology is reduction in poor quality, cost overruns and disrupted construction programmes – all holy grails of the construction industry. Steelwork contractors can use this technology in the workshop, improving quality even further and enhancing the already extensive offsite benefits of steel construction.

Mixed reality and other new technologies are being adopted across industries, in a drive towards smart factories and machines that has been called the fourth industrial revolution, or Industry 4.0.

There has always been a lot of advanced thinking in evidence in steel construction design and on site, but that isn't to say things won't be improved further. Even the highest quality steel-framed buildings like Bloomberg's new European HQ in the City which has just opened, and which achieved a BREEAM 98.5% score at the design stage (a record for a major office development), will be more easily and efficiently designed and built using advanced mixed reality technologies.

Many say that these technologies will change our working world in ways that we can't foresee. The evidence so far suggests however that steel will remain the smart choice in the new world of smart factories and ever smarter buildings.

Bloomberg London HQ rated world's most sustainable office

The steel-framed Bloomberg headquarters in London has set a world record BREEAM sustainability rating for an office building at design stage.

Opened last month in the City of London, Bloomberg's new European headquarters achieved an 'Outstanding' rating against the BREEAM sustainability assessment method, with a 98.5% score. This is the highest design-stage score ever achieved by any major office development.

Michael R. Bloomberg, Founder of Bloomberg L.P. said: "We believe that environmentally-friendly practices are as good for business as they are for the planet. From day one, we set out to push the boundaries of sustainable office design – and to create a place that excites and inspires our employees. The two missions went hand-in-hand, and I hope we've set a new standard for what an office environment can be."

Compared to a typical office building, the new Bloomberg building's environmental strategies deliver a 73% saving in water consumption and a 35% saving in energy consumption

Norman Foster, Founder and Executive Chairman of architect Foster + Partners, said: "In some of our first discussions on the project, Mike Bloomberg and I arrived at a 'meeting of minds' on how the design of the new Bloomberg headquarters should incorporate the highest standards of sustainability. The project evolved from thereon into a building that is one of the most sustainable in the world."

Main contractor for the project was Sir Robert McAlpine and steelwork was fabricated, supplied and erected by William Hare.

Work progresses on Post Building redevelopment

Steelwork erection is under way on the redevelopment of the former Royal Mail Sorting Office on London's New Oxford Street.

The Post Building is a 29,700m^2 mixed-use redevelopment, being developed by Oxford Properties and Brockton Capital in joint venture to a design by architect AHMM. Main contractor for the scheme is Laing O'Rourke and the steelwork package is being fulfilled by BHC.

The building is located on an island block bordered by New Oxford Street, High Holborn and Museum Street in the west end of London. It will be the new London headquarters of management consultant McKinsey.

Planned works include the retention of some areas of the original building, significant remodelling of the building interiors including the provision of a new central core, a new stainless façade and creation of innovative office accommodation which will make use of the significant floor-to-ceiling heights within the building's original structure.

The planned partial demolition of the original 1960s Royal Mail sorting office has now been completed by John F Hunt and Laing O'Rourke has now begun the main construction phase. There will be 25,000m^2 of offices with one-acre floorplates. Every floor will have its own roof terrace.

The scheme will also have shops, a doctor's surgery, a public roof space and cafe, as well as 21 affordable apartments.

The project is scheduled to complete in 2018.

Whitehaven school completes 11-week steel programme

Working on behalf of Wates Construction, Border Steelwork Structures (BSS) has completed its 700t steelwork package on Whitehaven Campus.

The project will bring together St Benedict's Catholic High School and special education needs (SEN) school, Mayfield, into two brand new buildings at the former's existing site in Hensingham, Whitehaven.

The project, which is due for completion in August 2019, has a £28M value and has been funded by investment from a range of partners, including Copeland Community Fund, Cumbria County Council, the Nuclear Decommissioning Authority and Sellafield Ltd.

As well as an indoor sports hall, fitness suite and a hydrotherapy pool, a range of outdoor facilities will be available to the local community during non-school hours. These include multi-use sports pitches, one of which will have an all-weather 4G surface.

"We erected the entire steel frame in 11 weeks, which amounted to some 3,500 individual pieces," said BSS Contracts Director Stuart Airey.

"That's one of the advantages of steel, it is quick to erect and only high winds, which we didn't really get, will halt its progress," added Wates Senior Project Manager Simon Humphrey.

"I've been involved in a number of steel construction jobs in the past and this one has been one of the most well organised. The trick is to order the steel early and get the fabrication started as soon as possible to iron out any snags, and this is precisely what we did."

Paddington footbridge scoops prestigious award

Merchant Square Footbridge in Paddington, London has won the Short Span Award at the 6th International Footbridge Awards, which were held in Berlin.

The lifting bridge, which spans Paddington Basin, was designed by Knight Architects with steelwork supplied and installed by S H Structures.

The structure's fabricated steel beams forming the deck open in sequence, with the first rising to an angle of 70 degrees and the last achieving the required clearance over the canal of 2.5m tall by 5.5m wide at mid-channel.

The footbridge also picked up a prestigious Structural Steel Design Award in 2015.

The judging jury said: "The bridge has a beautiful design, while the geometry is excellent. This is a playful, provocative and innovative opening bridge which is sophisticated in static position and poetic in operation. It adds a significant architectural value to this built environment.

"The design of the footbridge relied on the steelwork contractor's ability to manufacture the five 'fingers' to very exacting tolerances. When in its lowered position these fingers had to effectively create a flat, almost seamless, walking surface."

The event, which takes place every three years has previously been held in Paris, Venice, Porto, Wroclaw and London. Bridge designers and builders from all over the world come together to exchange ideas, share their views and network with other professionals with the same passion for footbridges.

The awards cover categories for short, medium and long-span footbridges, and for renovation and lighting.

Westok invests in bespoke FICEP Endeavour saw and drill line

Kloeckner Metals UK has invested £1M into their processing portfolio with the installation of a FICEP Endeavour saw and drill machine at its Westok plant.

The FICEP Endeavour drilling and sawing line has been built to a bespoke specification for Westok. The unit is a new three spindle drilling line for the processing of Westok cellular beams and a broad range of structural steel sections.

With the introduction of an automated procedure for the processing of cellular beams along with several other innovations, the FICEP Endeavour is said to be a significant step forward in value added service capabilities.

Kloeckner Metals UK | Westok General Manager Edward Skarratt said: "We are very excited about the new investment

and the additional capabilities that we will be able to offer our customers.

"The new FICEP Endeavour has been specified based on feedback from our customers and will enable Westok to offer solutions such as cut to length of cambered and asymmetric Westok beams that will help our customers to further develop their own processes and lower their production costs."

Frame completes on latest King's Cross commercial block

The latest steel-framed building to top-out at the large King's Cross development is Building S2, situated on Handyside Street.

Already fully let, the 12-storey building will offer 23,000m^2 of space and is set to achieve a BREEAM 'Outstanding' environmental rating.

Working on behalf of main contractor Carillion, Severfield has erected 1,700t of steelwork for the project.

Building S2 has reaped the rewards of a design change from a post-tensioned frame to a steel frame. The initial design had the building based around a fairly tight structural grid, which was later deemed to be too constrained with too many internal columns for modern office requirements.

The design was changed to a steel solution because the material offered a more economical method to achieve the desired spans and service integration.

According to the project team, another benefit of steel was the ease with which it framed the numerous architectural set-backs and cantilevers, primarily the west façade, south set-back terraces and a south-east cantilevered corner.

NEWS IN BRIEF

ArcelorMittal has a new publication focusing on high-rise buildings that was produced with the assistance and guidance of the Council on Tall Buildings and Urban Habitat. The guide highlights how structural steel can be used effectively in tall buildings and includes various effective structural options such as: use of S460, stiffness considerations including outrigger design, recommendations for seismic design, life cycle assessment and composite mega-columns. It can be downloaded from: *http://sections.arcelormittal.com/library/technical-brochures.html*

The third in a series of quarterly supplements entitled ***Costing Steelwork***, has been published in Building Magazine. Steel for Life has partnered with the magazine along with Aecom to produce the series, which comprises studies into offices, education, industrial (this edition), mixed-use and retail buildings. This edition, as well as all other archive features and supplements can be found at: *www.steelconstruction.info/Steel_construction_news*

Cleveland Bridge has reported profits of £4M for its financial year ending 31 December 2016 – an increase of more than £1.5M on the previous year. The company said it has secured a number of UK and international projects, which will support further turnover growth, which is forecast to be in the region of £60M in 2018.

Developer **LondonMetric Property** has announced its acquisition of the 40-acre Bedford Link site on which it plans to build a £60M logistics park. The site has planning consent for up to 62,200m^2 of logistics space and all other conditions relating to the purchase have now been satisfied. It is situated on the A421, close to junction 13 of the M1.

A planning application has been submitted to Birmingham City Council by U+I, the property regeneration specialist, and Calthorpe Estates to redevelop an outdated commercial site in Edgbaston into a major new mixed-use scheme named **New Garden Square**.

PRESIDENT'S COLUMN

In my column last month, I referred to Lord Adonis' dismissal of fears over low industry margins. Thankfully, he's now admitted that the industry should make 'a good living', but for this to happen budgets need to be released. This would be a win-win for government and industry because, as we all know, every pound spent on infrastructure delivers a whopping £2.78 back to the economy.

However, to maximise the benefits of increased government spending on infrastructure, the supply chain needs to work more effectively as a whole. It's a well-known fact that collaboration and early involvement are by far the best vehicles to reduce project risk, protect margins and ensure on time, in full delivery.

Pinsent Masons' June 2106 paper *'Collaborative Construction – More Myth than Reality'* notes that there is a lack of strong leadership with few prepared to commit to real change. I'm now seeing more advocating real change but we need commitment and action, rather than 'We just ran out of time let's do it the old way'!

Experience tells us that specifiers and main contractors that collaborate with their supply chain have a major competitive advantage, and are better able to balance the delivery of client needs against programme and cost. Specifically, involving subcontractors early enables them to contribute to buildability, project planning and cost. Early engagement also ensures that the design team releases information in a form and sequence that coordinates with the steelwork package. Design gaps and clashes will be picked up earlier as well, reducing the need for change requests and redesign, which in a commercial environment can cause delays and disputes.

Early involvement with subcontractors also establishes trust and mutual respect – something that is sometimes in short supply in the construction supply chain. Moving away from a combative approach to a collaborative one will also improve financial flows throughout the whole supply chain, protecting that economic value I mentioned earlier.

There really isn't anything not to like about early engagement and collaboration, but it will require behavioural change and a whole lot of trust from all of us.

Tim Outteridge
BCSA President & Sales Director Cleveland Bridge

Doncaster high-speed rail campus opens

As part of the government's efforts to boost rail construction expertise, the Doncaster campus of the National College for High Speed Rail (NCHSR) has officially opened its doors.

The college is part of government plans to train prospective engineers and construction workers to develop HS2 and other rail projects, as it looks to plug a potential post-Brexit skills gap.

The steel-framed Doncaster facilities are joined by a second campus in Birmingham, both of which were built by Willmott Dixon as part of a £52M contract.

Working with Wilmott Dixon, Hambleton Steel fabricated, supplied and erected 760t of structural steelwork for the Doncaster project.

Secretary of State for Education Justine Greening (pictured) said: "It has been great to attend the official launch of the NCHSR. It's part of how we are steadily transforming technical education in this country, training up a new generation of skilled young people and the existing workforce so that British business has the skills it needs and people have the opportunities they want – a win-win for everyone.

"We can only do this in partnership with employers – the NCHSR is just one great example of this. The impressive new building and training facilities are at the forefront of our ambitions to create a world class system of technical education."

Contractor selected for Dover leisure centre

Dover District Council has given the go-ahead for the construction of the new hybrid steel-framed £26M Dover District Leisure Centre.

Construction will start on the site in Whitfield late this year with a planned opening early in 2019.

The project to replace the current 40-year old Dover Leisure Centre has been awarded to BAM Construction and represents a major investment in the district's sport and leisure facilities.

The new Dover District Leisure Centre will feature a competition standard eight-lane swimming pool with spectator seating for 250 people, learner pool with moveable floor, four court sports hall, squash courts, multi-function room, fitness gym with 120 stations, fitness studios, clip 'n' climb wall, and a café.

The plans also include two outdoor 3G artificial pitches for five-a-side football and a minimum of 250 parking spaces.

BAM Construction Project Manager Daniel Brenchley said: "Having built in Dover recently, it's particularly satisfying to return, especially to create something that so many people will enjoy using.

"Our work in this beautiful county is extensive, as is our knowledge of the local supply chain and the community. We'll bring our customary skills, expertise and collaborative attitude to this important and landmark scheme."

Teesside University plans £300M expansion

Middlesbrough-based Teesside University has announced plans for a wide-ranging £300M expansion scheme.

The work is planned for the next 10 years and will include a number of steel-framed buildings.

Phase One includes a £10M Student Life Building to bring all student-facing services together in one location. It will also include an employability centre and teaching facilities.

The first phase of creating a new home for the Teesside University Business School will see £6M spent to support the establishment's continuing growth. Phase Two will follow, with a further £15M investment.

There are also plans for a £22.3M National Horizons Centre, a biomedical research, education and teaching facility at the University's Darlington campus, which will support the industries set to transform the UK economy, including biologics, industrial biotechnology and digital.

The huge programme of investment is said to reinforce Teesside University's commitment to providing an outstanding student and learning experience, and highlights its ambition to create a campus which is among the very best in the country.

The Campus Master Plan has been developed following extensive consultation with students and staff and will provide the optimum facilities to meet the needs of the 21st century learner.

Redhill's new retail quarter opens to the public

The transformation of an important site in Redhill town centre is now complete, as the brand new steel-framed Sainsbury's supermarket and the Gym Group gym opened their doors.

