

NEW STEEL CONSTRUCTION

# NVSC

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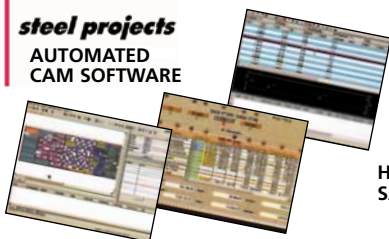
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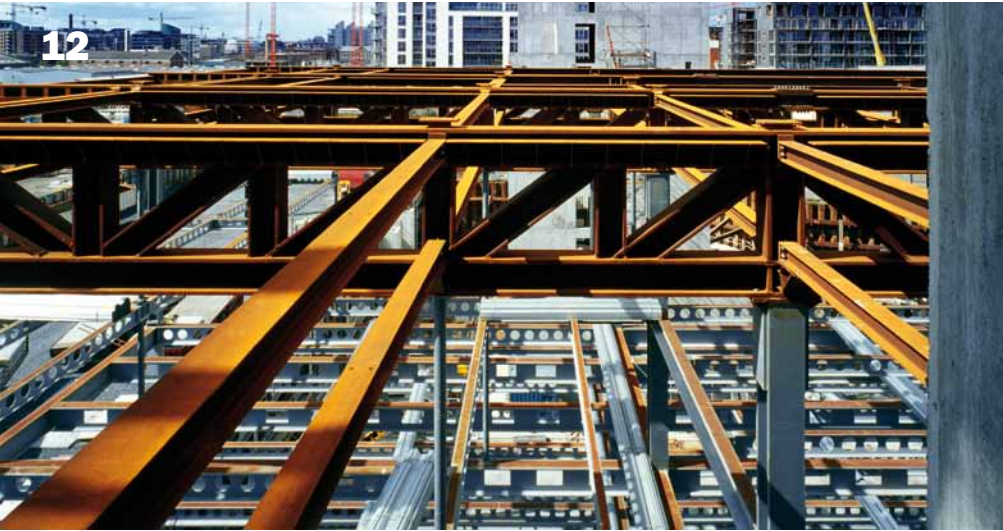
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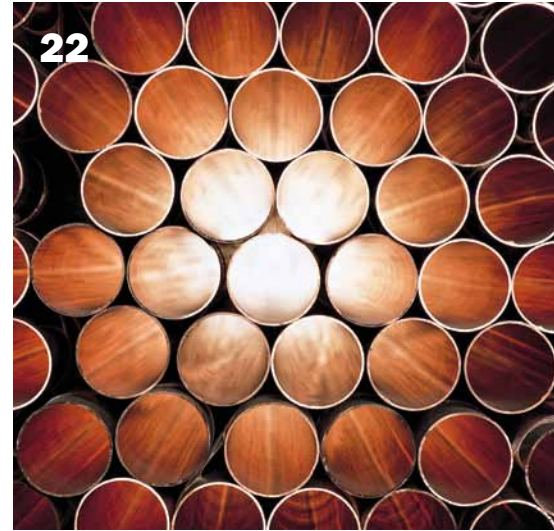
PIPE CUTTING



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These and other  
steelwork articles can  
be downloaded from the  
New Steel Construction  
website at [www.new-steel-construction.com](http://www.new-steel-construction.com)

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**Cover Image**  
**Point Village, Dublin**  
Main Client: Crosbie Property  
Architect: Scott Tallon Walker  
Steelwork contractor:  
Fisher Engineering  
Steel tonnage: 15,000t





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# Steel creates a strong supply chain

The strength of the steel construction supply chain is one of the sector's most notable features – yet many are unaware of just how strong it is, what role the constituent parts of it play and how intense is the level of cooperation between them. In this issue we launch a news series on the supply chain, starting with steel stockholders.

There have been great changes in the stockholder's role over the past 20 years or so. Stockholding was given a big boost in the 1960's when British Steel introduced a price structure designed to encourage the growth of investment in processing facilities by diverting small quantities away from the mills.

Stockholders have responded enthusiastically. More constructional steel is now sourced via them than is bought directly from the mills. Stockholders have invested heavily in a wide range of processing equipment like saws, laser and plasma cutters, and machines for decoiling, slitting, blanking, shearing, notching, shotblasting and painting.

Customers, mostly BCSA member steelwork contractors, have also responded enthusiastically. Initially they enjoyed the convenience of being able to buy more material cut to length, but today over 50% of structural sections supplied by stockholders have been processed in some way. Some of the stockholder's customers have been able to make their own operations more economic as a result, by relying on the stockholder's ability to process steel.

Other cost saving benefits have come from electronic communications between stockholders and customers, as material lists and drawings provided via e-mail are downloaded to the stockholder's own processing equipment.

The provision of just in time deliveries and material provided by phase or zone to construction projects can now be taken for granted by site managers.

Cooperation between steel manufacturer Corus and stockholders is very high, as is cooperation between stockholders and their steelwork contractor clients. The outcome is a more efficient service from the steel construction sector that has been given a conclusive thumbs up from the market, as steel's dominance in market share surveys shows. Productivity gains have been substantial and the cost benefits have been shared with clients.

Later articles in our Supply Chain series will highlight similar success and gains being made thanks to investment and cooperation by other parts of the steel supply chain, starting with light gauge steel and steel decking manufacturers in the July/August NSC.



Nick Barrett - Editor



## SSDA shortlist highlights innovation

Corus and the BCSA have announced a shortlist of 24 projects for the 2008 Structural Steel Design Awards (SSDA).

This year's shortlisted projects come from around the UK and even as far afield as Barbados, and reflect the innovative application of steel across a wide range of construction sectors including commercial and leisure, industrial, education, residential, bridges as well as landmark public art.

David Lazenby CBE, Chairman of the SSDA Judging Panel, said: "As judges we regard the awards as a showcase for how constructional steelwork plays a vibrant, forward thinking and innovative part in the success of the construction industry."

"Diverse as the shortlisted projects this year are, regardless of whether a project has used five or 30,000t of steel, each one stands as testament to the skills and determination of highly motivated project teams working to achieve noteworthy results."

The winners of the 2008 SSDA Awards will be announced at a black tie award ceremony taking place on 8 July 2008 at the Victoria and Albert Museum. The event will also include a retrospective of winning entries since 1969 to celebrate the 40th anniversary of the Awards.

The full shortlist is:

**The Savill Building** – Windsor Great Park  
**East Beach Café** – Littlehampton  
**Roof Garden Apartment** – Clerestreet, London  
**O<sub>2</sub> Arena** – North Greenwich, London  
**T5, Heathrow** – Roof and Main Terminal  
**LTA National Training Centre** – Roehampton  
**The Bridge** – Dartford, Kent  
**Killanin Stand** – Galway Racecourse  
**Bourbon Lane Housing Development** – White City, London  
**14 Cornhill** – London  
**University of Ulster Belfast Campus** – Belfast  
**3Ws Pavilion** – Kensington Oval, Barbados

**Kings Waterfront Arena** – Liverpool  
**The Willis Building** – 51 Lime Street, London  
**Unilever House** – Blackfriars, London  
**The Sidings Bridge** – Swansea  
**Panopticon Halo** – Top O'Slate, Lancashire  
**'Turning the Place Over'** – Liverpool  
**St Marylebone CE School** – London W1  
**The Roundhouse Roof** – Camden, London  
**St Stephen's Walk Shopping Centre Roof** – Hull  
**Singing Ringing Tree** – Burnley, Lancashire  
**Constructionarium (Mini-Gherkin)** – National Construction College  
**Transfer Structures** – 55 Baker Street London

## Double truss ready for take off

Barrett Steel Buildings has lifted the first of four 125m-long steel trusses on a design and build contract for the roof of a new maintenance hangar at Stansted Airport for Ryanair.

The steel-framed structure is 125m wide and 58m long and will be able to accommodate up to five 737 aircraft.

Chris Heptonstall, Associate Design Director at Barrett Steel Buildings, said: "We designed the roof around the ability to lift it accurately and safely within the very tight build window."

Two trusses were laced together and lifted as one box girder for the first lift. "We wanted a rigid box so a combined truss weighing more than 100t was erected on staged skids, piece small and lifted into position by two 300t capacity mobile cranes on a contract lift," he added.

Two further plain trusses will be lifted in the coming weeks, each weighing approximately 50t, and braced back to the rigid box girder. The roof is pre-cambered to take out the dead deflection and all connections are friction grip using TCB's.



"We chose TCB bolts for their speed of fixing and the surety that the full slip potential was guaranteed," said Mr Heptonstall.

Working on behalf of main contractor Kier Eastern, Barrett Steel Buildings is scheduled to complete its steelwork package - amounting to

600t - by early June and the hangar will be operational by the end of the year.

A detailed Tekla 3D model of the hangar can be visited at Barrett's website [www.barrettonline.co.uk](http://www.barrettonline.co.uk) and going to the 3D model library.



Steelwork has reached the 16th level at Ropemaker, a new commercial development currently under construction in the City of London.

Working on behalf of project manager Mace, Severfield-Reeve Structures will ultimately erect in excess of 5,500t of structural steelwork for the 21 floor tower and the company is scheduled to finish its steelwork in early June.

The building incorporates three concrete basement levels and steelwork erection began

at ground floor. Fabsec cellform beams have been used for the majority of floor construction.

A feature of the structure is its large open entrance which was formed with 500mm square fabricated box sections.

"These large chunky sections were needed because the entrance hall is an open space, two-floors high, and the columns are then supporting the above floors," explained Doug Willis, Project Manager for Severfield-Reeve.



## BCSA appoints welding and fabrication manager



Jeff Garner

Jeff Garner, previously Principal Engineer at Mott MacDonald, has been appointed as the new BCSA Welding and Fabrication Manager.

Mr Garner is a certified European Welding Engineer, a member of the Welding Institute and has a wealth of experience in all aspects of welding and fabrication.

His previous employment also includes railway sector Principal Welding Engineer at The Engineering Link; General Manager at Tecforce; Welding Engineer at British Steel; Welding Engineering Manager

at British Railways Board, and Company Welding Engineer at Titanium Fabricators.

The forthcoming introduction of CE Marking for fabricated steelwork and the associated European Standards for fabrication has prompted the BCSA to make the appointment. Mr Garner's role will be to advise BCSA members on all aspects of welding and welding quality management.

He will also assist BCSA's subsidiary company, the Steel Construction Certification Scheme, in the assessment of welding quality management

systems and the associated responsible welding coordinator.