A ribbon cutting ceremony was conducted by Councillor Roger Newstead, Mayor of Reigate and Banstead.

Dave Curness, the Redhill Store Manager, who recently won a national store manager of the year award, said: "We'd like to thank everyone that came along to the opening of our brand new store and are grateful for the patience that has been shown by the local community whilst we've undertaken this major redevelopment.

"We're proud to be able to bring this exciting new offer to Redhill and to be playing an important role in the ongoing regeneration of the town."

It is claimed that the completed supermarket will revolutionise shopping in Redhill, with a wide range of products and services that have never before been available in the town.

The overall redevelopment includes a new state-of-the-art Gym Group gym and a 68-bedroom Travelodge hotel. Significant investment was also made into the public areas in Redhill with new paving, seating and planters along London Road, highway improvements on Princess Way and a new canopy entrance for the Harlequin Theatre and Redhill Library.

A key part of the redevelopment has been the significant upgrade of parking facilities for the town centre. Around 900

car parking spaces are now available over three floors within the modernised car park, with travellators providing direct access into the Sainsbury's store from the upper two car park decks.

Working on behalf of main contractor RG Group, Billington Structures erected 3,000t of steelwork for the project.

UCLan's Innovation centre under way

Construction of the University of Central Lancashire's (UCLan) £30M Engineering Innovation Centre (EIC), a major milestone within the £200M Campus Master Plan, is under way.

The state-of-the art facility, which will establish UCLan as a leader in engineering innovation, is anticipated to produce an increase of 500 locally trained graduates per year in areas including aerospace, mechanical and energy technologies and engineering.

Staff, students, and companies within the region will have access to top of the range equipment including flight simulators, Formula One cars and specialist electronic labs, which will allow students to work on live, real-world projects.

BAM Construction is on site delivering the scheme, which is due for completion in 2019. Steelwork contractor Elland Steel Structures will erect approximately 650t of steel for scheme.

Michael Ahern, Chief Operating Officer at UCLan, said: "The start of work on-site marks another exciting milestone for our Campus Master Plan and the creation of a powerful hub for developing and nurturing skills.

"The EIC will address the skills deficit in engineering specialists in Lancashire and nationally. A skilled engineering workforce is essential for the economy and the benefit of wider society."

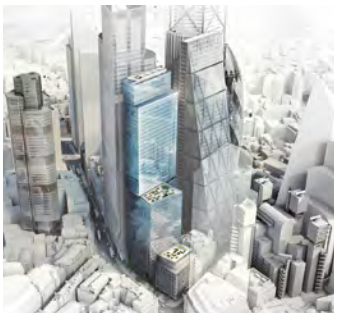
Revised plans for City 50-storey tower approved

The City of London Corporation has granted planning permission for WilkinsonEyre's revised 6-8 Bishopsgate/150 Leadenhall Street tower, which includes 10 more floors.

Approval has now been secured for the 50-storey office tower which will sit at the corner of Leadenhall Street and Bishopsgate. The development will encompass a distinctive 'stacked blocks' design, with retail units on the ground floor and a viewing gallery at its summit. The scheme will now provide over 52,900m^2 of space to let.

Developers for the scheme are Mitsubishi Estate London and Stanhope.

Stanhope Chief Executive David Camp said: "We are delighted to be continuing our partnership with Mitsubishi Estates on this striking landmark building for London that will further enhance its global appeal and its ability to attract high quality international businesses to locate in the City."



Diary

For SCI events contact Jane Burrell, tel: 01344 636500 email: *education@steel-sci.com*
For Institution of Structural Engineers events email: *training@istructe.org* or telephone 0207 201 9118

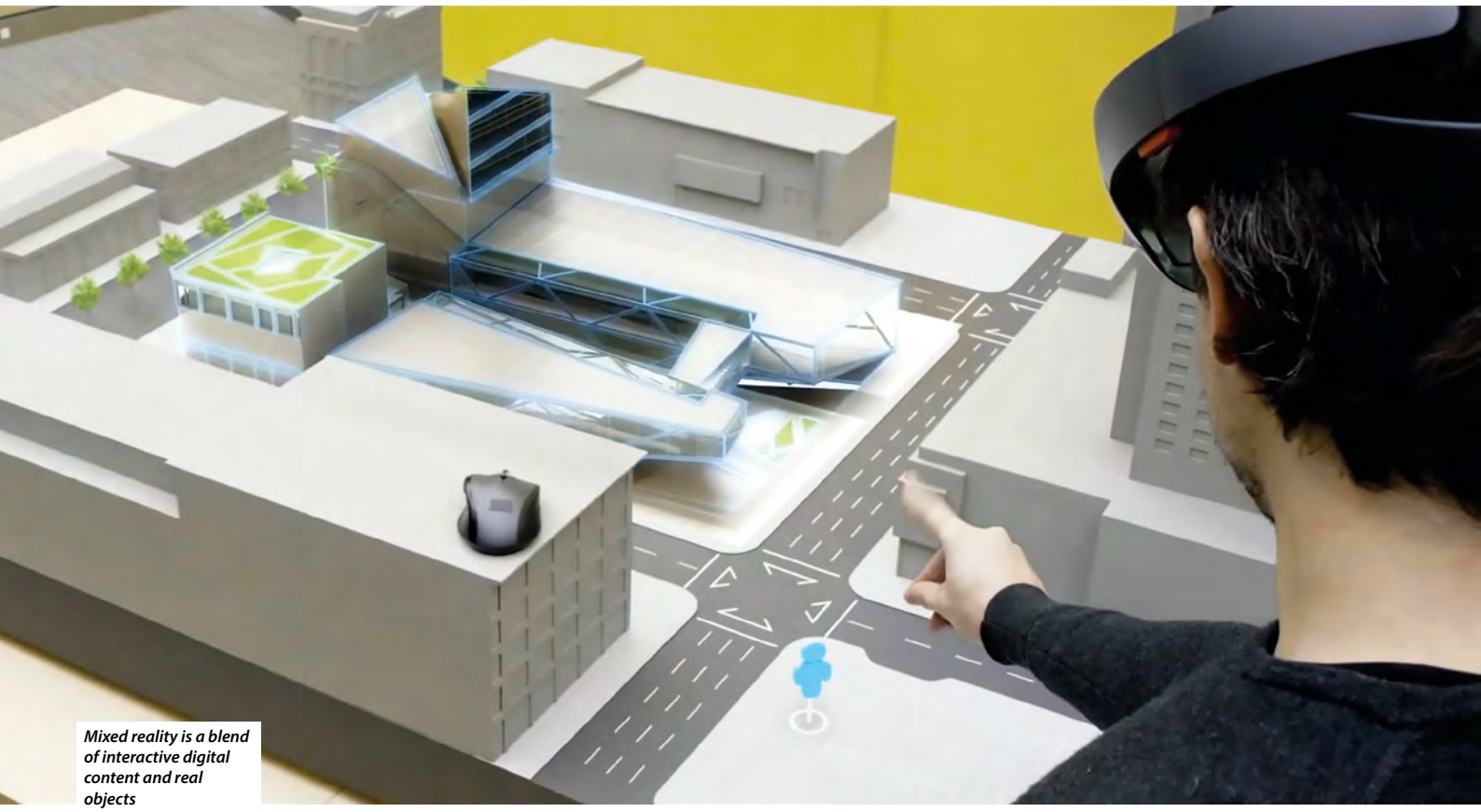
Tuesday 14 November 2017
SCI Annual Event
Presentations will be made on developments within the Steel Industry that could become of growing relevance. London

Thursday 7 December 2017
Portal Frame Design
This 1 day course provide in-depth coverage of the major issues surrounding the analysis, design and detailing of portal frames. Swindon

Tuesday 12 & Wednesday 13 December 2017
Steel Frame Stability
The 1 hour webinar provides guidance on, braced frames, continuous frames and portal frames.

Tuesday 16 & Wednesday 17 January 2018
Robustness
This 1 hour webinar will provide inforamtion on design of steel-framed buildings for robustness.

Wednesday 24 & Thursday 25 January 2018
Essential Steelwork Design
This 2-day course introduces the concepts and principles of steel building design to EC3. London.



Mixed reality is a blend of interactive digital content and real objects

From BIM to mixed reality technology

The construction industry is taking BIM to a new level with mixed reality technology, says Steve Jackson of Trimble Solutions (UK) Ltd, who explains the benefits of incorporating it within a construction process.

The use of BIM in construction is increasing year-on-year, which is helping to enhance planning and project management, while ensuring projects are delivered on time and on budget. Indeed, having an accurate 3D modelling solution, supported by well-defined data requirements, will deliver benefits at every stage of the design and construction process. However, the industry is now taking BIM to a new level by introducing mixed reality technology.

Mixed reality technology blends real world objects with digital content, interactively, and in real time. It helps users efficiently interpret physical and digital information, as well as the spatial relations between them.

It spans the purely virtual and real environments and, in the context of the construction industry, this is where digital and real content co-exist – where structural engineers' designs collide with reality – and where construction teams transform digital content into physical objects.

The interpretation of digital content and its translation to real world objects heavily depends on the user's spatial understanding, which is an error-prone process that demands a highly skilled workforce. Interpretation errors are common during the design and construction stages, and often result in poor quality, cost overruns and schedule delays. However, by visualising digital content as holograms in the physical world, it bridges the gap between virtual and reality, and eliminates the current workflow's inefficiencies. What's more, while the physical world is finite, mixed reality presents the opportunity for an infinite environment in which additional data such as schedule, specifications and simulation can be overlaid onto the world, creating a hyper-reality environment.

Over the last few years the transition from 2D documents to 3D models was a natural evolution, which improved team communication and coordination. However, mixed reality and holographic technology brings the 3D models out of the screen and provides users with the ability to engage and interact with design data more intuitively. In fact, Trimble is working with Microsoft to develop a new generation of tools integrated with the HoloLens holographic platform on Windows 10, which are intended to improve quality, collaboration and efficiency in the design, construction and operation of buildings and structures.

Microsoft HoloLens is a head-mounted, self-contained holographic computer that provides a mixed reality experience for a range of commercial and consumer applications. The device features a see-through, holographic display and advanced sensors that map the physical environment.

The HoloLens device creates new ways for many stakeholders of complex, multi-phase construction projects to visualise, collaborate, share ideas and manage change. And when used in connection with Trimble Connect software, it can deliver many benefits to structural engineers and steelwork contractors.

Trimble Connect provides a collaborative environment, where all stakeholders involved in a project know what is happening and

what should be done next. It gives engineers visibility of reliable, up-to-date information in one place and brings people, technology and information together to deliver a project quickly, safely and on time.

Models created within Tekla Structures, Field Layout, Sketchup, Autodesk Revit and many more can all be uploaded into Trimble Connect, in order to view the project as a whole.

By being able to view holograms of 3D structural frames in the real world when using Trimble Connect and HoloLens, engineers will be able to visualise a variety of constructions on site to see what they will look like, and confirm if they can physically be created. For example, engineers can view what an extension next to an existing building would look like, or even view the inclusion of a mezzanine within a building to see if it could be created.

For steelwork contractors, while viewing the 3D holographic image they will be able to isolate connections and extract them from the model to see if they are correct and if they can be fabricated in the workshop.

However, the HoloLens device does not only just work on a building site or in cities. In workshops, steelwork contractors can wear the headset to see if there are any missing bolts or anomalies within the structure, and physically use the hologram as a guide to creating the steel components.

The HoloLens could also be used to perform a 'construction rehearsal' where the steelwork contractor and site staff virtually walk through the construction sequence and connection processes. This would ensure the steelwork contractor's detailing aligns with the erection team's preferred method of assembly, before manufacturing instructions are sent through to production.

Realising the potential of HoloLens, Trimble has also been working closely with Microsoft and the Construction Information Technology Lab at the University of Cambridge to explore ways of advancing the use of technology within the industry further. The collaboration has resulted in new ways to incorporate mixed reality.

The first is Automated Progress Monitoring, which is a way to address one of the most time-consuming and error prone procedures in the industry: the demand to regularly, and manually, inspect remote structures. The process is currently conducted through visual inspections, form filling and report writing, with the need to extract information from different drawings and databases. However, the new trial revolutionises the process by presenting all physical and digital information through HoloLens, allowing inspectors to check, cross-reference and report on inspections very quickly, and collaborate with site representatives.

Trimble believes it is looking into the future with mixed reality technology

The second is Automated Bridge Damage Detection. Rather than sending structural engineers to each bridge as part of its inspection routine, through discoveries generated via the collaboration, high-resolution images can be taken by local teams and sent to inspection engineers. These are then automatically mapped onto 3D models of the respective bridge. Structural engineers can then review the integrity of a bridge in mixed reality using HoloLens, making recommendations for repairs or other preventative measures. This reduces costs and is more efficient, making sure bridges do not enter their 'failure zone', leading to major road closures and disruption.

Overall, by using Trimble products and BIM models as the main data source, mixed reality can improve communication, tighten workflow integration and enable real time collaboration with remote teams.

For more information about Tekla software please visit *www.tekla.com/uk/solutions*

An introduction to site connections

The fabrication and erection of steel structures involves the joining together of various steel members and the two principal methods used are welding and bolting. Welding is normally used in the factory but site connections should generally be bolted, as it is faster, less susceptible to poor weather conditions, and has less onerous access and inspection requirements than site welding.

For structures that are bolted together there are two types of system which are generally used – 'non-preloadable assemblies' and 'preloadable' assemblies.

Non-preloadable assemblies are perfectly satisfactory for the majority of orthodox connections, as the small amount of slip associated with clearance holes has no practical consequences for the structure. There are circumstances where the use of preloadable assemblies should be considered including: where slip must be avoided, fatigue, vibration and load reversal.

Bolting regulation and standards

Both systems are covered by a series of European standards. The biggest change from the old British Standards is that the European system applies to bolting assemblies (bolts, nuts and washers) rather than the individual components that make up a fastener.

Non-preloadable assemblies are covered by the European standards BS EN 15048-1 and BS EN 15048-2. BS EN 15048-1 is the harmonised or CE Marking standard and BS EN 15048-2 is a 'Suitability Test' to ensure that the assemblies are suitable for use in non-preloaded applications.

BS EN 15048 is not a complete product standard. It complements standards such as the BS EN ISO series of standards for fasteners by providing the testing and Factory Product Control (FPC) requirements necessary for the manufacture of bolting assemblies to be CE Marked.

The BS EN 14399 series of standards covers the two types of preloadable assemblies used in Europe – the HR and HV systems. For the HR system the nut thickness is 90% of the bolt diameter which effectively makes system HR assemblies dimensionally identical to the old BS 4395 fasteners.

Current practice

Structural bolting practice (for buildings) in the UK is based predominantly on property class 4.6 and 8.8 non-preloaded bolts to BS EN 15048, generally used in 2mm clearance holes. The recommended option of M20 8.8 fully threaded bolts is readily available. Property class 4.6 bolts are generally used only for fixing lighter components such as purlins or sheeting rails, when 12mm or 16mm bolts may be adopted.

There may be situations, for example a column splice subjected to large load reversals in a braced bay, where the designer considers that joint slip is unacceptable. In these cases property Class 8.8 preloaded bolts to BS EN 14399 should be used. Preloaded bolts are also predominantly used on bridgeworks. Generally, only system HR bolts are used in the UK, as recommended in the National Structural Steelwork Specification.

Design considerations

Bolts are discussed in the SCI publication Design for Manufacture Guidelines (P150), from which the following points are taken:

- Preloaded bolts should be used ONLY where relative movement of connected parts (slip) is unacceptable, or where there is a possibility of dynamic loading.
- The use of different grade bolts of the same diameter on the same project should be avoided.
- Washers are not required for strength with non-preloaded bolts in normal clearance holes.
- When appropriate, bolts, nuts and washers should be supplied with a corrosion protection coating which does not require further protection on-site.
- Bolt lengths should be rationalized.

Fully threaded bolts

Common practice is to specify fully threaded bolts, meaning one bolt size can be universally used for a large number of connections. The use of M20 8.8 fully threaded bolts 60mm long is recommended, as around 90% of simple connections could be made using such bolts.

Although there are potential minor extra manufacturing costs due to an increase in the average bolt length and a need for more threading, significant overall savings are possible when standard, fully threaded bolts are used:

- Reduced prices due to bulk purchasing
- 'Just in time' (JIT) purchasing
- No need to compile extensive bolt lists (giving details of bolt types and locations)
- Smaller stock
- Less handling due to reduced sorting
- Faster erection
- Reduced errors (therefore increased safety)
- Reduced wastage.

In those cases where bolts with part threaded shanks are specified the designer must indicate where these are to be used on their drawings to inform the steelwork contractor/erector where part threaded shanks are required.

INVITATION

DIJON - FRANCE

EVOpen Days

6th & 7th December 2017

VERNET BEHRINGER

Your business is EVOlving... our machines too !

Get familiar with our EVO range of processing machines for profiles, plates, beams and angles

+ more machining possibilities
+ more protection for operators
+ more productivity thanks to new features

as well as with our latest software and tooling developments.

All day machine and software demonstrations

Customised meetings with our specialists

Deadline for bookings 1/11/17

Please contact us for further information

info@behringerltd.co.uk
www.behringerltd.co.uk
01296 668259

BEHRINGER EISELE

SMD®
Structural Floor and Roof Solutions

Elements®
Design Software **2.0**

Create floor slab and roof deck calculations

The latest version of SMD Elements® with additional features allowing calculations to be created for all SMD's floor and roof deck profiles

To download this software, please visit **www.smdltd.co.uk**

SMD Ltd

The bullnose feature elevation of IFC5

Offices boost finance sector

Steel-framed office blocks are providing the much-needed Grade A office accommodation for Jersey's finance sector. Martin Cooper reports.

FACT FILE
International Finance Centre Jersey [IFC 5]
Main client: Jersey Development Company
Architect: MJP Architects
Main contractor: Camerons
Structural engineer: Waterman Structures
Steelwork contractor: Elland Steel Structures
Steel tonnage: 675t

Jersey is a leading offshore financial centre and importantly the sector accounts for approximately 50% of total tax revenue in the island.

It has also been estimated that the finance industry spends in excess of £300M on goods and services each year, much of which will have been payments to local non-financial businesses, generating further economic activity – and ultimately tax revenue – on the island.

Consequently, it is not surprising that Jersey intends to remain at the forefront of the industry and to maintain the position it needs to redress a shortage of Grade A office accommodation.

The local finance industry has made it clear that new premises are needed for them to grow, while new prospective finance firms and employers considering the island have done likewise.

One of the solutions is the construction of the International Finance Centre (IFC) Jersey, a cluster of six stand-alone office blocks situated close to St Helier Esplanade.

This scheme will deliver 43,665m² of modern Grade A office space with private car and bicycle parking beneath the buildings, and a 520-space public car park on three levels below a new public park. High quality civic open space will be created on 50% of the IFC Jersey site that will also include a public park and a public square.

Wholly-owned by the States of Jersey government, Jersey Development Company (JDC) was set up in 2011 to oversee the scheme. Its Director Lee Henry says:

"The office buildings will have a London specification and will set a new benchmark in terms of quality and design for the island.

"They feature excellent levels of natural light, column-free floorplates, high quality and highly glazed unitised façades."

Construction of the IFC Jersey has been split into phases and the scheme will be delivered on a building-by-building basis in response to demand.

IFC 1 (see box) was completed in March and construction is now progressing on the second office block, IFC 5, which is due to complete by the end of July 2018.

The third office building, the four-storey IFC 6, received detailed planning consent earlier this year and JDC is currently working up the technical design and seeking a pre-let to enable the construction of the building to commence in 2018.

"All of the offices will be steel-framed as the material provides the best solution for the long clear spans the development requires, as well as the built-in flexibility to divide the floorplates between tenants if required," says MJP Architects Associate Tomasz Fiszer.

"Steel construction hasn't been the norm on Jersey in the past, with many offices previously being built with concrete, adds Waterman Structures Director Richard Whitehead.

"However, by choosing a steel solution

we are creating the high-quality open-plan offices the client wants."

Speed of construction is also an important attribute of structural steelwork. Having started the steel erection in late August, Elland Steel Structures completed the frame and the installation of metal decking by early October.

Logistics play a big part when working on one of the Channel Islands, as all materials have to be shipped over from Portsmouth by freight ferry. However, Elland Steel has expertise gained from previous jobs on the island, including IFC 1, which put it in good stead.

In order to maintain a good workflow by always having sufficient steelwork on site for a day's work, the company had to arrange for the initial steel shipments to arrive prior to the work commencing. In this way, and with subsequent shipments of steel arriving every other day thereafter, the company guaranteed it had steelwork on the island for the duration of the works.

Prior to the steel programme starting, main contractor Camerons had completed the building's piled foundations, and the concrete works for the basement, ground floor slab and the structure's stability-giving central core.

With a similar design to its completed neighbour, this office block's steel frame is based around a regular grid with perimeter columns spaced at 7.5m centres and creating internal clear spans of up to 12m-long. The building will provide 6,400m² of space over six floors, have floor-to-ceiling windows on all four sides, and achieve a BREEAM "Excellent' rating.

All of the services are accommodated within the depth of the floor beams, via a series of bespoke holes. These were fabricated and cut by Elland Steel Structures after some close coordination with the structural engineer and M&E consultant to ensure the right sized holes were in the right locations.

"As well as maximising the floor-to-ceiling heights within the building, putting the services through the beams helped keep the structure to its permitted 18m height," says Mr Whitehead.

Moving away from the standard rectangular-shaped office, IFC 5 has a standout bullnose, rounded southern elevation, which mimics the site's curved boundary alongside an adjacent roundabout. This architectural feature is formed with a series of faceted beams for the main frame, with curved secondary members on the outside supporting the cladding.

The remaining IFC 2, 3 and 4 will follow in the coming years, with an overall completion date for IFC Jersey set for some time between 2025 and 2030.

First building open for business

Known as IFC 1, the development's first building has been described as a world-class business hub providing 6,300m² of high-quality Grade A office space, over six floors, in the heart of St Helier.

Elland Steel Structures fabricated, supplied and erected 600t of structural steelwork for this office block, which has the distinction of being one of the first structures in the Channel Islands to achieve a BREEAM 'Excellent' rating.

"Using steelwork allowed us to design a building with the required column-free spaces, as well as providing an integrated solution for all of the services within the steelwork's depth," explains Richard Whitehead, Director of Waterman Structures.

Bespoke cellular beams have been used for IFC5's services integration

"The office buildings will have a London specification and will set a new benchmark in terms of quality and design for the island."

Council project spurs regeneration

The project is providing a boost to the local construction sector

A steel-framed solution, offering a cost-efficient and quick construction programme, was the answer for a new council HQ and car park in Colwyn Bay. Martin Cooper reports from North Wales.

FACT FILE
Conwy County Council headquarters, Colwyn Bay
Main client: Conwy County Council
Developer: Muse Developments
Architect: AHR Architects
Main contractor: Bowmer & Kirkland
Structural engineer: Arup
Steelwork contractor: EvadX
Steel tonnage: 1,050t

Work is under way on a new steel-framed civic building in Colwyn Bay town centre, North Wales, which will provide the local authority with a four-storey, BREEAM 'Excellent' headquarters.

Providing 9,200m² of office space, it will accommodate around 750 staff and replace up to 13 existing offices. The scheme also includes an adjacent three-level, 354-space car park, which is also a steel-framed structure.

Overall, the scheme will contribute to the Council's continued regeneration of Colwyn Bay, having already invested over £50M in recent years for the modernisation of the promenade, as well as extensive coastal defences.

Regeneration specialist Muse gained planning approval for the project in August 2016. The company was selected as the Council's preferred development partner in September 2015 following a competitive procurement process.

Main contractor Bowmer & Kirkland's early involvement in the project began with a look at the design's framing solutions.

"Originally the frame was concrete for the car park and office cores, however through value engineering and a desire for cost savings the scheme switched to a full steel frame during the final design stage," says says Bowmer & Kirkland Project Manager Mark Hooson.

"The large spans in the office and car park lend themselves to a steel solution. The use of cellular beams ensures sufficient space to distribute services within the ceiling voids," adds AHR Associate Director Geoff Goodman.

"Steel is also the most efficient and lightweight structural solution to realise the building's very distinct roof form and glazed atrium roof, and steel also brings the benefit of programme savings through its speed of construction."

With the new design in place, Bowmer & Kirkland started on-site during November 2016. It initially demolished the existing buildings, clearing the site and then completed the groundworks in preparation for the steelwork erection, which began in June this year.

"Prior to the steel erection starting we also installed the piled foundations and laid the concrete slab throughout the site," explains Mr Hooson.

"The slab provides a clean and safe surface for the steel erectors' cranes and

MEWPs to work on."

EvadX is erecting the project's steelwork simultaneously on both the offices and car park with two erection gangs, each with their own 50t-capacity mobile crane.

The steel design of the car park is based around a 7.5m × 16m grid pattern, using Westok cellular beams supporting precast planks.

The car park has three floors, including an open rooftop level. In order to accommodate the footprint's slope, the middle floor has a split level.

"Planning dictated that the car park structure's height had to be kept to a certain height and so all of the beams are a maximum 575mm deep," explains Blue Print Engineers' [the company detailing the steelwork for EvadX] Paul Dean.

"This size of beam is sufficient to create the required headroom clearance, form the long 16m span, support the planks and 75mm floor topping, and create a light airy environment because of the cellular holes that allow light into the inner parts of the building."

Visualisation of the completed offices

Although the adjacent steel-framed office block is linked to the car park at ground floor, both buildings are structurally independent.

Kloeckner Westok provided value engineering design services to EvadX for the scheme's clear span solution. Kloeckner's Design Team Manager John Callanan said: "We were delighted to work with EvadX to realise the economic clear spans required for the project. Considering the strict beam depth limits throughout the structures, pre-cambered cellular Westok beams ticked all the boxes."

The office building is designed around a regular 7.5m × 15m grid pattern, which repeats throughout the building's four floors, giving the offices the desired open-plan environment. Cellular beams have been used to support metal decking in a composite design, as well as to accommodate all of the services within the structural void.

Positioned in the middle of the building is an atrium, creating a full-height void that is topped with a glazed roof. Allowing natural light to penetrate the inner areas of the building, the atrium also accommodates stairs and a lift core.

Supporting the atrium's glazing is a series of 10 × 15m-long tubular bowstring trusses that span the void at roof level.

The main elevations of the office structures feature steep pitched roofs, mimicking and in keeping with the town's 19th Century buildings.

The pitched roofs are formed with propped rafters from the flat low level roof on the inner portions of the building. The outer sides are supported with perimeter columns along the outer elevations. These outer columns are either full-height or start at third floor level.

In total, there are 12 pitched roofs, one atrium roof and also a high level flat roof above the main lift and stair core area.

Summing up, Muse Development Director Phil Marsden says:

'This is a very important project for Colwyn Bay and the ongoing regeneration of the town. We're working closely with Conwy Council to develop the scheme which will help them to operate more efficiently and reduce their carbon footprint by bringing a number of key services together into one energy-efficient and accessible building."

Cllr Dilwyn Roberts, Leader of Conwy County Borough Council, adds: "This new office building will not only help to streamline our office accommodation, but it's also a key part of our regeneration programme."