David Moore, BCSA Director of Engineering, said: "Jeff is able to visit BCSA member companies to give advice on general welding issues, how to set up welding quality management systems to BS EN 3834 and provide information on the knowledge and competence of the responsible welding coordinator."

Mr Garner will be based at the new BCSA office in Yorkshire and he can be contacted at: [jeff.garner@steelconstruction.org](mailto:jeff.garner@steelconstruction.org)

## RSC awards starring role to steel



Billington Structures has recently secured a multi-million pound contract for the redevelopment of the Royal Shakespeare Theatre in Stratford-upon-Avon.

The work comprises a complete refurbishment of the complex with new structural steelwork extensions added to the buildings.

The Royal Shakespeare Company's

aim is to create the best theatre in the world for the Bard's plays. Basing its idea on the courtyard theatres of the Middle Ages, the new complex will seat 1,030 people, with the furthest seat only 15m from the stage.

Working on behalf of Mace, steel erection is due to begin in September and Billington estimates it will erect approximately 600t of structural steel.

## Bridging the gap at Manchester University

North Yorkshire-based Allerton Engineering has supplied three innovative bridges for an on-going construction project at Manchester University.

The specialist steelwork contractor has been working on behalf of Elland Steel Structures for the past seven months building three pedestrian bridges which will link existing university facilities to a new building.

Fabricated and welded entirely at the company's Northallerton workshop, the bridges range in size from 10m to 23m in length and have been shaped in a complex tubular structure, giving them a heptagonal (seven-sided) appearance.

Paul Denning, Allerton Engineering Managing Director, said: "We are widely known for our ability to fabricate steel into almost any shape or size that is transportable. Crafting these pedestrian bridges for Manchester University has allowed us to further test and develop our expertise."



**Bridge Design and Engineering***First quarter 2008***Building bridges**

Simon Bourne, Benaim's UK Managing Director explains: "In the UK now, every bridge at any road or rail crossing or motorway widening is just a steel-composite bridge. They are easy for contractors, being fabricated off-site and subcontracted for someone else to build. Currently there are no real alternatives and they have become the norm for bridge construction..."

**New Civil Engineer***3 April 2008***Perfect Plaza**

Referring to the Westminster Bridge Park Plaza Hotel - Creating this bold statement has led to a unique and interesting design that incorporates two steel mega structures within a larger concrete outer shell. A large steel truss structure will form the column-free basement ballroom's roof and house the uppermost basement level within its depth. The other large steel element consists of two giant Vierend-trusses.

**Contract Journal***19 March 2008***Hospitals get fast delivery**

"If we'd used concrete, deliveries would be turning up on site on an hourly basis. Steel also lends itself to off-site fabrication and a relatively short erection period, which reduced pressure on our extremely tight construction programme, and meant on average only two steel deliveries a day," says Stephen Muir, Victoria Hospital project director for Balfour Beatty Construction.

**Building Magazine***11 April 2008***The rebirth of Charles de Gaulle**

Aéroports de Paris did not build with concrete again. Niccolo Baldassini, a director at Paris-based engineer RFR says: "In the end they decided to rebuild in steel. The building has to be rather simple and robust." A steel frame would be faster and easier to assemble, which was vital.

## Gold standard addition to sustainability charter



Kingspan Structural Products has been successfully audited and has joined the Steel Construction Sustainability Charter as a Gold member.

As part of the audit process companies are awarded points, and must score more than six points from a maximum of 12. Their points tally then gains them Charter

Status in three levels: Gold, Silver and Member.

Ian Hodgson, Kingspan's Managing Director, said: "We are very proud to have achieved such a high standard. Sustainability is an important issue for us, and we have worked hard to develop good sustainable practice throughout the company."

The Gold status was awarded after a successful audit under the Charter's rules. This included demonstrating the implementation of a range of management systems, such as OHSAS 18001, BS EN ISO 14001 and BS EN ISO 9001.

Other important elements needed to meet the Gold status include the institution of policies to manage energy usage and to ascertain whether suppliers have their own sustainability standards.

There are now 23 Charter signatories and Kingspan is the 11th Gold member.



## New option for steel erector NVQ assessments

The development of the Constructional Steelwork Site Operations NVQ Level 2, which covers steel erection, metal decking and stud welding, has been held back due to the lack of accredited training centres and the availability of qualified assessors.

The BCSA's Health & Safety Manager, Pete Walker, commented: "Some BCSA members have got around the problem by working

directly with the centres and training their own people as assessors."

A further organisation, TTE Technical Training Group, is now carrying out NVQ assessments for experienced workers at many locations around the UK and Ireland. Companies with steel erectors that are in need of an NVQ On Site Assessment, to enable them to comply with the

requirements of the CSCS card scheme should contact: Russell Coleman at TTE, Middlesbrough, tel: 01642 462266 or email [russell\\_coleman@tte.co.uk](mailto:russell_coleman@tte.co.uk).

The NVQ options available for assessment are: Constructional Steelwork Site Operations NVQ Level 2, Constructing Capital Plant Steel Structures - Erecting NVQ Level 3, and Moving Loads NVQ Level 3.

## Purlins hit the slopes at new ski centre



Steel purlins from Metsec have been used to create the external shell of the Chill Factor, the UK's longest and the world's widest real snow indoor ski slope.

Located at the Trafford Centre in Manchester, the £31M Chill Factor development is said to bring together the best snow sports, extreme sports and expert tuition all under one roof.

Containing a slope measuring 180m-long and 100m wide, the steel-framed structure needed 116t of Metsec's light gauge galvanised Z-section purlins and C-sections rails.

MetSPEC design software enabled the rapid evaluation of loadings to be calculated taking into account different cladding requirements, including the innovative horizontal cladding which was designed to produce various textures to the building.



## CE Marking of fabricated steel imminent

The European Standard for CE Marking of fabricated steel and aluminium structures has recently been circulated to European member states for Formal Vote for a second time.

Following the first Formal Vote the CEN Consultant insisted on a change on the frequency of surveillance of

factory production control systems by the notified bodies.

The Chairman of the BSI committee, responsible for EN1090-1 has debated this point and is happy to accept it and therefore the UK will put forward a positive vote to CEN.

It is anticipated that the majority

of member states will vote in favour of the standard and it will come in to force in October 2008. There is a one year overlap when either national provisions or the standard may be used, after which CE Marking will become mandatory in most member states.

## Bridge lift completed in one morning

Shoreditch High Street in east London was closed for one Saturday morning last month to allow a new 38m long steel bowstring bridge to be lifted into position.

The entire bridge deck was assembled by Fairfield Mabey in an adjacent goods yard and the completed structure weighed more than 350t. To lift this massive structure the UK's largest mobile crane, a 1,200t capacity Gottwald AK680, was hired from Sarens.

Getting this machine to site, along with all of its associated rigging and jibs, required 38 truck loads, delivered over two days.

With the mobile crane positioned and fully rigged in the assembly yard, the lifting procedure involved hoisting the completed structure off of its temporary trestles and over a yard wall. It was then slewed into position, above Shoreditch High Street, before being lowered on to



the abutment bearings.

The lift went to schedule and apart from the weather the only potential hazard was a listed Dutch barn roofed building which is adjacent to the bridge's western abutment.

The new bridge forms a link

between the new Shoreditch Station, currently under construction, and the northern section of the new East London railway line. Working on behalf of main contractor Balfour Beatty Carillion Joint Venture, Fairfield Mabey will erect two more steel bridges on the line during May.

## Expansion at Scotland's largest business park



The new £330M Maxim office development at the Eurocentral Business Park in Lanarkshire, will on completion offer 85,000m<sup>2</sup> of office space in ten high quality buildings.

The project is said to be Scotland's largest ever speculative build business park development and will create an estimated 7,000 jobs.

Caunton Engineering is fabricating, supplying and erecting all structural steelwork for the office blocks and estimates that it will eventually erect approximately 4,000t.

Steelwork is due to be completed this summer and the entire project will be finished in early 2010.

Drawing on its considerable experience of developing and testing deck products, **SCI** engineers have developed an Improved Engineering Model (IEM) that more accurately predicts cold-formed steel product behaviour in a wider range of construction scenarios than traditional analysis models allow.

Steelwork contractor **John Reid & Sons (Strucsteel)** is one of the winners of the Queen's Award for Enterprise 2008. This is the 43rd year of the Awards and The Queen announced 139 overall winners across all industry sectors. Each winning company receives an engraved crystal bowl and is entitled to use the coveted Queen's Award emblem on packaging and marketing materials for five years.

The UK's **Institute of Materials, Minerals and Mining** has awarded Dr. Tribidish Mukherjee, Tata Steel Group Director for Integration and Development, the 2008 Bessemer Gold Medal for his service to the steel industry. Dr Mukherjee worked for British Steel from 1968 to 1971 before joining Tata Steel.

A total of 170t of **Metsec** purlins and side rails have been used on the rebuilt Pinewood studio famous for the 007 James Bond films. The new and improved stage is now the largest in Europe and was built within the same footprint as the original structure. Main steelwork contractor, Bourne Steel, erected approximately 1,450t of structural steelwork for the building.

**SCI** has been shortlisted for the Health and Safety Awards 2008 in the Best Safety Product or Equipment category for its work on the Trojan Horse Safety Messaging project. The awards ceremony will take place at the Hilton Hotel, Park Lane, London on Tuesday 17 June.

# Improved drilling efficiency

Voortman's redesigned V600 drilling system now incorporates a number of new features including an automatic tool changer with a capacity for five drills.

Previously the drilling system was driven by frequency-controlled motors. These have been replaced

with servomotors and servodrives which allow not only HSS drills but also carbide tipped drills to be used. This has increased the system's drilling speed by 300%.

The V600 is also provided with a fixed drilling table which reduces the required floor space for the unit

by approximately 50%.

The company said, as a result of its limited footprint and the attractive price, the V600 is very popular with small to medium sized steel fabricators and steel stockholders who have limited floor space available.



## City project maximises its space



A new eight-storey office development at 60 Gresham Street in the City of London has overcome a number of challenges with steel construction.

Situated on a site which is roughly rectangular, the building is bounded by roads on three elevations, none of which are straight. The structure's irregular shape also has to incorporate two historic retained features - an old police station's facade and an ancient pub entrance.

"Many of the challenges are typical with central London projects," said Chris Jarman, Project Manager for SKM Anthony Hunt. "Us-

ing steel means we have a variety of grid patterns and spans, with the longest at approximately 15m."