Cellular beams offered the most efficient solution for the car park

The distinctive rounded shape of the hospital presented a number of construction challenges

FACT FILE
New Orkney Hospital and Healthcare Facility, Kirkwall
Main Client: NHS Orkney
Architect: Keppie
Main contractor: Robertson Major Projects
Structural engineer: AECOM
Steelwork contractor: BHC
Steel tonnage: 1,200t

Healthcare in the frame

A number of challenges have had to be overcome during the construction of a new hospital in the Orkney Islands. Martin Cooper reports from a project where steel has ticked all the boxes.

Healthcare in the Orkney Islands is set to be transformed by a new £64M hospital and healthcare facility which will provide a state-of-the-art clinical environment for the delivery of health services, and with the introduction of new technologies and facilities will reduce the number of people having to travel to the Scottish mainland for routine care.

Replacing the existing Balfour Hospital, the new facility, which opens in 2019, is currently being built on a greenfield site on the outskirts of Kirkwall, the Island's largest settlement and capital.

The project is said to be the biggest construction job on the Orkney Islands since St Magnus Cathedral was completed in the 12th Century. In recent times, it is certainly the largest project since the construction of Kirkwall Grammar School and Pickaquoy Leisure Centre [see NSC April 2012].

Apart from the Cathedral, all of the aforementioned projects have used structural steelwork as their main framing material.

Steel has a number of advantages over alternative framing solutions when it comes to construction on outlying islands [see box].

"A composite steel solution with metal decking was the best choice for the hospital, as other framing materials simply wouldn't have worked," explains Mark Dalziel, Senior Project Manager for Robertson Major Projects, which is delivering the project.

"For instance, there is only one concrete batching plant on the Orkney Islands and they could not have supplied our needs. Installing our own plant would have been very time-consuming and wouldn't have been cost-effective, so steelwork, which can be brought over from the mainland by ferry ready for erection, was the best option."

Steel works

Delivering a major healthcare project on the Orkney Islands presented main contractor Robertson Major Projects with a unique set of challenges. To solve these, it took into account the remoteness of the island, supply chain logistics, local landscape, and challenging climatic conditions.

For example, procuring and shipping construction materials, such as steel, to the island and storing on-site well in advance of programme requirements reduced the vulnerability of the project to extreme weather conditions.

Steelwork's speed of construction was also vital as the envelope of the building is designed to take into account the available trades on the islands and to achieve an early wind and watertight position, thereby allowing internal trades to progress despite inclement weather.

The hospital is due to open in 2019

Minimising vibration generated by footfall is an important issue for hospitals, particularly in areas accommodating wards and operating theatres. At this hospital, all of these facilities are located on the first floor and, to minimise vibration, the composite reinforced concrete floor slab has been designed as 300mm thick, as opposed to a more conventional 150mm in less sensitive areas.

Supporting the thicker slabs, the design has also required the use of short-span heavy steel beams and two additional lines of columns, further negating the potential for vibration issues.

Importantly, the hospital has a very complicated design and shape, necessary to support the required clinical adjacencies and flows, and this also lent itself to a steel composite solution.

The two-storey structure incorporates two inner circular courtyards, one completely enclosed by the building, and the other a partially enclosed horseshoe-shaped yard with an opening.

In between the courtyards there is a connecting hub containing the main entrance, restaurant, a shop and main waiting area. Adjacent to the hub and courtyards, and joining them altogether, the main hospital building is a long-curved structure.

"The plan geometry of the design is very complicated and the curved longitudinal grids are based on a number of different radii. We've used straight steel beams for most areas, effectively faceting the frame between grids, although for the tightest curves we've used curved steel members," says AECOM Project Engineer Chris Denton.

Utilising steelwork supporting metal decking has also made it easier to form the required curves in the floorplate.

"Metal decking is fairly easy to cut on-site compared to the alternative precast flooring solution, which would have been far more challenging and time-consuming," says Mr Dalziel.

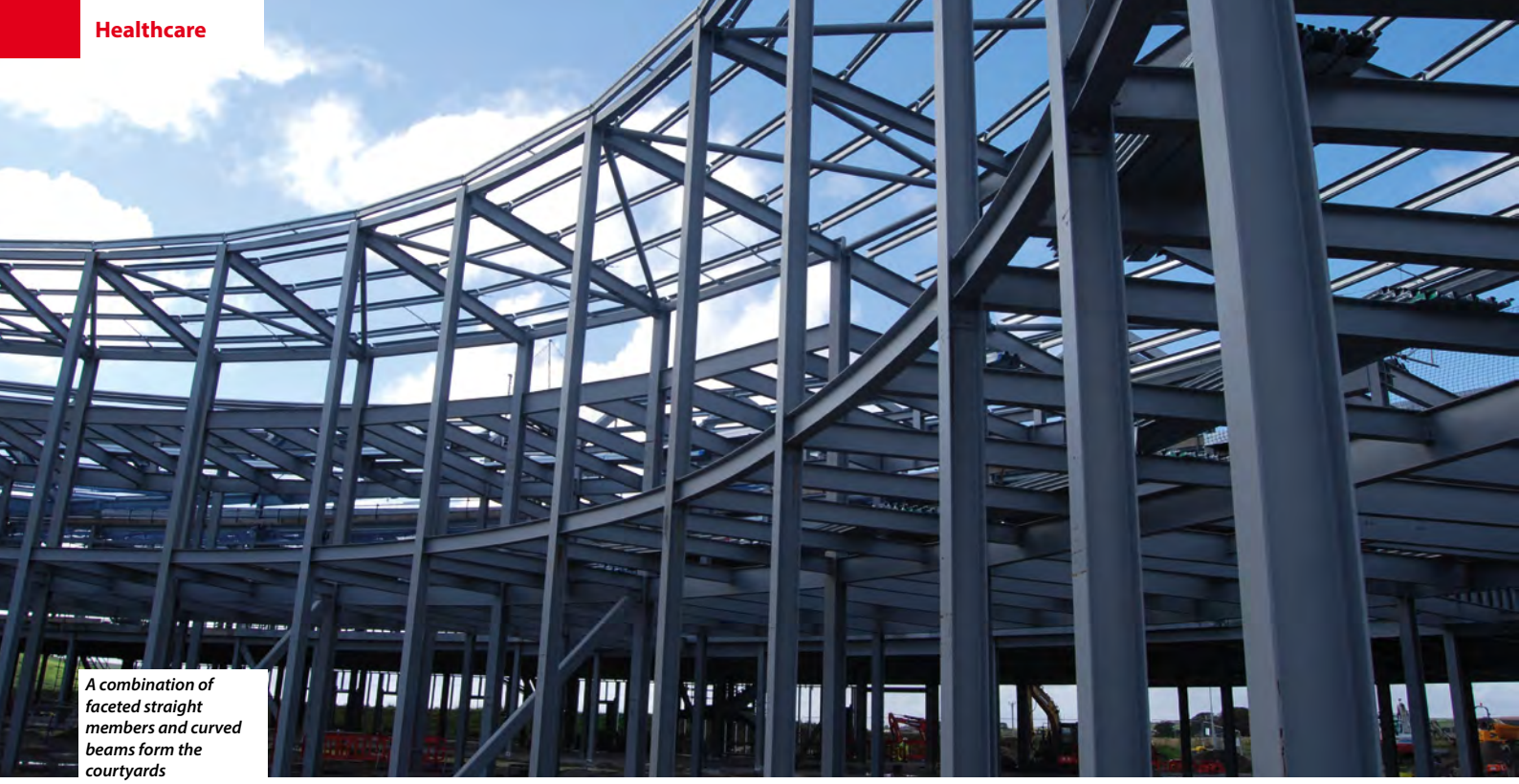
Predominantly the steelwork is based around a fairly regular 6m grid pattern, at least as far as the perimeter columns are concerned. However, internal columns arranged around the tighter curves of the courtyards have been adjusted accordingly, presenting the scheme with a grid pattern that can also vary from 4m up to 7m spacings.

"There may be three columns positioned along the outside perimeter of a curved area, but the inside of the curve only requires two columns," explains Mr Denton.

The hospital's configuration is fairly standard throughout with a central corridor running down the middle of most parts of the building, separating rooms on either side. The corridors are where the services are located just below the steel first floor and roof beams.

As hospitals are heavily serviced, and this one is no different, some services have had to be accommodated within the beam's depth, via a series of bespoke holes.

"In some areas, we would have had severe congestion without running some



A combination of faceted straight members and curved beams form the courtyards

services through the beams," says Mr Dalziel. "Having a BIM model to share with the steelwork contractor BHC and all of the other team members meant that we could avoid clashes and provide sufficient room for services."

The entrance to the hospital is accommodated within a large central column-free space known as the hub. This double-height space will have a series of north lights positioned within the roof, allowing plenty of natural light into the hub.

The hub is formed with a series of 15m-long rafters creating the required spacious zone.

From the hub the southern courtyard can be accessed. This totally enclosed outdoor area will be landscaped and feature a sensory garden and seating to create a sheltered area for visitors and patients alike. The other partially enclosed courtyard will be an outdoor area for a range of users.

The building's steel frame derives most of its stability from vertical diagonal bracing, positioned in internal partition walls and perimeter areas where there are no windows. This has worked well for the ground floor where the GP practices, dentistry, outpatients, staff areas and kitchens are located.

The first floor, which predominantly has operating theatres and patient rooms – all en-suite single occupancy units – has been designed with more flexibility in mind. Stability to the steel frame on some parts of the upper floor is therefore provided by moment frames.

Using moment frames instead of bracing has allowed the scheme the flexibility to change partition walls and room layouts right up to the last minute, without causing any undue issues to the steelwork contractor's fabrication programme.

Summing up, NHS Orkney Chief Executive Cathie Cowan says: "This development will match our aspirations to deliver the highest quality care and services from fit-for-purpose facilities."

Vibration requirements

Phil Francis of the SCI discusses design for vibration mitigation

The vibration requirements for hospitals are the most onerous that a typical designer might encounter. Vibration design should always be considered at every stage of the design process, since it is quite usual for vibration requirements to dictate both the thickness of slab required and the maximum spans. The 300mm slab specified by AECOM for sensitive areas of the Kirkwall hospital project is not atypical.

The SCI's key publication concerning vibration is 'Design of Floors: A New Approach (P354)'[1]. In addition to the guidance for ordinary structures, Section 8.2 gives specific advice for hospital floors. A limiting response factor of 1 is presented for operating theatres and 2 for wards, derived in accordance with 'Health Technical Memorandum 08-01 (HTM 08-01)'[2]. Designers should also be aware that hospitals often include sensitive equipment, such as MRI machines, which may have specific vibration requirements, which should be sought from the manufacturer.

P354 presents both a simplified assessment methodology and a finite element method. The simplified method combines the individual natural frequencies of the elements into a system frequency, which in combination an approximate model mass allows the acceleration of the floor to be calculated. As with any simplified method, conservative assumptions have been introduced. The implications of these assumptions on the sizes of the structural elements can be large, especially in the most sensitive areas. For this reason, the simplified method is recommended only for initial design.

Finite element analysis represents the best available tool for vibration design. In recent years the requirements of P354 have been implemented in a large number of software packages. The designers of the Kirkwell Hospital made use of Autodesk Robot. Other software packages known to have implemented the P354 method include Masterseries and OASYS GSA.

The requirement for such large slabs and beams can result in a considerable 'structural depth', which may be an issue for some designs. In this situation, various 'shallow floor' systems are available, which allow for the beams to be integrated into the slab. Testing of the proprietary *slimdek* system has shown good performance in hospital applications[3].

References

1 Design of Floors: A New Approach (P354), Revised Edition 2009

2 Health Technical Memorandum 08-01 (HTM 08-01): Acoustics, Department of Health, 2013

3 Slimdek manual, Tata Steel, 2012

Search for Advisory Desk articles on newsteelconstruction.com

Use the search bar at the top of every page of ***newsteelconstruction.com*** to search out Advisory Desk articles by name, number or subject, or list them (most recent first) by hovering over *Technical* in the main menu and selecting *Advisory Desk* from the resulting pop-up menu.

Steelwork has been erected while the store remains open

Steel checks out at West End store

Phase two of Selfridges' ambitious redevelopment programme is under way, with structural steelwork playing an integral role. Martin Cooper reports.

FACT FILE
Selfridges' redevelopment phase two
Main client: Selfridges
Architect: David Chipperfield Architects
Main contractor: Blue Sky Building & Sir Robert McAlpine JV
Structural engineer: Expedition Engineering
Steelwork contractor: William Hare
Steel tonnage: 550t

Selfridges, London's world-renowned West End department store is currently in the midst of a multi-million pound refurbishment project.

The scheme will provide better links between the famous 1909-built classical-style main building, which fronts Oxford Street, and a later extension to the rear, initially built in the 1930s and known as the SWOD building, after the Somerset, Wigmore, Orchard and Duke streets that used to surround it.

The revamp includes the construction of a new entrance on Duke Street, to cope with the footfall increase expected when the nearby Bond Street Crossrail station opens, as well as new retail floors above.

Interestingly, both of these Selfridges buildings are steel-framed, with the original store having the distinction of being one of London's oldest steel-framed buildings.

Phase one of this ambitious scheme, which included the construction of a new loading bay egress ramp, was completed towards the end of 2016.

This initial phase was essentially an enabling works package, as once the store had its new ramp operational the old loading bay ramp along Duke Street, as well as the floors above, were demolished to make way for the more complex phase two to begin.

The phase two footprint is situated within an area previously occupied by Somerset Street, the thoroughfare that once separated the original Selfridges store from its later SWOD annex.

The road was purchased from Westminster Council in the late 1940s and consequently disappeared as new store buildings were constructed over it to link the two parts together. It is the eastern end of this zone, formerly containing a 1950s-built structure, that a new structurally independent steel frame is being erected.

There are five levels of existing structure either side of the new steel frame to be linked; lower ground, ground, first, second and third.

Although there are older steel-framed elements either side, phase two did not necessarily have to have the same framing solution. However, as the surrounding structures are historic and their capacity for additional loadings is limited, a stand-alone steel-framed solution was deemed the most appropriate solution.

The only exception to this structural independence is a new steel-framed lift and stair core, which has been carefully and meticulously inserted into an adjacent area of the 1909-built building and welded to the original steelwork.

"The best solution to create the entrance and the desired new flexible retail spaces in this area was an independent steel sway frame separated from the existing structures by movement joints," explains Expedition Engineering Associate Director George Oates.

Steelwork's comparative lightness to other framing solutions was also a reason for choosing this material. A light frame is essential for the project as the Post Office's now redundant railway tunnel runs directly beneath the site.

"A heavier frame would have meant deeper piles and these would not have been viable because of the tunnel," explains Mr Oates.

The confined site has room for only one tower crane

The design's three-storey high Vierendeel sway frame does not need any internal bracing, which would have interfered with the open retail areas. The three upper floors consequently have 15m-wide spans with no internal columns and the supporting perimeter members are located as close to the adjacent existing columns as possible, thereby maximising available space.

Below the sway frame the supporting columns step in at ground floor and then again at lower ground to deliver loads into the ground away from the existing basement structures. To accommodate this column line change, a total of eight 1.2m-deep, 17t transfer beams have been installed; four on each level.

"The new steelwork frame is approximately 15m wide and four bays deep and it will provide flat seamless linkages between the two parts of the store," explains Blue Sky Building & Sir Robert McAlpine JV Project Manager Martin Ewing.

"But the desire to have flat links gave rise to one of our main challenges as at ground floor there is an area, towards the back of the site, known as the 'bump' where there are a couple of steps in the floor level due to the various construction phases that have taken place over the last 100 years."

The 'bump' needed to be flattened and breaking out the old concrete to level the floor was straightforward enough, but that alone would have left seven existing steel columns too short to reach the ground. The solution was to insert a series of jacks that each supported three floors of structure while the work was done.

Once the concrete flooring was removed, new steel stubs measuring 1.5m-high were welded into place at the base of each column, making them the correct height for the new build. The structure was then de-jacked and the temporary works removed.

Another similar jacking process was also undertaken to remove two large masonry columns from the lower ground and ground floor levels. These two large elements were positioned either side of the new entrance area in the zone where the new build abuts the existing structures.

In order to create more space for customer flow, the columns were removed and replaced with much slimmer steel 305 columns.

"To give the Duke Street elevation, including the entrance foyer, a high-quality finish, the entire front bay of steelwork is being encased in a high-quality finish precast concrete," adds Mr Ewing.

"And to ensure the best possible finish, the correct tolerances and a quick installation programme, the steelwork is being erected fully encased in precast concrete."

This has required steelwork contractor William Hare to liaise closely with the precast concrete contractor; delivering the steel sections to its plant and then taking delivery of members that are fully encased in precast concrete, ready to be taken to site and erected.

The front entrance bay includes a series of six slender T-sections that support a barrel-vaulted roof over a three-storey open area that extends upwards from first floor level as well as a glazed frontage.

The ability to bring steelwork to site in relatively small sizes has been a benefit to a project with no room for storage and only one tower crane for all lifting duties.

"Steelwork is prefabricated offsite and this was an important consideration for our design, especially the front bay," sums up Mr Ewing.

"And importantly, all of the steelwork has been successfully installed without causing any interference to the store, which will remain open throughout the entire construction programme."

Selfridges phase two is due to complete in mid-2018.


Numerous listed elements on Selfridges' original building are being protected


Larger retail areas and better links between buildings are being created

Energy solution

Steel-framed structures house the main processing areas for a new renewable energy plant in Kent.

Up to 50,000 households could benefit from this energy centre

FACT FILE
Kent Renewable Energy, Sandwich
Main client: Kent Renewable Energy
Main contractor: Burmeister & Wain Scandinavian Contractor [BWSC]
Structural engineer: BWSC
Steelwork contractor: Caunton Engineering
Steel tonnage: 820t

With the demise of traditional coal-burning power stations throughout the UK, the search for new and more sustainable sources of energy has become increasingly important.

Many local authorities are investing in renewable energy plants where either household waste or a renewable commodity is used as an alternative fuel source.

An example of this is the Kent Renewable Energy plant under construction at Discovery Park near Sandwich. This facility will have a capacity of 27.8MW and will be fired primarily with woodchip sourced locally in the UK.

The entire biomass fuel required for this plant will be sourced under a long-term contract with Euroforest, one of the largest virgin wood suppliers in the UK. It is claimed the plant will deliver CO_2 savings of approximately 100,000 tonnes every year.

The plant is owned by a joint venture of Burmeister & Wain Scandinavian Contractor (BWSC) and a Danish infrastructure fund managed by Copenhagen Infrastructure Partners, who together are investing around £160M in the project.

Once complete, the plant will be operated for up to 20 years by BWSC, which is also managing the construction of the project.

It is said that the plant will be able to produce energy corresponding to the power consumption of 50,000 households. Heat and some of the power will be delivered to Discovery Park, which is one of the UK's leading science parks, with the remainder going to the National Grid.

Regardless of what fuel is used, power plants generally make use of steel construction for their main buildings and the Kent Renewable Energy plant is no exception. Here, a number of large steel-framed buildings have been erected to accommodate the main processing stages.

"Steel is the most efficient way of designing this sort of energy centre as it allows the flexibility to construct the required tall buildings quickly and economically," explains BWSC Lead Engineer Agust Asgrimsson.

The project is on a fast-track construction programme and, in order to keep the job on schedule, the steel frames for the boiler hall and turbine building had to be erected around equipment installation.

"Much of the project's steelwork was designed to include temporary works, so that it could be partially erected around our installation programmes," adds Mr Asgrimsson.

"The boiler hall for instance was initially erected without one façade and its roof so the boiler could be lifted into place during a break in the steel erection process."

Caunton Engineering is responsible for the fabrication, supply and erection of the steel structures as well as the design of the connections.

In order to fit in and around the site's important equipment installations, Caunton began its steel erection package with the boiler hall.

"Having erected three sides of the boiler hall, we moved on to the project's other steel buildings, allowing the contractor to install the boiler," explains Caunton Engineering Erection Manager Robert Aitman.

"Once the boiler was in we came back and erected the fourth elevation and the roof, and also dismantled all of the structure's temporary bracing."

The boiler hall is 33.5m high and 32m wide on two elevations and 28m wide on the other two sides. It is formed by a series of large UB914 x 305 columns spaced at 7.5m centres which were brought to site in three pieces. They were then assembled on the ground and lifted into position as one large section.

The building's roof is formed by five 28m-long rafters, which arrived on site in two sections, each weighing 4t. Using two 220t-capacity cranes in conjunction with two 160-tonners holding man-baskets, the roof rafters were lifted individually and bolted together in the air while being connected to the supporting columns.

After completing the first stage of the

Construction of the plant is taking place around a number of existing businesses

Steel erection has been completed around equipment installation

Steel was chosen for its long span attributes

Cladding follows on quickly behind steel erection

boiler hall erection, Caunton moved on to the adjacent turbine hall.

The turbine hall is a structurally independent building separated from the boiler hall by a movement joint. Having the same width as the boiler house, albeit with a slightly lower roof, once clad the structures will appear alike.

In a similar methodology to the boiler hall, the main elevational steelwork was erected first with the roof on the turbine hall installed later, once BWSC had lifted the turbine and its associated equipment into place through the roof void.

Along with these two major steel frames, Caunton has also been responsible for a number of smaller structures, such as an electrical annex, pump room, workshop, associated stairways and ladders, and a cable bridge.

Wood will be delivered to the plant as processed woodchip and initially stored in a large steel-framed 20m-high portal shed that required 222t of steelwork. The building measures 48m-long x 25m-wide and the roof is formed with a series of 25m-long rafters. The steel frame also supports a set of crane rails and an overhead gantry crane.

From here the woodchip is fed into an adjacent wood feed building, where the fuel is transferred on to a conveyor belt system that delivers it to the boiler. Caunton supplied and erected the roof for the feed building.

Summing up the project, BWSC Resident Project Manager Erik Pedersen says: "There are a number of challenges on this brownfield site, not least the number of underground services from previous installations found during excavation works.

"The steelwork programme has progressed successfully working around this obstruction, as well as in and around numerous other trades on this busy site."

The Kent Renewable Energy plant will go live in November 2018.

Design of buildings to resist external accidental explosions

Bassam Burgan of the SCI discusses the design of low to medium rise buildings against external explosions and SCI's forthcoming design guide.

Figure 1: Northgate Building, Buncefield (courtesy of the Health and Safety Laboratory)

Blast caused by industrial accidents

The chemical and petrochemical industries process substances that are essential to our lives (e.g. mineral fertilizers, fuels and pharmaceuticals). Under certain conditions, such substances may be flammable, explosive or toxic. These industries continuously strive to improve the safety of their manufacturing processes and today, they are amongst the safest industrial sectors. However, when accidents happen, they can impact not only the industrial facility itself, but also its neighbourhood, sometimes extending several miles from the accident site. Major high profile incidents such as Flixborough, UK (1974), Seveso, Italy (1976), Bhopal, India (1984), Shell Norco, USA (1988), Phillips Pasadena, USA (1989), BP Texas City, USA (2005), Buncefield, UK (2005), Caribbean Petroleum Corporation, Puerto Rico (2009) and Indian Oil Company, India (2009) demonstrated the loss of life and property and the environmental, economic and reputational damage that can be caused by such accidents.

An explosion caused by an industrial accident results in a blast wave. High pressure blast waves that travel through air at a velocity greater than the speed of sound are referred to as shock waves (Figure 2(a)). By contrast, lower amplitude blast waves travelling at speeds below the speed of sound are referred to as pressure waves(Figure 2(b)).

Blast wave interaction with building structures

Both shock and pressure waves result in a "global" action on buildings at adjacent sites. The response of a building to blast is influenced by the magnitude, rise time and duration of the blast wave and there is strong coupling between the action and the building due to reflection and diffraction effects. Once the envelope of a building fails, pressure distribution can be amplified by multiple reflections inside the building and building elements, such as floors, are exposed to upward pressure, an action for which they are not normally designed.

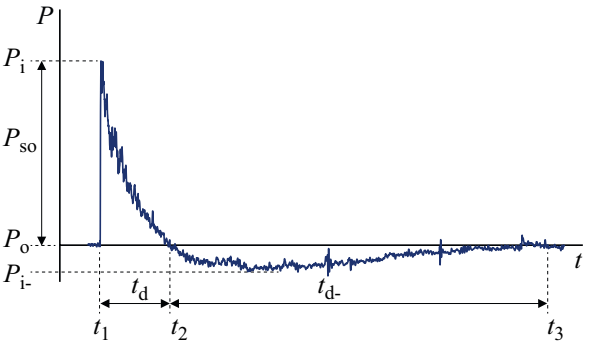


Figure 2(a) Shock wave

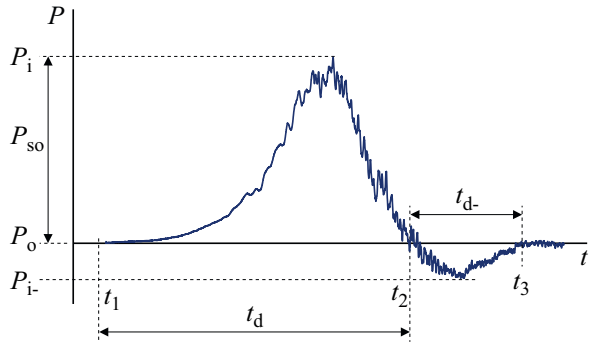


Figure 2(b) Pressure wave

When a blast wave strikes the surface of a building, the air molecules at the front of the blast wave are arrested abruptly by the building's surface. These molecules are compressed by the trailing blast wave, which causes the reflected pressure to be greater in magnitude than the incident pressure (Figure 3). The increase in the magnitude of reflected pressure depends on the angle at which the incident blast wave strikes the building surface.

Blast wave interaction with a building structure was studied in a recent SCI led European project in which experimental studies quantified the nature and distribution of the blast actions on a typical "out-of-town" office building (reference building)- see Figure 4. The tests were performed on two 1:60 scale models of the building, one solid and one with openings to investigate

▶28

celebrating

excellence in steel

Call for entries for the 2018 Structural Steel Design Awards

The British Constructional Steelwork Association and Trimble have pleasure in inviting entries for the 2018 Structural Steel Design Awards.

The Awards celebrate the excellence of the United Kingdom and the Republic of Ireland in the field of steel construction, particularly demonstrating its potential in terms of efficiency, cost-effectiveness, aesthetics and innovation.

The Awards are open to steel-based structures situated in the United Kingdom or overseas that have been built by UK or Irish steelwork contractors. They must have been completed and be ready for occupation or use during the calendar years 2016-2017; previous entries are not eligible.