Maximising the available space also included the floor to ceiling heights and keeping all the services within the supporting floor beams.

Fabsec cellular beams have been used throughout the project and were stipulated because of the services alignment and the number of beams and columns which have to sit on top of these steel sections.

Steelwork contractor Bourne Steel has supplied and erected 500t of structural steelwork on the project and the job is scheduled for completion this summer.

Atlas Ward Structures has started work on the largest bonded warehouse in Europe which will cover an area of more than 80,000m<sup>2</sup>.

Located in Avonmouth, the project's main contractor is Fitzpatrick Contractors and the developer is Goodman.

The project is for drinks company Constellation Europe, and consists of a large warehouse and bottling centre together with associated offices and ancillary buildings.

The aim of the development is to cut shipping and reduce the mountain of imported green glass produced by UK wine drinkers. Instead wine will be imported in large containers and bottled in Avonmouth.

## Europe's largest bonded warehouse under way



The distribution and bottling plant should be operational in early 2009, while the offices will

open later the same year. Approximately 2,860t of steel will be used on the job.

## Diary

For all Corus events visit [www.corusevents.com](http://www.corusevents.com) email [events@corusgroup.com](mailto:events@corusgroup.com) tel: 01724 405060  
For all BCSA events email: [david.moore@steelconstruction.org](mailto:david.moore@steelconstruction.org) tel: 020 7747 8122

7 May 2008

### Sustainability Seminar

Thinktank, Birmingham. Free



22 May 2008

### Sustainability Seminar

Cavendish Conference Centre, London. Free



The SCI provide a range of in-house training courses to both Members and Non-Members of the SCI. Courses can be customised to suit a company's CPD objectives.

21 May 2008

### Responsible Welding Coordinator Seminar

Boyne Valley Hotel & Country Club  
Drogheda, Republic of Ireland.  
£100 for members, £150 non-members



4 June 2008

### Steel: The Show

Botley Park, Southampton. Free



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- Any degree of asymmetry
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### CASE STUDY

#### Watersmeeting Medical Centre, Bolton

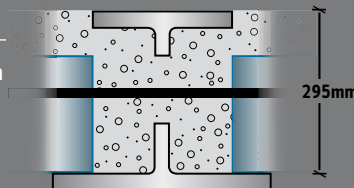
This project required a very shallow depth construction, with spans up to 9.2m. USFB with in-situ metal deck was specified. The slab was tied either side of the USFB web by rebar laid through the regular web-openings.

Client: Hurstwood Developments  
Engineer: Rutter Johnson  
Steelwork Contractor: BD Structures

#### USFB Type 1

319 x 254/368 x 155kg/m

Span 9.2m



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# Capital change

*A new cultural and business quarter is rapidly taking shape on the banks of the River Liffey in Dublin's Docklands. Martin Cooper reports from a project making the most of steel's flexibility and spanning qualities.*

The centre and cultural heartbeat of Dublin is gradually moving eastwards along the River Liffey, from the old city centre to the fast-changing Docklands area.

Large areas of this underused portion of Dublin are being redeveloped, with a number of cultural, residential and commercial projects well underway.

**To shore up the site and make it watertight steel sheet piles were installed around the footprint's perimeter.**

A forest of tower cranes among the old warehouses indicates that construction activity is rampant and one project, a large mixed-use scheme known as the Point Village, will act as a focal point for the entire development.

Point Village is huge and is centred around a large open plaza. It will include a shopping centre with 27,000m<sup>2</sup> of retail space, a four-star hotel, 200 apartments, offices, a cinema complex, conference centre and underground car parking for more than 1,000 cars. All of this requires approximately 15,000t

of structural steelwork which is being erected by Fisher Engineering.

The development also includes the 'Watchtower' a concrete 32-storey residential tower, which will be Ireland's tallest building at 100m-high. Adjoining Point Village an expanded and rebuilt Point Depot, the city's premier live entertainment venue is also under construction.

"This mixed-use scheme, once complete, will create a new quarter at Dublin's waterfront gateway," explains Patrick Dillon, Senior Contracts Manager for main contractor McNamara Construction.

Getting to and from the Point Village from downtown will not be a problem as the project's large central plaza, which also adjoins the adjacent venue, will contain a new terminus and extension of the LUAS Dublin light rail system. A vast array of restaurants and shops will also draw people in and encourage them to stick around after concerts or even choose to visit the development for their weekly shopping expeditions.

Previously the site was occupied by the Point Depot's car park and as that structure is currently under redevelopment (under a separate contract to



## FACT FILE

**Point Village, Dublin**  
**Main client:** Crosbie Property  
**Architect:** Scott Tallon Walker  
**Main contractor:** McNamara Construction  
**Structural engineer:** O'Connor Sutton Cronin  
**Steelwork contractor:** Fisher Engineering  
**Steel tonnage:** 15,000t  
**Project value:** £350M





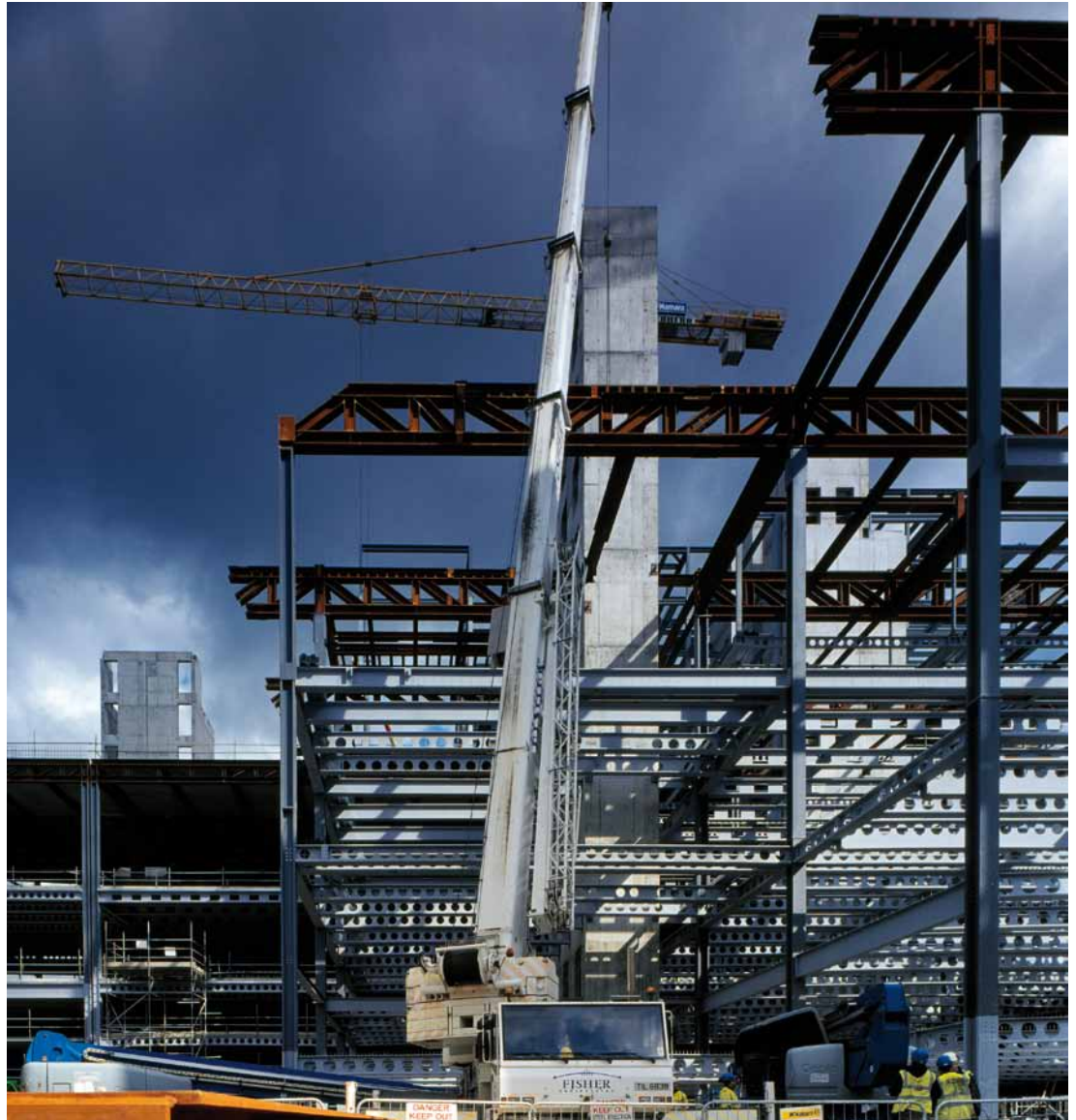


*Main picture: Large trusses allow the grid pattern to change at level three.*

*Above: The long-span underground car park.*

*Above right: The lower levels of the project are predominantly retail, changing to office space above level three.*

*Below: The development will have its own light rail terminus.*



Point Village) a large plot became vacant and prime for construction.

The site measures approximately 150m x 200m, and the entire footprint was initially dug out to 10m below ground level. To shore up the site and make it watertight steel sheet piles were installed around the footprint's perimeter.

Interestingly, these steel sheet piles have become structurally integral to the job as they are permanent fixtures and the project's steel frame is attached to them. This methodology has given the project maximum use of available space and proven to be more efficient than alternative methods.

"The majority of the project is being built with a steel frame and by including the sheet piles into the structural frame we've probably gained a metre all the way around the perimeter," explains Mr Dillon.

The majority of the dug out area consists of the site's three basement levels which is primarily taken up by car parking. The client wanted as few a columns as possible in the car park, to enhance the customer experience by allowing slightly larger vehicle spaces than normal and generally make parking easy.

These lower levels of the project are predomi-

nantly constructed around a large 16m x 8m grid and this was one of the principle reasons why steel was chosen as the framing material for the entire Point Village project.

"We wanted some large spans in the lower areas and this suits steel," explains Martin McGrath, Director of project engineer O'Connor Sutton Cronin. "We looked at all available materials and steel was chosen primarily for its ease of erection as well as the required spans."

The large grid pattern also easily accommodates the project's underground loading bay which is located on basement level -2. "Trucks entering the loading area need a large space in which to turn around and this grid pattern allows for this," adds Mr McGrath.

The flexibility of the large grid pattern also means the project's anchor department store, Dunnes Stores, will also have one of its retail levels at basement level -1.

Once the enabling works and piling programme had been completed, the project's 13 concrete cores were constructed and the basement slab was cast. This then allowed Fisher to begin steel erection during October 2007.