To find out more and request an entry form visit www.steelconstruction.org/resources/design-awards or call Gillian Mitchell of BCSA on 020 7747 8121

Closing date for entries:
Friday 23rd February 2018

BCSA

Trimble

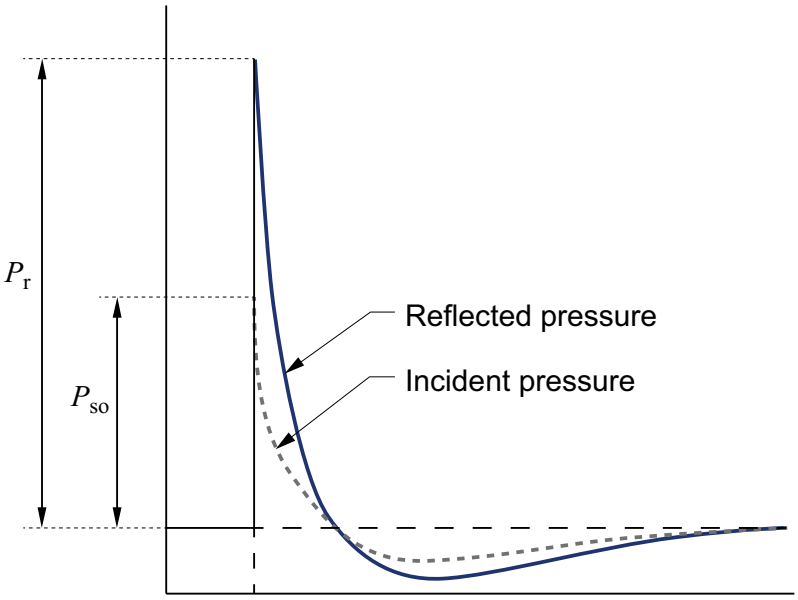


Figure 3: Pressures due to incident and reflected shock wave

▶26 blast wave interaction with the building floors and walls within the building. The scale models were tested at different angles of incidence of the blast to determine the variation in the reflected pressure as a function of the angle of incidence. The results were also used to assess the accuracy of analytical equations used for calculating blast action and for providing guidance on numerical (computational fluid dynamics) modelling of blast actions.

Response of building components and whole building to blast

Large scale blast tests were also performed on building elements and sub-assemblies including masonry and composite cladding, simple beam-column connections and composite floors. The purpose of these tests was to study the transfer of blast actions from the envelope to the frame of the building and the performance under blast action of building elements such as floors and connections. The results were used to validate detailed numerical models and carry out numerical parametric studies. Based on this work, sub-models (a component connection model and a 2D flat shell element for the composite slab) were calibrated and used in whole building finite element models. The whole building model enabled the behaviour of the reference building under a series of explosion scenarios to be studied, identified failure modes and was used to propose retrofitting strategies.

New SCI design guide

The project led to the development of a new SCI design guide which provides recommendations and advice for the structural design of low to medium rise steel-framed buildings (typically two to five storeys high) subjected to blast action due to external explosions. Step-by-step methods are given for the calculation of the resultant blast action on a building as a result of the interaction of the blast wave with the building elevations.

Guidance is given on the calculation of material properties to be used in the design of members. Yield stress design values are increased by a static increase factor to account of the fact that the actual yield strength of the common grades of steel (up to S355) is frequently greater than its guaranteed minimum value by more than 25%. This reduces conservatism in a design situation which involves an accidental combination of actions and ensures that the forces and moments transmitted from members to connections are not underestimated. To avoid failure of the connections, the static increase factor is not applied to the connection components. This is similar to the approach adopted in BS EN1998-1 for capacity design.

The mechanical properties of structural steels are affected by the rate of load application. The guide therefore recommends values to account for the increase in yield and ultimate strength due to the dynamic nature of the blast action.

In blast response analysis, the calculation of forces, moments and deformations requires the use of dynamic analysis of the building structure. Simplified analysis software (www.blastresponse.com) was developed comprising three modules: (i) an advanced single degree of freedom (SDOF) model capable of accounting for generalised boundary conditions and loading of a structural element, (ii) SDOF composite floor model and (iii) a multi-degree of freedom (MDOF) model capable of analysing 3D building structures with general grid layouts. The software was validated using advanced finite element analysis.

The response of the building frame members is verified by reference to deformation limits (both deflection and rotation) which correspond to different damage levels. These depend on member type and slenderness and on the nature of loading acting

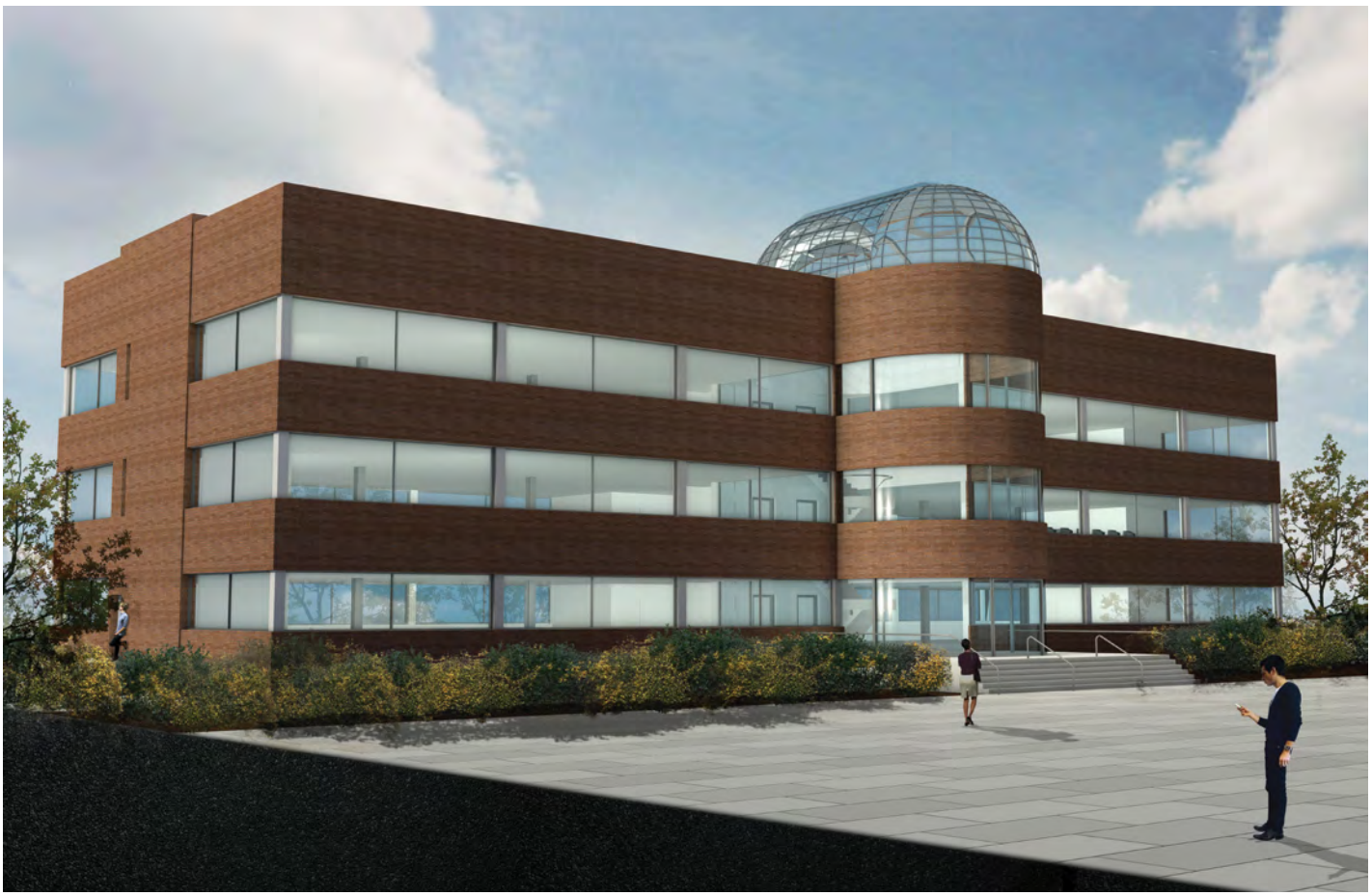


Figure 4: Reference building

on the member. Connections are also verified by reference to rotation limits. To ensure overall frame stability, inter-storey drift and frame member rotation limits are imposed.

Member capacity checks are performed in accordance with BS EN1993-1-1. This is modified in some cases to allow for the large deformations that may be tolerated in the case of blast response. Furthermore, the verification of columns in braced bays is modified as per BS EN1998-1 to ensure that the columns can resist the additional forces transmitted to them by the bracing members.

Design examples

The design guide is illustrated by a series of design examples based on the reference building. They include two explosion scenarios of different severity and the design verification of (a) a lintel supporting building cladding, (b) a composite floor and (c) the overall assessment of the building frame and the redesign of the bracing and columns to resist the more severe of the two blast scenarios.

The project was funded by the European Union's Research Fund for Coal and Steel (RFCS) under grant agreement no. RFSR-CT-2013-00020 and the UK Centre for the Protection of the National Infrastructure (CPNI).

AD 412: Issues related to coatings and availability of structural fasteners

Recently, SCI has received some queries related to the coatings and availability of structural fasteners. This advisory desk note addresses some of these issues.

It is probably useful to clarify the terminology applicable to zinc-coated bolts, nuts and washers. There are currently three common standardized types of zinc coating in use in the construction industry – galvanized, sherardized and electro-plated.

Galvanized, used correctly, means 'hot-dip galvanized' – a process of dipping in molten zinc. In the case of bolts and nuts, after dipping they are normally spun in a centrifuge while the coating is still fluid to clear the threads of excess zinc. This is described as 'spun galvanized'.

Sherardized means zinc-coated by a special process involving heat and zinc dust, normally carried out in a rotating drum.

Electro-plated, as the name implies, means coated by a process of electrolysis, which involves immersion in an acid.

Regrettably, 'galvanized' is sometimes used more loosely, either to mean any zinc-coated fastener, or any except electro-plated. This is confusing and should be avoided.

Q1. There appears to be a shortage of sherardized bolts in the market, do you know why this is? And what is the recommendation to use as an alternative? Electro-plated or hot-dip galvanized bolts?

A1. The shortage of sherardized bolts is generally a reflection of market demand with the hot-dip galvanized and electro-plated finishes dominating the structural bolting market with rough approximation of a 70 % hot-dip galvanized / 30% zinc-plated. Another factor is that the vast majority of non-preloaded bolting assemblies are imported and since sherardizing is not generally available in the manufacturing markets, sherardized structural bolts are more expensive

Q2. Bolt galling/lock up, does this become more of a problem with hot-dip galvanized bolts?

A2. Galling is not a problem with non-preloaded structural bolting assemblies whether hot-dip galvanized or zinc-electroplated. In the distant past there could be problems with hot-dip galvanized bolting assemblies because of excessively thick, uneven or rough coatings. However, these problems do not affect the current hot-dip galvanized structural bolting assemblies available in the UK market.

Q3. My understanding is a lubricant should be applied to prevent this, but should you only really need to use a lubricant in pre-loaded bolt assemblies? Or in all cases?

A3. For pre-loaded assemblies, it is a requirement of the European standards (EN 14399 series) that bolting assemblies are supplied with suitable lubrication to ensure satisfactory installation. However, it is essential that these assemblies are stored in suitable dry and well ventilated storage conditions to ensure there is no deterioration of the lubricant on site prior to installation. Provided the storage conditions are suitable no additional lubrication should be necessary.

In preparation of this AD note, SCI acknowledge assistance provided by Mark Tiddy of Cooper & Turner (bolt manufacturers).

Contact: **Abdul Malik**
Tel: **01344 636555**
Email: **advisory@steel-sci.com**

New and revised codes & standards

From BSI Updates October 2017

BS EN PUBLICATIONS

BS EN ISO 377:2017
Steel and steel products. Location and preparation of samples and test pieces for mechanical testing
Supersedes BS EN ISO 377:2013

BRITISH STANDARDS WITHDRAWN

BS EN ISO 377:2013
Steel and steel products. Location and preparation of samples and test pieces for mechanical testing
Superseded by BS EN ISO 377:2017

NEW WORK STARTED

EN 1337-1
Structural bearings. General
Will supersede BS EN 1337-1:2000

EN 1337-2
Structural bearings. Sliding elements
Will supersede BS EN 1337-2:2004

EN 1337-3
Structural bearings. Elastomeric bearings
Will supersede BS EN 1337-3:2005

EN 1337-4
Structural bearings. Roller bearings
Will supersede BS EN 1337-4:2004

EN 1337-5
Structural bearings. Pot bearings
Will supersede BS EN 1337-5:2005

EN 1337-6
Structural bearings. Rocker bearings
Will supersede BS EN 1337-6:2004

EN 1337-7
Structural bearings. Spherical and cylindrical PTFE bearings
Will supersede BS EN 1337-7:2004

EN 1337-8
Structural bearings. Guide bearings and restraint bearings
Will supersede BS EN 1337-8:2007

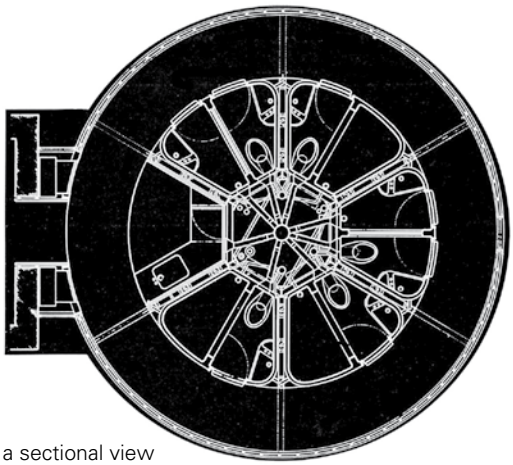
DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT – NATIONAL BRITISH STANDARDS

17/30349707 DC
BS 5975 Code of practice for temporary works procedures and the permissible stress design of falsework.
Comments for the above document are required by 31 October, 2017

17/30362175 DC
BS EN 10058 Hot rolled flat steel bars and steel wide flats for general purposes. Dimensions and tolerances on shape and dimensions
Comments for the above document are required by 23 October, 2017

BUILDINGWITHSTEEL
Reprinted from Volume 4 No. 8
November 1967

A tower full of baths



a sectional view of the structure

Six large Victorian houses at Lancaster Gate, London, are being converted into an international student's hostel. With space at a premium, the architects were driven outside to provide a service tower at the rear of the building, carrying all the hostel's bathrooms.