## Retail/Commercial

"We're erecting the frame up to level 3 with 80t mobile cranes working off of the slab, while the higher floors are to be erected by tower crane using cherry-pickers working off level 3 slab for access," explains Fisher's Site Manager Richard Grey.

The cores provide the stability for the steel frame which is being erected around them. Although the entire project starts at the same lowest basement level, the steel frame is being erected as four structurally independent structures, all connected by expansion joints.

Filling in such a large area with a steel frame presented a few structural challenges and each of the four quarters of the site is essentially a stand-alone structure. The sheet piles are also propped and the steel erectors have had the tricky job of working around these temporary works. The props

**The trusses are not only structurally important, they also create a service void between levels three and four.**

beneath the plaza zone we had to use some large 1,100mm deep sections weighing approximately 5t each," says Mr Grey. "The loads from above were increased in this area because of the infrastructure

are only removed once the connecting steel frame and composite floors have reached the ground floor level.

The majority of the steelwork frame is a stick and beam configuration, however supporting the plaza area did require some of the project's largest and heaviest steel members.

"By keeping the same spans



*Left: The completed south east elevation.*

*Right: Steel erection has utilised a combination of tower and mobile cranes.*

*Far right: The project is centred around a large open plaza which will accommodate a light rail terminus.*



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associated with the tram terminus in the plaza."

From ground floor to third floor level the Point Village project is predominantly retail. However, from here to the uppermost level (seven or eight, depending on which zone) the structure is taken up with office space, apartments and a hotel.

The steel framed grid pattern changes here to a smaller 8m x 8m grid, and this required the installation of a series of large trusses. The trusses were brought to site as complete sections and are up to 18m long and 2m deep.

"Non retail units need smaller spans and so the trusses support the floors above and the extra column lines," explains Mr McGrath. "And, importantly the trusses also house all the services from above within their depth."

Consequently, the trusses are not only structurally important, they also create a service void between levels three and four. This space accommodates the enormous amount of services generated by a hotel, offices and residential units.

Other notable steel features of Point Village include a large and impressive glass clad atrium adjoining the central plaza. This will house elevators and lifts able to whisk guests directly up to the project's hotel lobby situated on the fourth floor.

Steelwork is due to be complete by October this year and the entire project is scheduled for completion by 2010.



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**FACT FILE**

**Homeseeker Homes,  
Express Park, Rushden,  
Northamptonshire**

**Main client:**

Homeseeker Homes

**Architect:** Tew and Smith

**Structural engineer:**  
Brian Cole Associates

**Main contractor:**

Warwick Burt Construction

**Steelwork contract:**

DGT Steel & Cladding

**Steel tonnage:** 380t**Project value:** £4.5M

# Robust shed for homebuilder

*A new production facility for one of the UK's leading manufacturers of park homes is under construction at Express Park in Northamptonshire.*

*Above: The main production building has a 35m clear span.*

*Below: DGT undertook a design and build contract for the project.*

Homeseeker Homes currently builds its range of portable homes for residential parks in Irthlingborough, but this facility has been out grown and the company will move into its new premises in September.

Its new home will be Express Park, a large business park in nearby Rushden and this development occupies one of the last vacant lots on the site.

Main contractor Warwick Burt Construction began work at the end of last year and initially it had to level a sloping site with a large cut and fill operation.

"We had to strip out a lot of soil before compacting everything," explains Warwick Burt's Contracts Manager Jonathan Smith. "This left us with a levelled site which was then suitable for the steel erector's cherry pickers to work on."

Steelwork is founded on pad foundations which are 3.5m deep in some places, while the overall project is surrounded by concrete retaining walls.

DGT Steel and Cladding started the steel erection in March this year and all 380t was up by the end of April.

The job comprises of a 150m-long portal framed production building, an adjacent (but not attached) office building and timber store, and a separate material storage building.

The production building is a duo-pitch portal frame, with a 35m clear span and a height of 9m to the underside of the portal rafter haunch. Frame stability is provided by portal action, and to reduce differential deflection effects between the gable and the penultimate frame, the gable frames are also portalised in lieu of the traditional braced gable.

Stability to the side elevations is by tubular

strut bracing, which was designed to accommodate longitudinal surge from the building's cranes and thermal expansion forces. This design approach also negated the need for an expansion joint within the frame construction.

Ryan Thurston, Project Structural Engineer for DGT, which has a design and build contract for the steel frame, says: "The main building had to accommodate four overhead gantry cranes each with a safe working load (SWL) of 5t, in addition to dead, imposed and wind loadings.

The design consequently accommodates two cranes working buffer-to-buffer and in tandem to lift a combined SWL of 10t.

***"The main building had to accommodate four overhead gantry cranes each with a safe working load of 5t..."***

"We had to design an economical structure which was robust and this required larger sections than would normally be used on a portal frame of this size," adds Mr Thurston.

Any movement of the frame, during wind or because of snow piling up on the roof would prevent the cranes from operating

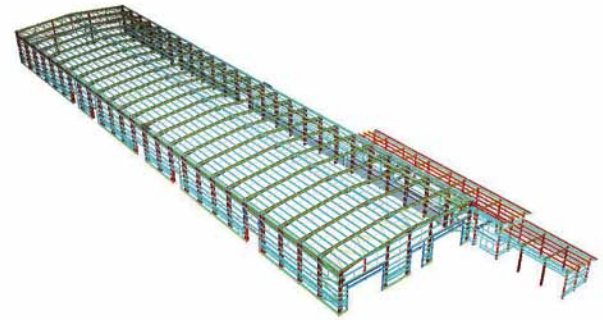
properly. The columns which DGT erected, at 6m spacings, were consequently 762 x 267 x 134 beams, while the rafters were 533 x 210 beams.

Adjoining the main production building is the office block which was required to be structurally independent from its neighbour in order to minimise noise and vibrations from the cranes.

As such, the two storey building has its own stability system. "No internal columns were







permitted so we adopted moment resisting connections at first floor and roof level to create rigid frames, which has the added benefit of reducing the floor beam deflections,” explains Mr Thurston.

Stability to the gable and side elevations is performed by vertical flat cross bracing concealed within cavity walls. Further frame stiffness was achieved by incorporating the precast concrete first floor within the design model to provide diaphragm plate action.

Due to the number of openings within the front elevations the corner gable columns were designed as vertical cantilevers from the first floor level. This was done to transmit the roof plan girder reaction into the first floor level diaphragm, and through to the vertical bracing within the adjoining timber store’s rear elevation.

The timber store is a smaller continuation of the office block and is also designed as a typical portal frame. However, as the structure has an open side the wind pressure coefficients needed to be modified from that of a typical enclosed building.

Meanwhile, the material storage building is a

typical portal framed structure with a plane frame stability provided by portal action and stability to the gable and side elevation by tubular strut bracing.

Mr Thurston says due to the close proximity of the site perimeter, fire boundary conditions exist to the rear and gable elevation, and as such the steel frame was designed with a separate load case for fire collapse.

The structure’s columns were designed with moment resisting bases to resist the horizontal thrust of the rafter destabilising the columns and wall in a fire. Slotted bolt holes with neoprene washers have been provided in the side rails to permit thermal expansion.

“By designing the frame in this manner the costly alternative of applying intumescent paint to the steelwork was negated,” sums up Mr Thurston.

Warwick Burt are currently cladding the completed steel framed structures and it will hand over the completed buildings in September. Homeseeker will also erect a sales office on the site, this structure will be a large modular building from its sister company – within the Shepherd Group – Portakabin.

*Above: Structural diagram of main production building and the adjacent office and timber store.*

*Top left: Steel erection was completed within six weeks.*



*Larger columns than would normally be used on a portal frame structure were specified.*

# Playing by the Merton rule

*A new superstore in south west London has been designed to comply with local legislation that requires new non-residential buildings to generate a percentage of their own energy needs.*

The new B&Q superstore in New Malden could well act as a blueprint for future construction of large distribution centres and stores throughout the UK. The steel-framed three-level structure has a number of built-in sustainability features and these elements have not only dictated the building's design, but also keep it in line with a piece of legislation that originated in its local Borough.

In October 2003 the London Borough of Merton became the first authority in the UK to include a policy in its Unitary Development Plan that requires new non-residential developments, above a 1,000m<sup>2</sup> threshold, to generate at least 10% of their energy needs from renewable energy equipment, such as solar panels and wind turbines.

Merton is now revising the policy so that residential developments will also have to cut their CO<sub>2</sub> emissions by at least 10%, while other local authorities, including the Greater London Authority have also adopted similar policies.

Black Architecture has been involved with this project for nearly five years and company Director Steve Burr, says environmental issues played an important part in the design process from the initial stages.

"The superstore is in Merton and as it has a footprint of approximately 10,000m<sup>2</sup> it is above the threshold and so the 10% renewable energy Rule applies," explains Mr Burr.

Of all the sustainability features the project's wind turbine will be the most visible as it will be placed on a 30m-high steel tower located on a perimeter facade. "As well as being an important feature the tower and turbine will act as a signpost for the store," adds Mr Burr.

Other environmental features include rainwater harvesting and an external geothermal closed-loop system, whereby the store will be heated and cooled by water passing through heat exchangers and a pipework loop that circulates 100m beneath the site.

During the winter hot water will be circulated via this subterranean pipe network into the building through pipes in the store's floor. In summer, this process will be reversed and the water via the exchangers will be cooled allowing cold air to circulate around the store.

"This system gives a constant temperature throughout the store, in all seasons and is far more efficient than using heaters," says Mr Burr. "The customer experience is enhanced and there will

be no cold or hot spots within the store, which is typical when in-store heaters are used."

Hemmed in by busy roads - including the A3 along one elevation - and an existing superstore on another side, the B&Q store's irregular shape is dictated by the available space. Overall the structure consists of a large sales area sitting on top of a two level car park. Along one street facade the building also has a three-level row of offices, which unlike the rest of the project, is topped with a sedam roof.

Placing a large sales area above a car park was the most challenging aspect of the project as far as the design team are concerned. "Because of the heavy loadings associated with a superstore such as B&Q, with all the large stacked pallets, forklift movements and general weight of the shoppers themselves, we essentially provided a suspended floor that had all the characteristics of a ground floor slab," says Barrett Steel Buildings Technical Director Richard Beesley.

Barrett Steel Buildings are the project's design and build steelwork contractor, but its contract also includes supplying and installing precast floor units, precast walls, precast ground beams, precast lift shafts and metal staircases.