A circular structure was decided upon with a diameter of 21 ft. Access to the bathrooms is by a spiral ramp which winds up the building.

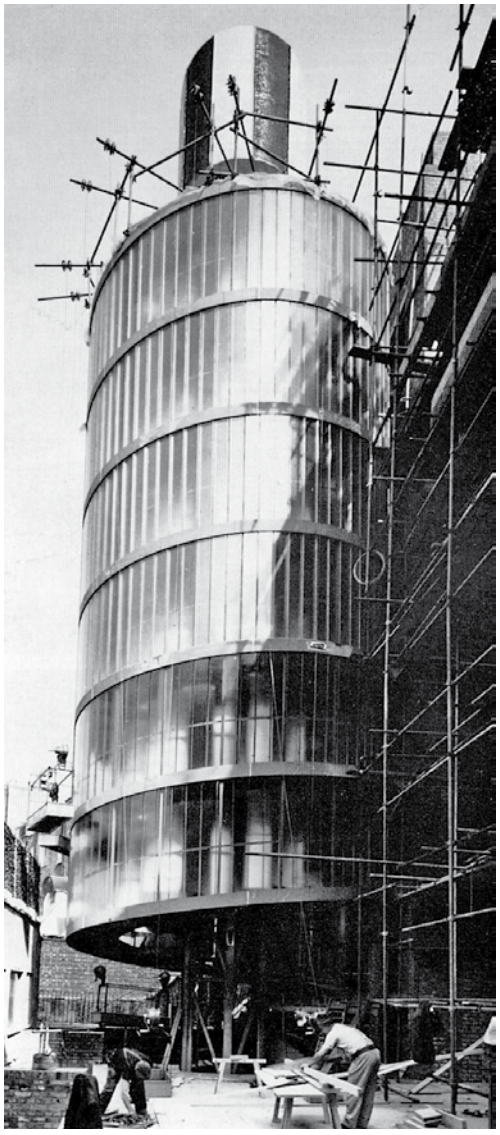
The tower structure consists of a steel-framed core with beams radiating from it supporting a continuous spiral steel ramp which gives access to thirty bathroom 'pods' made from glass reinforced plastic.

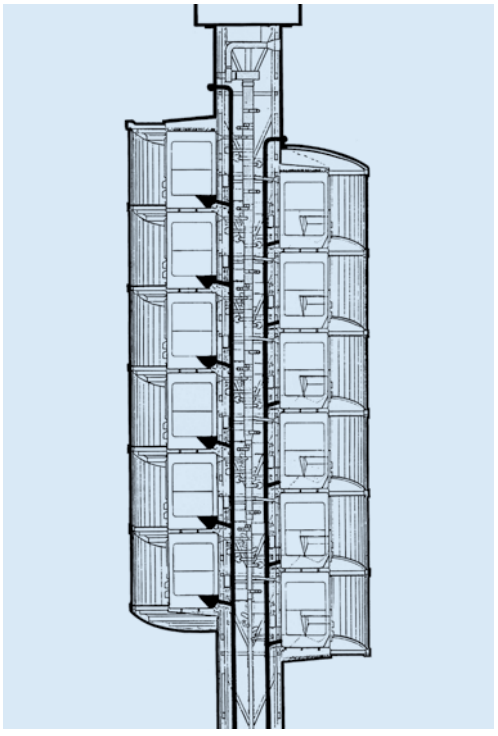
The twelve pre-fabricated sections from which the core was erected were placed one on top of another by means of a beam slung from the existing buildings. A revolving lifting beam with winch, attached to the top of the core positioned the remaining steel members, bathroom 'pods' and ramps.

Radial beams were placed in position and supported from the core by diagonal hangers. Each radial beam was at 60° to and 1ft $2\frac{1}{2}$ in higher than the last. 'Pod' support beams were fitted between the radial beams and the structure was ready to receive the first bathroom 'pods'.

This erection work was completed and all bolts tested to the satisfaction of the District Surveyor within three weeks and exactly on schedule. All steelwork – main structure and ramp units – was shot blasted and zinc sprayed to BS 2569 Part 1: 1964 and all nuts and bolts were cadmium plated of an HSFG type using load indicating washers to indicate correct shank tension.

The architects for this most interesting structure are Farrell Grimshaw Partnership.





Steelwork contractors for buildings

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 Director General, BCSA, 4 Whitehall Court, London SW1A 2ES
Tel: 020 7747 8121 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

FPC Factory Production Control certification to BS EN 1090-1
1 – Execution Class 1 **2** – Execution Class 2
3 – Execution Class 3 **4** – Execution Class 4

BIM BIM Level 2 assessed

QM Quality management certification to ISO 9001

SCM Steel Construction Sustainability Charter
(● = Gold, ● = Silver, ● = Member)

Notes

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

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

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
A & J Stead Ltd	01653 693742			●	●					●	●			●	●		2			Up to £400,000
A C Bacon Engineering Ltd	01953 850611			●	●	●	●				●			●			2			Up to £3,000,000
A&J Fabtech Ltd	01924 439614	●					●		●	●	●		●	●		✔	3			Up to £400,000
Access Design & Engineering	01642 245151					●				●	●			●	●	✔	2			Up to £4,000,000
Adey Steel Ltd	01509 556677	●		●	●	●	●	●	●	●	●			●	●	✔	3	✔	●	Up to £4,000,000
Adstone Construction Ltd	01905 794561			●	●	●	●									✔	2	✔	●	Up to £3,000,000
Advanced Fabrications Poyle Ltd	01753 653617				●	●	●	●		●	●			●	●	✔	2			Up to £800,000
AJ Engineering & Construction Services Ltd	01309 671919			●	●					●	●			●	●	✔	4			Up to £3,000,000
Angle Ring Company Ltd	0121 557 7241												●			✔	4			Up to £1,400,000
Apex Steel Structures Ltd	01268 660828					●	●			●	●			●	●		2			Up to £2,000,000
Arc Fabrication Services Ltd	01709 557654			●	●	●	●	●	●	●	●			●	●	✔	3			Up to £200,000
Arminhall Engineering Ltd	01799 524510	●			●	●		●		●	●			●	●	✔	2			Up to £400,000
Arromax Structures Ltd	01623 747466	●		●	●	●	●	●	●	●	●	●		●	●		2			Up to £800,000
ASA Steel Structures Ltd	01782 566366			●	●	●	●			●	●			●	●	✔	4			Up to £800,000
ASME Engineering Ltd	020 8966 7150				●	●				●	●			●	●	✔	4		●	Up to £2,000,000
Atlasco Constructional Engineers Ltd	01782 564711			●	●	●	●				●			●	●	✔	2			Up to £1,400,000
Austin-Divall Fabrications Ltd	01903 721950			●	●		●	●		●	●			●	●	✔	2			Up to £1,400,000
B D Structures Ltd	01942 817770			●	●	●	●				●	●		●		✔	2			Up to £1,400,000
Ballykine Structural Engineers Ltd	028 9756 2560			●	●	●	●	●				●				✔	4			Up to £1,400,000
Barnshaw Section Benders Ltd	0121 557 8261												●			✔	4			Up to £2,000,000
BHC Ltd	01555 840006	●	●	●	●	●	●	●			●	●		●	●	✔	4		●	Above £6,000,000
Billington Structures Ltd	01226 340666		●	●	●	●	●	●	●	●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Border Steelwork Structures Ltd	01228 548744			●	●	●	●			●	●				●		4			Up to £3,000,000
Bourne Construction Engineering Ltd	01202 746666		●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●		●	●	●	●	●	●	●	●			●	●	✔	4			Up to £6,000,000
Builders Beams Ltd	01227 863770			●	●	●	●			●	●			●	●	✔	3	✔		Up to £3,000,000*
Cairnhill Structures Ltd	01236 449393	●			●	●	●	●	●	●				●	●	✔	4		●	Up to £3,000,000
Caunton Engineering Ltd	01773 531111	●	●	●	●	●	●	●		●	●	●		●	●	✔	4	✔	●	Above £6,000,000
Cementation Fabrications	0300 105 0135	●			●			●			●		●		●	✔	3		●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	●	●	●		●		✔	4		●	Above £6,000,000
CMF Ltd	020 8844 0940				●		●	●		●	●				●	✔	4			Up to £6,000,000
Cook Fabrications Ltd	01303 893011			●	●		●			●	●			●	●		2			Up to £800,000
Coventry Construction Ltd	024 7646 4484			●	●	●	●		●	●	●			●	●	✔	4			Up to £1,400,000
D H Structures Ltd	01785 246269			●	●		●				●						2			Up to £100,000
D Hughes Welding & Fabrication Ltd	01248 421104				●	●	●	●		●	●		●	●	●	✔	4			Up to £800,000
Duggan Steel	00 353 29 70072		●	●	●	●	●	●	●	●	●	●			●	✔	4			Up to £6,000,000
ECS Engineering Services Ltd	01773 860001	●		●	●	●	●	●	●	●	●			●	●	✔	3			Up to £3,000,000
Elland Steel Structures Ltd	01422 380262		●	●	●	●	●	●	●	●	●	●		●		✔	4	✔	●	Up to £6,000,000
ESL (GB) Ltd	01482 787986	●					●	●	●	●	●	●	●	●	●	✔	4			Up to £400,000
EvadX Ltd	01745 336413			●	●	●	●	●	●	●	●	●				✔	3		●	Up to £3,000,000
Four Bay Structures Ltd	01603 758141			●	●	●	●	●		●	●			●	●		2			Up to £1,400,000
Four-Tees Engineers Ltd	01489 885899	●											●	●	●	✔	3		●	Up to £2,000,000
Fox Bros Engineering Ltd	00 353 53 942 1677			●	●	●	●	●		●	●				●		2			Up to £2,000,000
Gorge Fabrications Ltd	0121 522 5770				●	●	●	●		●				●	●	✔	2			Up to £1,400,000
Company name	**Tel**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**Q**	**R**	**S**	**QM**	**FPC**	**BIM**	**SCM**	**Guide Contract Value (1)**

Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)
Gregg & Patterson (Engineers) Ltd	028 9061 8131			●	●	●	●	●				●		●		✔	3			Up to £3,000,000
H Young Structures Ltd	01953 601881			●	●	●	●	●		●	●			●	●	✔	2		●	Up to £2,000,000
Had Fab Ltd	01875 611711				●				●	●	●				●	✔	4			Up to £3,000,000
Hambleton Steel Ltd	01748 810598		●	●	●	●	●	●				●		●		✔	4		●	Up to £6,000,000
Harry Marsh (Engineers) Ltd	0191 510 9797			●	●	●	●			●	●				●	✔	2			Up to £1,400,000
Hescott Engineering Company Ltd	01324 556610			●	●	●	●			●				●	●	✔	2			Up to £3,000,000
Intersteels Ltd	01322 337766	●			●	●	●	●					●	●		✔	3			Up to £2,000,000
J & A Plant Ltd	01942 713511				●	●									●		4			Up to £40,000
James Killelea & Co Ltd	01706 229411		●	●	●	●	●				●	●		●			4			Up to £6,000,000*
John Reid & Sons (Strucsteel) Ltd	01202 483333		●	●	●	●	●	●	●	●	●	●		●	●	✔	4		●	Up to £6,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445			●	●	●	●	●	●	●	●	●		●	●	✔	4		●	Up to £6,000,000
Kloeckner Metals UK Westok	0113 205 5270												●			✔	4			Up to £6,000,000
Leach Structural Steelwork Ltd	01995 640133			●	●	●	●	●			●					✔	2		●	Up to £6,000,000
Legge Steel (Fabrications) Ltd	01592 205320			●	●		●		●	●	●			●	●		3			Up to £800,000
Luxtrade Ltd	01902 353182									●	●				●	✔	2			Up to £800,000
M Hasson & Sons Ltd	028 2957 1281			●	●	●	●	●	●	●	●				●	✔	4			Up to £2,000,000
M J Patch Structures Ltd	01275 333431				●					●	●				●	✔	2			Up to £1,400,000
M&S Engineering Ltd	01461 40111				●				●	●	●			●	●		3			Up to £1,400,000
Mackay Steelwork & Cladding Ltd	01862 843910			●	●		●			●	●			●	●	✔	4			Up to £1,400,000
Maldon Marine Ltd	01621 859000				●	●		●	●	●	●			●	●	✔	3			Up to £1,400,000
Mifflin Construction Ltd	01568 613311			●	●	●	●				●						2			Up to £3,000,000
Murphy International Ltd	00 353 45 431384	●			●		●	●	●		●				●	✔	4			Up to £1,400,000
Newbridge Engineering Ltd	01429 866722	●	●	●	●	●	●	●	●		●	●		●	●	✔	4		●	Up to £2,000,000
Nusteel Structures Ltd	01303 268112						●	●	●	●				●		✔	4		●	Up to £4,000,000
Overdale Construction Services Ltd	01656 729229			●	●		●	●			●				●		2			Up to £400,000
Painter Brothers Ltd	01432 374400								●		●			●	●	✔	3			Up to £6,000,000*
Pencro Structural Engineering Ltd	028 9335 2886			●	●	●	●	●	●		●			●	●	✔	2			Up to £2,000,000
Peter Marshall (Steel Stairs) Ltd	0113 307 6730									●					●	✔	2			Up to £800,000*
PMS Fabrications Ltd	01228 599090			●	●	●	●		●	●	●			●	●		3			Up to £1,400,000
Rippin Ltd	01383 518610			●	●	●	●	●						●	●		2			Up to £1,400,000
Robinson Structures Ltd	01332 574711			●	●	●	●				●			●	●	✔	2			Up to £3,000,000
S H Structures Ltd	01977 681931	●			●		●	●	●	●	●	●			●	✔	4	✔	●	Up to £2,000,000
SAH Engineering Ltd	01582 584220			●	●	●				●	●			●	●		2			Up to £800,000
SDM Fabrication Ltd	01354 660895	●	●	●	●	●	●				●			●	●	✔	4			Up to £2,000,000
Sean Brady Construction Engineering Ltd	00 353 49 436 4144			●	●	●	●			●	●			●	●		2			Up to £800,000
Severfield plc	01845 577896	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4		●	Above £6,000,000
SGC Steel Fabrication	01704 531286				●					●				●	●	✔	2			Up to £800,000
Shaun Hodgson Engineering Ltd	01553 766499	●		●	●		●			●	●			●	●	✔	3			Up to £800,000
Shipley Structures Ltd	01400 251480			●	●	●	●		●	●	●			●	●		2			Up to £3,000,000
Snashall Steel Fabrications Co Ltd	01300 345588			●	●	●	●	●			●				●		2	✔		Up to £1,400,000
South Durham Structures Ltd	01388 777350			●	●	●				●	●	●			●		2			Up to £1,400,000
Southern Fabrications (Sussex) Ltd	01243 649000				●	●				●	●			●	●	✔	2			Up to £800,000
Steel & Roofing Systems	00 353 56 444 1855			●	●	●	●					●		●	●	✔	4			Up to £3,000,000
Taziker Industrial Ltd	01204 468080									●				●	●	✔	3			Above £6,000,000
Temple Mill Fabrications Ltd	01623 741720			●	●	●	●				●			●	●	✔	2			Up to £400,000
Traditional Structures Ltd	01922 414172			●	●	●	●	●	●		●			●	●	✔	3	✔	●	Up to £2,000,000
TSI Structures Ltd	01603 720031			●	●	●	●	●			●			●			2	✔		Up to £2,000,000
Tubecon	01226 345261						●	●	●	●				●	●	✔	4		●	Above £6,000,000*
Underhill Engineering Ltd	01752 752483				●		●	●	●	●	●			●	●	✔	4			Up to £3,000,000
W I G Engineering Ltd	01869 320515				●					●					●	✔	2			Up to £400,000
Walter Watson Ltd	028 4377 8711			●	●	●	●	●				●				✔	4			Up to £6,000,000
Westbury Park Engineering Ltd	01373 825500	●		●	●		●	●	●	●	●				●	✔	4			Up to £800,000
William Haley Engineering Ltd	01278 760591			●	●	●			●	●	●			●		✔	4		●	Up to £4,000,000
William Hare Ltd	0161 609 0000	●	●	●	●	●	●	●	●	●	●	●	●	●	●	✔	4	✔	●	Above £6,000,000
Company name	Tel	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	QM	FPC	BIM	SCM	Guide Contract Value (1)