"We had numerous design meetings to ensure coordination between the steel and the various sub-trades," says Mr Beesley. "This included working very closely with Tarmac Precast to ensure all aspects of the B&Q specification were met."

The slab above the two-level car park which supports the store's sales area is consequently a 'highly engineered slab.' The extremely heavy loadings generated above meant the steel frame had to act compositely in order to work.

"To meet the very tight deflection requirements we used 1,373mm deep Westok cellform beams to support this slab," explains Mr Beesley. "There are some big spans of up to 16m-long. The columns in the sales area follow a similar grid pattern as the car park, and these beams offered the best solution."

Mr Burr agrees and adds: "This floor is highly engineered and cellform beams were used because of the tight tolerances and big loadings from above. Normally services will dictate the use of these members, but in this case it was decided that they offered minimal deflection and the best solution."

Another interesting and environmental feature is the structure's north facing roof which will allow natural daylight to penetrate the store and give customers an outside view. "Plenty of



*Main picture: The tower and wind turbine will act as a signpost for the store.*

*Above: Tapered trusses form the north facing environmentally friendly roof.*





***"We essentially provided a suspended floor that has all the characteristics of a ground floor slab."***

natural daylight is integral in enhancing further the customers shopping experience and letting them see what's happening outside," explains Mr Burr.

To get the store's roof aligned in a north-south position also meant some complex steelwork engineering was required on some of the supporting columns. Because of the site's confined position and to get the maximum spaces in the available space, the almost rectangular-shaped car park is positioned in an east-west position.

So the second floor trading area is in fact twisted by 45 degrees to the levels below. Columns at this level are repositioned and slightly skewed to give the upper level its north facing roof.

The car park is based on a 7.8m x 15.6m grid pattern which is slightly more generous than the average store car park. The upper trading level has a larger grid and only every third column is twisted and extends into it.

The north facing roof is formed by four rows of tapered steel trusses, which span up to 22m over the two central aisles and seven metres on two outer spans. At their deepest, facing north, the trusses are 2.3m high and will be glazed to allow the daylight to penetrate.

Barrett Steel Buildings will complete its steelwork erection this June and is scheduled to finish its work by July, with the store opening for business in December.



#### FACT FILE

**B&Q Superstore,  
New Malden, Surrey**  
**Main client:** B&Q  
**Architect:** Black Architecture  
**Structural engineer:**  
 Bradbrook Consulting  
**Main contractor:**  
 Simons Construction  
**Steelwork contractor:**  
 Barrett Steel Buildings  
**Steel tonnage:** 2,800t

*Above: Cellform beams offered the best solution for supporting the retail zone's slab.*



**FACT FILE**

**Collingwood House,  
111 New Cavendish  
Street, London**

**Main client:** CORE  
(City Offices Real Estate)

**Architect:**

Sturgis Associates

**Structural engineer:**

Furness Partnership

**Design and build**

**contractor:** Faithdean

**Project manager:** Buro

Four Project Services

**Steelwork contractor:**

Graham Wood

Structural

**Steel tonnage:** 500t

**Project value:** £26M

# Keeping the neighbours happy

*A worn out 1960's concrete structure in central London is being given a new lease of life with steel framed extensions, with the majority of the construction work taking place directly beneath 47 occupied apartments.*

Refurbishing and extending an old building in central London may not be an unusual undertaking; the procedure seems to be taking place regularly in most areas of the capital as demolition isn't always a viable option.

There can be many reasons for choosing to refurbish rather than demolish and rebuild a building, with criteria such as a protected and listed historic facade, disruption to adjacent or conjoined structures, and sometimes even the cost of the operation coming into play.

However, none of these apply to Collingwood House, a 1960s office and residential building situated just north of London's major shopping thoroughfare of Oxford Street.

The structure sits on its own island site, surrounded by four busy London streets, so adjoining buildings are not an issue. There are no restrictions due to it being listed, as Collingwood House is an unremarkable looking reinforced

concrete edifice.

What makes this site unusual is the fact that all building work is being carried out beneath 47 occupied apartments. Moving out all of the tenants would have made the construction work easier, but this was not an option as they all possess leaseholds. Project developer CORE initially bought two of the apartments, but that still left plenty of residents for the contracting team to work around.

"It's certainly a unique aspect having occupants living above the work, but we've tried to make life for them as bearable as possible," explains Andy Doughty, Project Director for design and build contractor Faithdean.

Faithdean publishes a monthly residents newsletter, outlining where the project works are currently at and what is imminent during the next month, while quarterly meetings, held in a local hostelry, also help to keep Collingwood's occupants on-side.





***"Steel was the right material for the project. It is easier and quicker to erect."***

Overall the work includes increasing the building's office space to approximately 8,300m<sup>2</sup>. This is being done by extending three portions of the structure up to the fourth floor from first floor level. All of these elevations will then fill-in the original H-shape of the structure and create a true city centre block.

"We're building three bespoke structures," is how Mr Doughty describes the project. "Two of these are connected to two parts of the existing structure (Gt Titchfield St and Hanson St), while another (Clipstone St) is a completely new north elevation. The building's fourth facade (New Cavendish Street) will contain the new building's residential and office entrance.

All of this work is being carried out literally under the tenant's noses, as apartments start at the fifth floor - although set-back from the extensions - and extend up to the ninth level.

Designing three new extensions to an existing city centre building had to take many parameters into consideration, and during the design period it was decided that the new superstructure had to be steel with lightweight concrete floors in order to justify the loads on the existing concrete structure.

Extending portions of the building, which were originally only one-storey, upwards with new steelwork also meant a considerable amount of strengthening had to be done at basement level.

The basement originally housed a car park and is being converted into a plant room and management suite while still retaining some parking spaces.

Some of the original concrete columns have been strengthened with steel parallel flange channels, while 150 new mini piles were also inserted into the basement slab to accept new steel columns for the new extensions.

"Putting new steel columns against existing concrete columns required a huge amount of drilling," says Jeff Beverley, Project Manager for steelwork contractor Graham Wood Structural.

"And we had to do all the drilling at set times which were previously agreed with the tenants."

New service holes also had to be drilled through the existing concrete ground floor slab. The majority of these needed steel trimmers at the underside of the existing slab, but where large holes were needed, new steel columns and foundations transfer the loads to the ground.

Not wanting to overload the existing columns was an important consideration as Solomon Tsikkos, Director of structural engineer, Furness Partnership explains: "We have strengthened the original columns where they were accessible, but many under the residential portion were not accessible and therefore it was crucial to limit the loading."

The structural challenge for the project is primarily the application of additional loads to the existing structure due to the additional three storeys on three elevations. Consequently, the new floors have been designed with steelwork and concrete formed on metal decking.

"To justify the extra loading on the existing and retained lower level columns we specified

lightweight concrete for the new floors and utilised live load reduction," says Mr Tsikkos. "We are adding load with the new floors, but by using lightweight materials for partitions and the new facade's cladding, we are also balancing the loads."

The new extensions also have to link into retained parts of the building which in turn dictate the new floor to ceiling heights.

"Because of the headroom limitations we've used column sections in most areas. These heavier steel sections gave us the required heights, but also contributed to the 500t overall project steel tonnage," explains Mr Tsikkos. "Ordinarily on a job of this size the tonnage may only have been in the 300t region."

"Even so steel was the right material for the project," adds Mr Doughty. "It is easier and quicker to erect."

Another interesting element of the project is the addition of two new penthouses situated above the residential block. These units, both measuring 10m x 15m, are located on a new tenth floor level where the original plant rooms were housed.

Working above occupied apartments meant steel was the only serious choice of framing material for the penthouses. There was a need to minimise noise and the number of trades working on the roof, while timber floors will lessen the loads being transferred down through the existing residential structure.

With thirty years experience of the structural engineering sector, Mr Tsikkos says, Collingwood House is one of the most challenging projects he has ever worked on.

"We had no original drawings to work with, so the job required a lot of exploratory works early on, such as exposing beams, just to see what condition the materials were in.

"We designed the job with a lot of flexibility because we continually found new challenges as the project progressed."

The project is scheduled for completion by the end of 2008.

*Left: Artists impression of the completed and renovated Collingwood House.*

*Far right: The project's new steel framed northern facade along Clipstone Street.*

*Below: One of the new rooftop penthouses.*

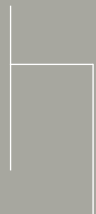




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# Stockholders – the strategic resource



*Above: Sections stock-piled ready for delivery (photograph courtesy of Barrett Steel Ltd).*

*Left: As well as sections, stockholders supply all the parts needed for a steel building (photograph courtesy of ASD metal services).*

*One of the best-organised distribution networks of any industrial product is at the service of the UK's structural design community, in the shape of the national network of constructional steel stockholders. NSC explains their role in the first of a new series on the Steel Supply Chain.*

Steel stockholders are little publicised yet play a vital part in the steel construction supply chain, ensuring the market is supplied with what it needs when it is needed. From an extensive national network of depots, steel stockholders serve all parts of UK industry, and construction is their biggest client. As well as heavy structural sections they provide plates, light sections, cladding materials, flats, angles – all the elements needed to create a steel building. Total stocks held are thought to represent at least 40 days supply, a vitally important strategic resource of national economic significance.

Part of the stockholder's value to the construction industry stems from their close working relationship with Corus, the UK's major steel manufacturer. Corus has a continuous programme of major investment in its world class plant and processes, providing high quality steels as well as improving service to customers. Corus produces steel in large quantities to keep the UK market supplied, but stoppages are needed occasionally for essential maintenance work, upgrade or repairs, which can give rise to gaps in the production schedule.

Stockpiling ensures continuity of supply when production is interrupted, and eliminates risks of disruption to customers. The new Automated Distribution Centre at Corus' Scunthorpe works for example can hold up to 17,000 tonnes of steel sections at any one time, and stockholders provide a vital back-up resource of their own.

The service does not end with simply supplying steel, and the role of the stockholder in processing steel has grown substantially in recent years. Some stockholders liken their service to a Steel Service Centre. Like the rest of the steel construction supply chain stockholders have invested heavily in productivity and service enhancing equipment and computer controlled stock control and distribution processes. Some have invested in the latest sawing machinery for example, and more environmentally friendly shotblasting and priming equipment. Stockholders are also investing in state of the art equipment such as laser cutting machines that can cost £5M or more.

Outside observers might suspect that this puts stockholders in competition with their steelwork

***In essence, successful stockholding is all about making steel available quickly.***





contractor customers who traditionally carry out processing work, but their services are recognised as making the supply chain more efficient, producing savings that can be shared with end users. All parts of the supply chain benefit from this.