Corporate Members

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

Company name	Tel
A Lamb Associates Ltd	01772 316278
Balfour Beatty Utility Solutions Ltd	01332 661491
Gene Mathers	0115 974 7831
Griffiths & Armour	0151 236 5656
Highways England Company Ltd	08457 504030
Kier Construction Ltd	01767 640111

Company name	Tel
McGee Group (Holdings) Ltd	020 8998 1101
PTS (TQM) Ltd	01785 250706
Sandberg LLP	020 7565 7000
Structural & Weld Testing Services Ltd	01795 420264
SUM Ltd	0113 242 7390

Steelwork contractors for bridgeworks

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
- **AS** Ancilliary structures in steel associated with bridges, footbridges or sign gantries (eg grillages, purpose-made temporary works)
- **QM** Quality management certification to ISO 9001
- **FPC** Factory Production Control certification to BS EN 1090-1
  1 – Execution Class 1 2 – Execution Class 2
  3 – Execution Class 3 4 – Execution Class 4
- **BIM** BIM Level 2 compliant
- **SCM** Steel Construction Sustainability Charter (● = Gold, ● = Silver, ● = Member)

Notes

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

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

BCSA steelwork contractor member	Tel	FG	PG	TW	BA	CM	MB	RF	AS	QM	FPC	BIM	NHSS 19A	NHSS 20	SCM	Guide Contract Value (1)
A&J Fabtech Ltd	01924 439614	●	●	●	●				●	✓	3					Up to £400,000
Bourne Construction Engineering Ltd	01202 746666	●	●	●				●	●	✓	4	✓		✓	●	Above £6,000,000
Briton Fabricators Ltd	0115 963 2901	●	●	●	●	●	●	●	●	✓	4			✓		Up to £6,000,000
Cairnhill Structures Ltd	01236 449393	●	●	●	●	●		●	●	✓	4			✓	●	Up to £3,000,000
Cementation Fabrications	0300 105 0135	●	●						●	✓	3			✓	●	Up to £6,000,000
Cleveland Bridge UK Ltd	01325 381188	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000
D Hughes Welding & Fabrication Ltd	01248 421104	●		●			●	●	●	✓	4			✓		Up to £800,000
Donyal Engineering Ltd	01207 270909	●						●	●	✓	3			✓	●	Up to £1,400,000
ECS Engineering Ltd	01773 860001	●	●	●	●		●		●	✓	3					Up to £3,000,000
ESL (GB) Ltd	01428 787986							●	●	✓	4			✓		Up to £400,000
Four-Tees Engineers Ltd	01489 885899	●	●	●	●		●	●	●	✓	3			✓	●	Up to £2,000,000
Kiernan Structural Steel Ltd	00 353 43 334 1445	●		●				●	●	✓	4			✓	●	Up to £6,000,000
Millar Callaghan Engineering Services Ltd	01294 217711	●				●		●	●	✓	4			✓		Up to £1,400,000
Murphy International Ltd	00 353 45 431384	●	●	●	●				●	✓	4			✓		Up to £1,400,000
Nusteel Structures Ltd	01303 268112	●	●	●	●	●		●	●	✓	4		✓	✓	●	Up to £4,000,000
S H Structures Ltd	01977 681931	●	●	●	●	●	●		●	✓	4	✓		✓	●	Up to £2,000,000
Severfield (UK) Ltd	01204 699999	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000
Shaun Hodgson Engineering Ltd	01553 766499							●	●	✓	3			✓		Up to £800,000
Taziker Industrial Ltd	01204 468080	●	●	●	●			●	●	✓	3		✓	✓		Above £6,000,000
Underhill Engineering Ltd	01752 752483	●	●	●	●			●	●	✓	4			✓		Up to £3,000,000
Non-BCSA member																
Allerton Steel Ltd	01609 774471	●	●	●	●	●		●	●	✓	4			✓		Up to £4,000,000
Centregreat Engineering Ltd	029 2046 5683	●	●	●	●	●	●	●	●	✓	4					Up to £1,400,000
Cimolai SpA	01223 836299	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000
CTS Bridges Ltd	01484 606416	●	●	●	●	●	●		●	✓	4			✓	●	Up to £800,000
Francis & Lewis International Ltd	01452 722200							●	●	✓	4			✓	●	Up to £2,000,000
Harland & Wolff Heavy Industries Ltd	028 9045 8456	●	●	●	●	●		●	●	✓	3					Up to £2,000,000
Hollandia Infra BV	00 31 180 540 540	●	●	●	●	●	●	●	●	✓	4					Above £6,000,000*
HS Carlsteel Engineering Ltd	020 8312 1879	●	●					●	●	✓	3			✓		Up to £40,000
IHC Engineering (UK) Ltd	01773 861734	●							●	✓	3			✓		Up to £400,000
Interserve Construction Ltd	020 8311 5500							●		✓	N/A					Above £6,000,000*
Lanarkshire Welding Company Ltd	01698 264271	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Up to £2,000,000
P C Richardson & Co (Middlesbrough) Ltd	01642 714791	●						●	●	✓	N/A					Up to £3,000,000
Total Steelwork & Fabrication Ltd	01925 234320	●		●				●	●	✓	3			✓		Up to £3,000,000
Victor Buyck Steel Construction	00 32 9 376 2211	●	●	●	●	●	●	●	●	✓	4		✓	✓	●	Above £6,000,000

Industry Members

Industry Members are those principal companies involved in the direct supply to all or some Steelwork Contractor Members of components, materials or products. Industry 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

CE
CE Marking compliant, where relevant:
M manufacturer (products CE Marked)
D/I distributor/importer (systems comply with the CPR)
N/A CPR not applicable

SCM
Steel Construction Sustainability Charter
● = Gold,
● = Silver,
● = Member

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM	BIM
AJN Steelstock Ltd	01638 555500								●		M		
Albion Sections Ltd	0121 553 1877	●									M		
Arcelor Mittal Distribution - Scunthorpe	01724 810810								●		D/I		
Autodesk Ltd	01252 456893		●								N/A		
AVEVA Solutions Ltd	01223 556655		●								N/A		
Ayrshire Metals Ltd	01327 300990	●									M		✓
BAPP Group Ltd	01226 383824									●	M		
Barrett Steel Services Limited	01274 682281								●		M		
Behringer Ltd	01296 668259					●					N/A		
British Steel	01724 404040				●						M		
BW Industries Ltd	01262 400088	●									M		
Cellbeam Ltd	01937 840600	●									M		
Cleveland Steel & Tubes Ltd	01845 577789								●		M		
Composite Metal Flooring Ltd	01495 761080	●									M		
Composite Profiles UK Ltd	01202 659237	●									D/I		
Cooper & Turner Ltd	0114 256 0057									●	M		
Cutmaster Machines (UK) Ltd	01226 707865					●					N/A		
Daver Steels Ltd	0114 261 1999	●									M		
Daver Steels (Bar & Cable Systems) Ltd	01709 880550	●									M		
Dent Steel Services (Yorkshire) Ltd	01274 607070								●		M		
Duggan Profiles & Steel Service Centre Ltd	00 353 567722485	●							●		M		
easi-edge Ltd	01777 870901							●			N/A	●	
Fabsec Ltd	01937 840641	●									N/A		
Ficep (UK) Ltd	01924 223530					●					N/A		
FLI Structures	01452 722200	●									M	●	
Forward Protective Coatings Ltd	01623 748323						●				N/A		
Graitec UK Ltd	0844 543 8888		●								N/A		
Hadley Industries Plc	0121 555 1342	●									M	○	
Hempel UK Ltd	01633 874024						●				N/A		
Highland Metals Ltd	01343 548855						●				N/A		
Hilti (GB) Ltd	0800 886100									●	M		
Hi-Span Ltd	01953 603081	●									M	●	

Company name	Tel	1	2	3	4	5	6	7	8	9	CE	SCM	BIM
International Paint Ltd	0191 469 6111						●				N/A	●	
Jack Tighe Ltd	01302 880360						●				N/A		
Jamestown Manufacturing Ltd	00 353 45 434288	●									M		
John Parker & Sons Ltd	01227 783200								●	●	D/I		
Joseph Ash Galvanizing	01246 854650						●				N/A		
Jotun Paints (Europe) Ltd	01724 400000						●				N/A		
Kaltenbach Ltd	01234 213201					●					N/A		
Kingspan Structural Products	01944 712000	●									M	●	
Kloeckner Metals UK	0113 254 0711								●		D/I		
Lindapter International	01274 521444									●	M		
MSW UK Ltd	0115 946 2316	●									D/I		
Murray Plate Group Ltd	0161 866 0266								●		D/I		
National Tube Stockholders Ltd	01845 577440								●		D/I		
Peddinghaus Corporation UK Ltd	01952 200377					●					N/A		
Pipe and Piling Supplies Ltd	01592 770312	●									M		
PPG Performance Coatings UK Ltd	01525 375234						●				N/A		
Prodeck-Fixing Ltd	01278 780586	●									D/I		
Rainham Steel Co Ltd	01708 522311								●		D/I		
Sherwin-Williams Protective & Marine Coatings	01204 521771						●				M	○	
Structural Metal Decks Ltd	01202 718898	●									M	●	
StruMIS Ltd	01332 545800		●								N/A		
Stud-Deck Services Ltd	01335 390069	●									D/I		
Tata Steel Distribution UK & Ireland	01902 484000								●		D/I		
Tata Steel Ireland Service Centre	028 9266 0747								●		D/I		
Tata Steel Service Centre Dublin	00 353 1 405 0300								●		D/I		
Tata Steel Tubes	01536 402121				●						M		
Tata Steel UK Panels & Profiles	01244 892199	●									M		
Tension Control Bolts Ltd	01948 667700						●			●	M		
Trimble Solutions (UK) Ltd	0113 887 9790		●								N/A		
voestalpine Metsec plc	0121 601 6000	●									M	●	
Wedge Group Galvanizing Ltd	01909 486384						●				N/A		
Yamazaki Mazak UK Ltd	01905 755755					●					N/A		

STRUMIS V10.2

NOW EVEN FASTER
AT SAVING TIME AND MONEY
FOR ALL STEEL FABRICATORS

A WORLD LEADING STEEL FABRICATION MANAGEMENT INFORMATION SOFTWARE, USED WORLDWIDE TO REDUCE COSTS WHILE MAXIMISING PRODUCTIVITY AND INCREASING PROFITABILITY.

STRUMIS V10.2 HAS BEEN RELEASED, CONTAINING EXCITING OPTIMISATIONS SPANNING THE ENTIRE SYSTEM.

COME SEE THE STRUMIS FEATURES THAT OTHER PROVIDERS ARE ONLY TALKING ABOUT.
OTHERS PROMISE; WE DELIVER.

THE FUTURE OF STEEL FABRICATION.

Stay connected to STRUMIS:

STRUMIS

BRINGING STRUCTURE TO STEEL

SALES@STRUMIS.COM | 01332 545800 | WWW.STRUMIS.COM

SOFTWARE BY STRUMIS LTD. PART OF THE GLOBAL RDS GROUP