Stockholders also have a bulk breaking role. As their name suggests, they buy in large volumes and hold vast stocks of steel so they can respond to the demands of customers for the hundreds of steel sections sizes and grades available.

The stockholder's main customer is the steelwork contractor. In 2007 the UK construction industry used some 1.5Mt of structural steel and over 70% of that was sourced through stockholders. Most of that steel went through steelwork contractors, most of whom are BCSA members, as are many of the stockholders.

The mutual dependence that exists between the stockholders and their steelwork contractor customers is acknowledged by the holding of regular meetings and cooperation between them on key issues. The aim of joint activities is to better discover and meet the needs of the UK structural design community.

Some steelwork contractors of course buy direct from the mill, usually for specific projects involving exceptionally large or complicated steel sections. The factors that influence what percentage of a steelwork contractor's steel is sourced from a stockholder or direct from the mill will vary over time and with the size and nature of the project. There will also be a lot of variation between steelwork contractors.

One of the major benefits to steelwork contractors of the stockholders is not having to hold expensive stocks of steel on the off chance that it may be demanded soon. Stockholders can do this much more economically as, having a lot of steelwork contractors to supply, they can turn their stock over much more quickly. The benefit to the end user of the steel is of course that they get the steel needed for the job at a much more economic price than would otherwise have been possible.

Stockholders play a vital role and can adapt to changing times whether the construction industry is experiencing levels of high demand when time is of the essence, or in quieter periods. When building projects are thinner on the ground the construction

buyers market means there will be a demand for speedier tendering and acceptances of jobs offered, and steelwork contractors will not feel able to wait for mills to roll the appropriate sections; in this economic climate stockholders will improve the availability of steel. When times are better or production cannot immediately catch up with a sudden and rapid rise in demand for a particular type or size of section, then the industry will be able to rely on steel held by stockholders. In essence, successful stockholding is all about making steel available quickly.

Initial consideration of the stockholders' business model might lead observers to think that they might maximise turnover and hence profitability by simply having a minimum amount to hand of the most popular sections. But there is competitive advantage to be gained by developing a reputation as a supplier that will have what is needed when it is needed; time sensitive steelwork contractors will quickly learn who to turn to when the pressure is on and will know who to support with the rest of their business.

It is important for specifiers and designers to appreciate the extent of the resource that stockholders represent, providing them with assurance that steel will be available for their projects whatever the market conditions. They point to the extensive network of distribution depots that have been established nationally to ensure that local projects can be easily supplied on a just in time basis.

The service does not end with simply supplying steel. Like the rest of the steel construction supply chain stockholders have invested heavily in recent years in productivity and service enhancing equipment and computer controlled stock control and distribution processes. Some have invested in the latest sawing machinery for example, and more environmentally friendly shotblasting and priming equipment.

Most stockholders are now accredited to ISO9000. Investment has been made in delivery vehicles and safety innovations made in safe ways to unload when steel reaches either the fabrication yard or site.

The flexibility that the stockholder provide to the steel construction sector has meant they have been able to respond to construction industry demands for just in time deliveries for about 20 years. Designers can share the steelwork contractors' confidence that stockholders will be able to supply what is needed at the right time. The large stocks held also mean that designers need not worry about designing in high quality steel grades (for open sections) like S355JR or S355JO and are not limited to S275JR (43A).



**Some stockholders liken their service to a Steel Service Centre.**

Recognition is given to the following stockholders which are supporting the BCSA/Corus steel construction market development programme:

**ASD metal services**  
**Austin Trumanns Steel Ltd**  
**Barrett Steel Ltd**  
**Corus**  
**National Tube**  
**Stockholders Ltd**  
**NSD Ltd**

*Stockholders have invested in sophisticated equipment such as state of the art saws (photo-graph courtesy of ASD metal services).*



# Reinventing a shopping centre

*A town centre shopping mall that had been rapidly falling into a state of disrepair has been extensively refurbished with steel and is now a flagship development in Southend.*

What was once the town centre's state-of-the-art architectural masterpiece is now a rather rundown and shabby building, disliked by the populace and under used or visited. Designed as a modern structure, the building today looks tired and out of date and needs to be extensively refurbished or even demolished.

This is a story familiar to many UK towns and cities as a lot of buildings built in the 1960s and 70s have not stood the test of time. Although many structures dating from this era are not highly thought of, demolition is not always an option and refurbishment is the answer.

The Victoria shopping centre in Southend-on-Sea is a case in point. Built in the late 1960s, the concrete framed centre occupies a prime town centre location and was in its day a modern and exciting place to visit. However, times change and over the last few years shoppers used to air-conditioned indoor malls viewed the Victoria's open and uncovered thoroughfares as unwelcoming and inhospitable.

Delamere Estates bought the site in conjunction with The National Grid UK Pension Scheme and in May 2006 started a multi-million pound project to upgrade and refurbish the Victoria shopping centre.

The work includes covering the open malls with a glass clad roof, improving and replacing lifts and escalators, extending the existing floorspace, adding

a new retail extension, and installing new entrance features.

Martin King, Contracts Manager for main contractor EllmerTry, says: "Shoppers were at the mercy of the elements and some of the malls were like wind tunnels. Our work has rejuvenated the centre and by covering the malls made it a pleasant place to shop."

As well as having to work with old and incomplete construction plans, the main challenge the building team faced was that the centre would remain open throughout the construction programme.

Primarily for this reason a phased rotational programme was employed, whereby demolition and erection work was carried out around a functioning shopping centre.

Hillcrest Structural's steelwork package was subsequently carried out over a 15 month period, with the firm generally spending a month on each sector and then returning when the main contractor had another area ready for steel erection.

The original concrete structure consists of four levels of retail topped by a seven level car park. New structural steelwork was erected in five main areas with the largest sector, in terms of tonnage, being a new four-storey extension.

An area adjacent to the centre's service yard has

***"Our work has rejuvenated the centre and made it a pleasant place to shop."***





**FACT FILE**

**The Victoria shopping centre, Southend-on-Sea**

**Main client:**

Delamere Estates

**Architect:** Benoy

**Structural engineer:**

Scott Wilson

**Main contractor:**

EllmerTry Joint Venture

**Steelwork contractor:**

Hillcrest Structural

**Steel tonnage:** 425t

**Project value:** £21.5M



2



1



4



3

1. Refurbishment included a new main entrance to the centre.
2. Better access has been added to and from Victoria Station.
3. Creating more retail space was one of the project's goals.
4. A new retail extension has been built at the rear of the centre.
5. New floors and a roof have been added to the main central plaza.



5

been in-filled with a steel framed extension. "During construction work we had to divert the services to the basement level delivery yard," explains Mr King. "Now the extension has been completed, the revamped, but slightly smaller, service yard is still adequate for the shopping centre."

Logistically, the most challenging sector of steel erection was conducted over the Deepings, an underpass which previously housed a subterranean bus terminal and two lanes of traffic.

The bus terminal has been relocated to another area in the town centre but the road remains and this was closed during construction work. Hillcrest's work involved erecting 17m-long beams over the highway in order to extend the shopping centre's floor plate. Primarily above the Deepings the structure is taken up with retail outlets, and the new extension is designed to aid access between different areas of the shopping mall.

"One of the main objectives of the overall work at the centre is intended to improve the flow of shoppers around the malls," explains Mr King.

An existing diaphragm wall was initially strengthened and then Hillcrest erected large transfer columns into new piles which supported the new floor space.

"This was a complex part of our programme as we had to erect over a road and getting a mobile crane into the correct position wasn't easy," says a Hillcrest spokesperson.

One of Southend's main railway stations, Victoria,

is located opposite the shopping centre across the busy A13. Previously there was a concrete ramp which stretched across the road and allowed pedestrian access between the station and the shopping centre.

This structure has been demolished and during a seven week road closure, a new entrance from the station has been erected. A steel frame straddles the busy road and accommodates an escalator, lifts and stairs, giving easier direct access into the centre from the station.

Feedback from local residents seemed to indicate that access from the station was laborious and uninviting. The new entrance is intended to encourage commuters as well as shoppers to use the shopping centre as a thoroughfare into the town centre.

The other two sections involving new steelwork centred around Churchill Square, the main central plaza of the centre. The work basically involved in-filling the upper levels to create more retail space, while another level was added above one retail store creating a new 52 space car park.

Summing up the project, The Victoria's Centre Manager, Jonathan Poole, says: "This is what Southend has been waiting for. We hope shoppers will find it easier to move around using the new escalators and accessways.

"Our shoppers have also been extremely patient throughout the building works, but the new centre is going to totally change shopping in Southend."





# Steel bowls a quick delivery

## FACT FILE

**SWALEC Stadium,  
Glamorgan Cricket  
Club, Cardiff**

**Main client:**

Glamorgan County  
Cricket Club

**Architect:** HLN

Architects

**Structural engineers:**

Arup

**Main contractor:**

Carillion

**Steelwork contractor:**

Rowecord Engineering

**Steel tonnage:** 750t

*Glamorgan cricket's headquarters in Cardiff has been completely redeveloped and the new 16,000 capacity stadium, which officially opened for this Summer's season, will also host the first npower Test of the 2009 Ashes series.*

Next year's eagerly anticipated Ashes Test series between England and Australia will kick-off at the redeveloped SWALEC Stadium in Cardiff. This will be the first Test match to take place in the Welsh capital and the first time an Ashes Test has been played outside England or Australia.

The decision to host an Ashes Test match in Cardiff was taken in 2006, but final confirmation was dependent on a full-scale redevelopment taking place and, most importantly, being completed.

Formerly known as Sophia Gardens, the stadium has been the home of Glamorgan County Cricket Club since 1967 and was used as a venue during the 1999 Cricket World Cup.

However, in order to become a recognised Test venue the stadium had to increase its seated capacity and redevelopment work started on site

in early 2007, with the entire stadium completed in March this year, in time for this summer's season.

The majority of the existing stands and terraced areas were demolished, with only a small section of terracing backing on to the River Taff and the National Cricket Centre being left undeveloped.

Main contractor Carillion was responsible for demolition, piling and all groundworks, and the entire project was undertaken sequentially in order to cause minimal damage to the pitch and also to allow the ground to remain partially open for a few county matches during the 2007 season.

Steelwork contractor Rowecord Engineering began erecting steel in March 2007 and had finished all of its work by September.

Rowecord's Contracts Manager Colin Davies, says special care was taken in sensitive areas such

**"The vision was to create a bowl within the available space."**

as the protection of established trees along the River Taff frontage, and protection of the grassed cricket playing surface.

"Behind the Riverside Stand extra care was taken not to damage the established trees which overhang the terracing. Our access to the work areas was also restricted because we could not encroach on the playing surface and our deliveries of steel and precast concrete sections, and the positioning of our cranes and elevated working platforms were coordinated to use the limited space available."

The redevelopment work was architect led and the vision was to create a bowl within the available space. All the new structures are linked, although many are still structurally independent.

Matthew Evans, Arup's Project Engineer, says the plan was also to give the stadium a park-like feel and the retained and protected trees along the river frontage perfectly fit this requirement.

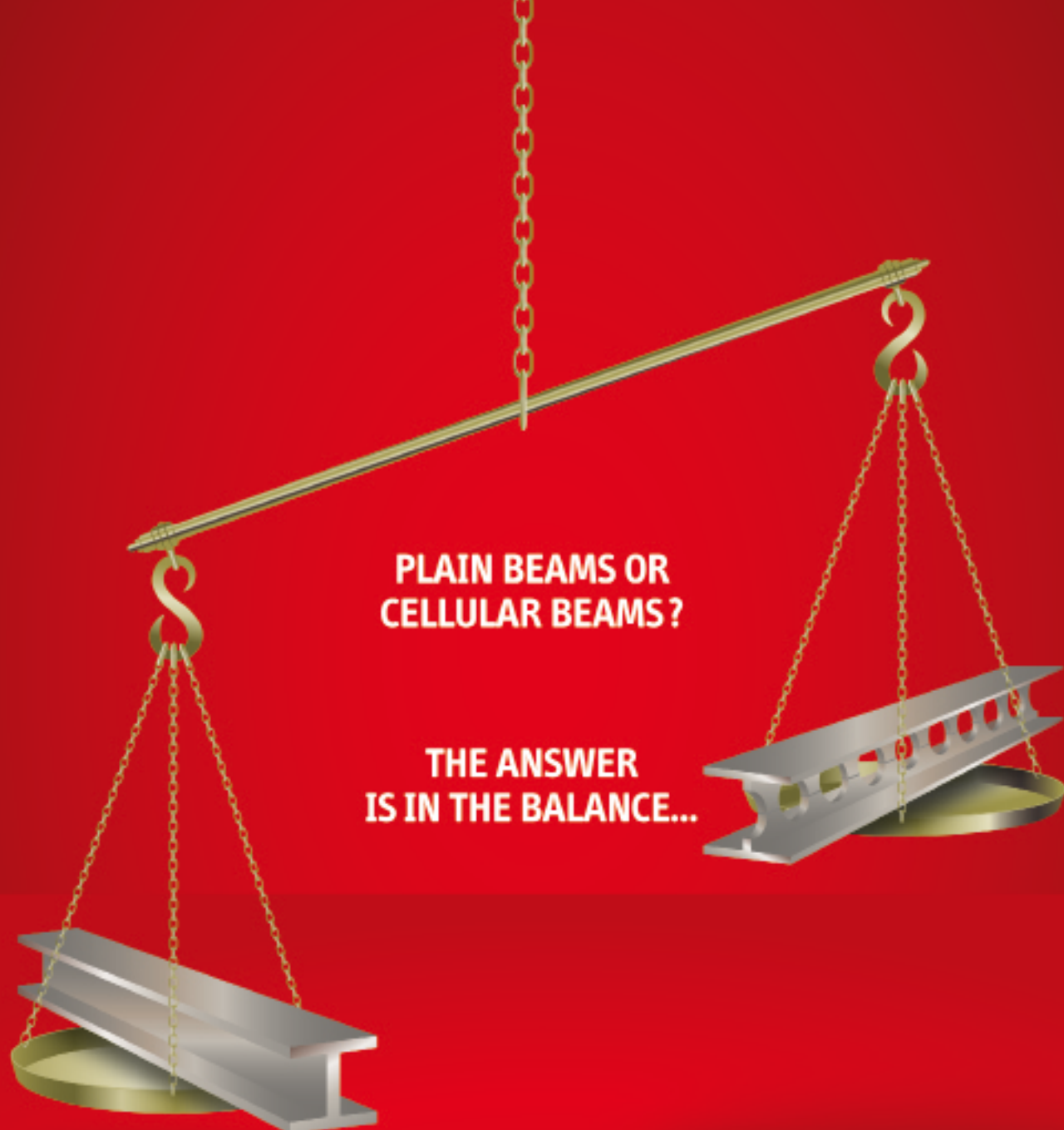
Referring to construction design, he adds:

*Above: The new Pavilion has 2,660 seats, 11 hospitality suites, and players' and officials' facilities.*

*Below: All work had to be carried out without damaging the playing surface.*







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Sport



*All stands were constructed as A-frames with sloping rakers, which is typical stadium construction.*



"All stands are constructed as an A-frame with long sloping rakers, and have additional bracing for stability. This is typical for sports stadium construction and all of these stands are designed to accommodate the effects of crowd loading."

Steelwork erection began with the North West Stand/ Pavilion adjacent to the existing River Taff terrace. The new Pavilion - sponsored by The Really Welsh Company - has 2,660 permanent seats and occupies the land between the National Cricket Centre and the site of the previous scoreboard.

The Pavilion is the centre piece of the new redeveloped stadium and features the Museum of Welsh Cricket (due to open in March 2009) on the ground floor; 11 hospitality suites and a business club on the first floor; and changing rooms, officials and umpires rooms, players dining room and a members area on the upper second floor.

The Pavilion structure is 112m long and 27m

wide and required approximately 185t of structural steelwork.

When Rowecord began its work Carillion had already started to prepare the groundwork in advance, and cast in the holding bolts ready to accept the steelwork's columns.

Carillion worked ahead of Rowecord by demolishing, clearing the ground and preparing the ground before steelwork erection could begin.

"This sequence of build

***"We built our way around the pitch from the River Taff terracing in both directions and on completing the Entrance Stand, which was the last structure to be erected, backed ourselves out of the ground."***

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was started from the furthestmost point from the Entrance Stand, working back toward the entrance from two directions in a pincer movement," explains Mr Davies.

Rowecord's contract also included the installation of all precast concrete terrace planks. "We needed to erect the structural steel in a number of bays to within the cranes working capacity, then line and level the structure and harden all construction bolts. Only then could the precast units be loaded and fixed. This operation was then repeated throughout the build," adds Mr Davies.

Once the Pavilion had been erected Rowecord moved to the other side of the existing River Taff terracing to erect the Riverside Stand. This single storey terrace is 70m-long and has 674 seats. A new electronic scoreboard and groundstaff building has been built at the rear of this stand.

The new main Grandstand was by the largest steel structure erected during the programme and required 265t of steel. The new structure has been built on the site of the former pavilion, erected in 1967 following Glamorgan County Cricket Club's move to the stadium from the nearby Arms Park.

The Grandstand has over 4,864 permanent seats arranged along one level. The structure is 91m long and is topped with a 9m cantilevered roof which is clad with a stretched canvas membrane.

"The entire job was done with piece-small sections, with 14m long columns being the largest members," explains Mr Davies. "On the Grandstand the most exacting work was to make sure the connections were correct for the roof's cladding."

The final pieces of the jigsaw were the Cathedral Road Stand and the Entrance/Corner Stand. The 77m-long stand at the Cathedral Road end has 3,494 seats on the lower level, with a state-of-the-art



media centre above, containing four broadcasting boxes for radio stations and three television studios, plus a tiered seating area for more than 100 journalists. The structure is 51m-long, has a 9m cantilevered roof and needed some 250t of structural steelwork.

"We built our way around the pitch from the River Taff terracing in both directions and on completing the Entrance Stand, which was the last structure to be erected, backed ourselves out of the ground," adds Mr Davies.

The Entrance has been built on the site of former hospitality suites and contains more than 2,000 seats. At the rear of the stand, there will be a cricket shop, plus a turnstile complex, with a tented entrance canopy adjacent to some existing and retained gates.

The completely redeveloped SWALEC stadium opened for the new cricket season and in preparation for next year's Ashes Test it will host a One-day International between England and South Africa on 3 September.

*Care had to be taken not to damage well established trees behind many of the stands.*



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The development of the new Blue Book on member resistances highlighted some new methods. Edurne Nunez Moreno of the SCI explains the background to two of the issues.

# 1. Web Bearing and Buckling to BS EN 1993-1

Web Bearing and Buckling are modes of failure that arise from concentrated forces being transversely applied onto the flanges of beams or columns.

Web bearing failure means that the web yields at its most vulnerable location, close to the root radius adjacent to the flange where the force is applied, as illustrated in Figure 1.a.

Buckling of the web happens when the web is too slender to carry the transverse force being transferred from the flange. In this mode the web has to work as a strut in compression and it buckles as shown in Figure 1.b. It is assumed that the flange is adequately restrained in the lateral direction and therefore it can neither rotate nor move laterally.

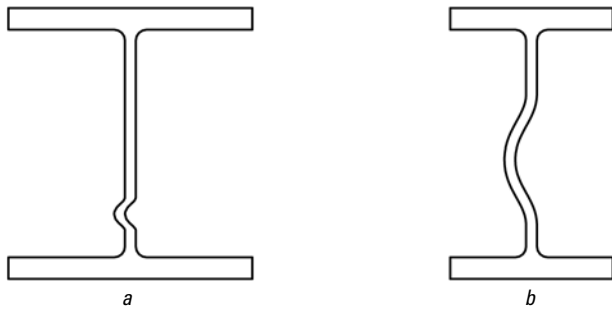


Figure 1: Web bearing (a) and buckling (b) failure modes

BS5950-1 requires that two independent checks are carried out for web bearing and buckling. The Eurocode presents a single check to deal with these two failure modes. This single check accounts for the bearing and buckling of the web when the member is subject to a transverse force.

Web bearing and buckling is not in fact covered in BS EN 1993-1-1 but the designer is referred to section 6 of BS EN 1993-1-5: *Resistance to transverse forces*. The design resistance to transverse forces  $F_{w,Rd}$  is calculated as given in equation 6.1:

$$F_{w,Rd} = \frac{f_{yw} L_{eff} t_w}{\gamma_{M1}} \quad (6.1)$$

In this expression  $f_{yw}$  is the yield strength of the web;  $t_w$  is the thickness of the web;  $\gamma_{M1}$  is the partial factor for resistance of members, given in the National Annex to BS EN 1993-1-5 (in the UK National Annex  $\gamma_{M1}$  is given as 1.0) and  $L_{eff}$  represents the effective length for resistance to transverse forces, calculated as  $\chi_F l_y$ , where:

$$\chi_F = \frac{0.5}{\bar{\lambda}_F} \leq 1.0 \quad (6.3)$$

$$\bar{\lambda}_F = \sqrt{\frac{\ell_y t_w f_y}{F_{cr}}} \quad (6.4)$$

$l_y$  is the effective loaded length, taken as the minimum of the following three values:

$$\ell_{y1} = s_s + 2t_f (1 + \sqrt{m_1 + m_2}) \quad (6.10)$$

$$\ell_{y2} = \ell_e + t_f \sqrt{\frac{m_1}{2} + \left(\frac{\ell_e}{t_f}\right)^2 + m_2} \quad (6.11)$$

$$\ell_{y3} = \ell_e + t_f \sqrt{m_1 + m_2} \quad (6.12)$$

$F_{cr}$ ,  $m_1$ ,  $s_s$  and  $\ell_e$  are all simple to calculate and fully defined in BS EN 1993-1-5.

Note that, at the time of printing this article, the published document BS EN 1993-1-5 refers to equations 6.11, 6.12 and 6.13 instead of 6.10, 6.11 and 6.12. This is due to be amended by CEN in the forthcoming corrigendum of the standard.

The calculation of  $m_2$  and  $\bar{\lambda}_F$  is not straightforward, as they are interdependent.  $\bar{\lambda}_F$  depends on  $l_y$ , which in turn is affected by  $m_2$ . However,  $m_2$  can take two values, depending on the value of  $\bar{\lambda}_F$ :

$$m_2 = 0.02 \left( \frac{h_w}{t_f} \right)^2 \quad \text{if } \bar{\lambda}_F > 0.5$$

$$m_2 = 0 \quad \text{if } \bar{\lambda}_F \leq 0.5$$

This means that two alternatives must be checked, considering both possibilities for the value of  $m_2$ , as shown in the following example.

## Example

The following example shows how to calculate the resistance to transverse forces according to BS EN 1993-1-5

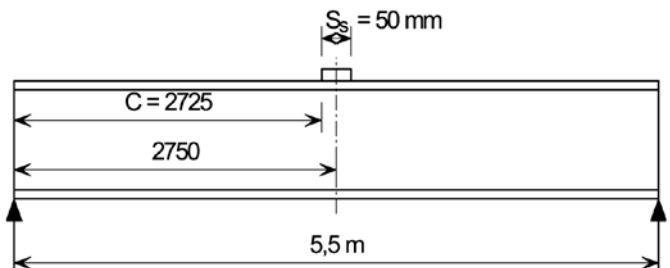


Figure 2: Beam size: UB 406 x 140 x 39

Assume firstly that  $\bar{\lambda}_F < 0.5$ . Then:

$$m_1 = \frac{f_y b_f}{f_y t_w} = \frac{355 \times 141.8}{355 \times 6.4} = 22.2$$

$$m_2 = 0$$

$$\ell_e = \frac{k_f E t_w^2}{2 f_{yw} h_w} = 190.9 \text{ mm}$$

where  $k_f = 6$  from Figure 6.1 in BS EN 1993-1-5.

Using the expressions for  $l_y$  given above the following values are obtained:

$$\text{From equation 6.10: } l_{y1} = 148 \text{ mm}$$

$$\text{From equation 6.11: } l_{y2} = 384 \text{ mm}$$

$$\text{From equation 6.12: } l_{y3} = 231 \text{ mm}$$

The lowest of these three values is used to calculate the value of  $\bar{\lambda}_F$  to check the validity of the original assumption.

From the equations in BS EN 1993-1-5 the critical force is calculated as  $F_{cr} = 780649 \text{ N}$

$$l_y = 148 \text{ mm, therefore } \bar{\lambda}_F = \sqrt{\frac{\ell_y t_w f_y}{F_{cr}}} = 0.66 > 0.5 .$$

This shows that the slenderness is not in the range assumed for the calculation of  $m_2$  and therefore the alternative range for  $\bar{\lambda}_F$  has to be analysed.





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Try with  $\bar{\lambda}_F > 0.5$ . Then:

$m_1 = 22.2$ , as per the first calculation

$$m_2 = 0.02 \left( \frac{h_w}{t_f} \right)^2 = 0.02 \left( \frac{380.8}{8.6} \right)^2 = 39.2$$

$$\ell_e = \frac{k_F E t_w^2}{2 f_{yw} h_w} = 190.9 \text{ mm}$$

where  $k_F = 6$  from Figure 6.1 in BS EN 1993-1-5.

Using the expressions for  $l_y$  given above:

From equation 6.10:  $l_{y1} = 202 \text{ mm}$

From equation 6.11:  $l_{y2} = 389 \text{ mm}$

From equation 6.12:  $l_{y3} = 258 \text{ mm}$

The lowest of these three values is used to calculate the value of  $\bar{\lambda}_F$ .

As in the previous case the critical force is calculated as  $F_{cr} = 780649 \text{ N}$  from the equations in BS EN 1993-1-5.

$$l_y = 202 \text{ mm, therefore } \bar{\lambda}_F = \sqrt{\frac{\ell_y t_w f_y}{F_{cr}}} = 0.77 > 0.5. \text{ This shows}$$

that the slenderness is in the range assumed for the calculation of  $m_2$  and therefore the calculation can be finalised using this value:

$$\chi_F = \frac{0.5}{\bar{\lambda}_F} = \frac{0.5}{0.77} = 0.65 < 1.0$$

$$L_{eff} = \chi_F \ell_y = 0.65 \times 202 = 131 \text{ mm}$$

$$\therefore F_{w,Rd} = \frac{f_{yw} L_{eff} t_w}{\gamma_{M1}} = \frac{355 \times 131 \times 64}{1.0} \times 10^{-3} = 298 \text{ kN}$$

This value compares with 327 kN for web bearing and 202 kN for web buckling calculated in accordance to BS5950-1.

## 2. Buckling modes of angles and channels in compression

Torsional buckling modes affect sections like angles, channels and cruciform sections in compression and can be critical in I sections when the flanges are not equally restrained. Clause 6.3.1.4 of BS EN 1993-1-1: 2005 requires torsional modes to be checked.

For angles in compression the following buckling modes should be considered:

- Flexural buckling about the y-y, z-z, v-v and u-u axis
- Torsional-flexural buckling
- Torsional buckling.

Clauses 6.3.1.3 and 6.3.1.4 of BS EN 1993-1-1 provide guidance to calculate slenderness for the buckling resistance for all of these modes.

- Slenderness for flexural buckling:

$$\bar{\lambda} = \sqrt{\frac{A f_y}{N_{cr}}} = \frac{L_{cr}}{i} \frac{1}{\lambda_1}, \quad \text{for class 3 angles} \quad (6.50)$$

$$\bar{\lambda} = \sqrt{\frac{A_{eff} f_y}{N_{cr}}} = \frac{L_{cr}}{i} \sqrt{\frac{A_{eff}}{A}} \frac{1}{\lambda_1} \quad \text{for class 4 angles} \quad (6.51)$$

$$\text{where } \lambda_1 = 93.9 \sqrt{\frac{235}{f_y}}$$

These expressions are straightforward.  $N_{cr}$  is more commonly known as the Euler buckling load, or alternatively the slenderness can be calculated as the BS 5950 slenderness divided by a

constant. Note that  $\frac{L_{cr}}{i} = \frac{L_e}{r_{yy}}$  and  $\lambda_1$  is a constant, which

depends on the yield strength.

- Slenderness for torsional-flexural buckling and torsional buckling (one single check):

$$\bar{\lambda}_T = \sqrt{\frac{A f_y}{N_{cr}}} \quad \text{for class 3 angles} \quad (6.52)$$

$$\bar{\lambda}_T = \sqrt{\frac{A_{eff} f_y}{N_{cr}}} \quad \text{for class 4 angles} \quad (6.53)$$

where  $N_{cr} = \min(N_{cr,TF}; N_{cr,T})$

To avoid the complex iterative procedure to calculate  $N_{cr,TF}$ ,

Annex BB of BS EN 1993-1-1 allows an alternative approach which accounts for the practical types of end connections, which increase the member resistance. Annex BB gives the following modified expressions for the effective flexural slenderness:

$$\begin{aligned} \bar{\lambda}_{eff,v} &= 0.35 + 0.7\lambda_v && \text{for buckling about the v-v axis} \\ \bar{\lambda}_{eff,y} &= 0.50 + 0.7\lambda_y && \text{for buckling about the y-y axis} \\ \bar{\lambda}_{eff,z} &= 0.50 + 0.7\lambda_z && \text{for buckling about the z-z axis} \end{aligned}$$

In these expressions  $\bar{\lambda}_v$ ,  $\bar{\lambda}_y$  and  $\bar{\lambda}_z$  are the values obtained from equations 6.50 or 6.51 as appropriate. These effective values of the flexural slenderness account for both flexural and torsional-flexural buckling in a much simpler way than by calculating  $N_{cr,TF}$ . These expressions are applicable provided the angles are appropriately restrained at the ends (at least two bolts if bolted, or welded).

The code does not include an expression for the effective slenderness for buckling about the u-u axis. One could think that in some situations, when the angle is restrained about the v-v axis buckling about the u-u axis could be critical. However practical restraints against v-v buckling will also increase the torsional flexural resistance in the u-u axis.

The torsional buckling resistance is not covered by the effective slenderness approach and must be calculated using  $N_{cr,T}$ . Torsional buckling resistances are given in the new Blue Book.

Channels in compression are also affected by all these buckling modes. Although the calculation of  $N_{cr,TF}$  and  $N_{cr,T}$  for channels is quite involved, it does not require iteration and therefore the torsional and the torsional-flexural buckling resistance can be calculated by using the minimum of  $N_{cr,TF}$  and  $N_{cr,T}$  in equation 6.52 or 6.53.

The flexural buckling resistance of channels is calculated using equation 6.50 or 6.51 for concentrically loaded channels and for channels connected only through its web when considering buckling about the major (y-y) axis. For channels connected only through its web when considering buckling about the minor (z-z) axis the following expression from Annex BB is used for the effective slenderness:

$$\bar{\lambda}_{eff,z} = 0.50 + 0.7\bar{\lambda}_z$$

Continued on p 39 >



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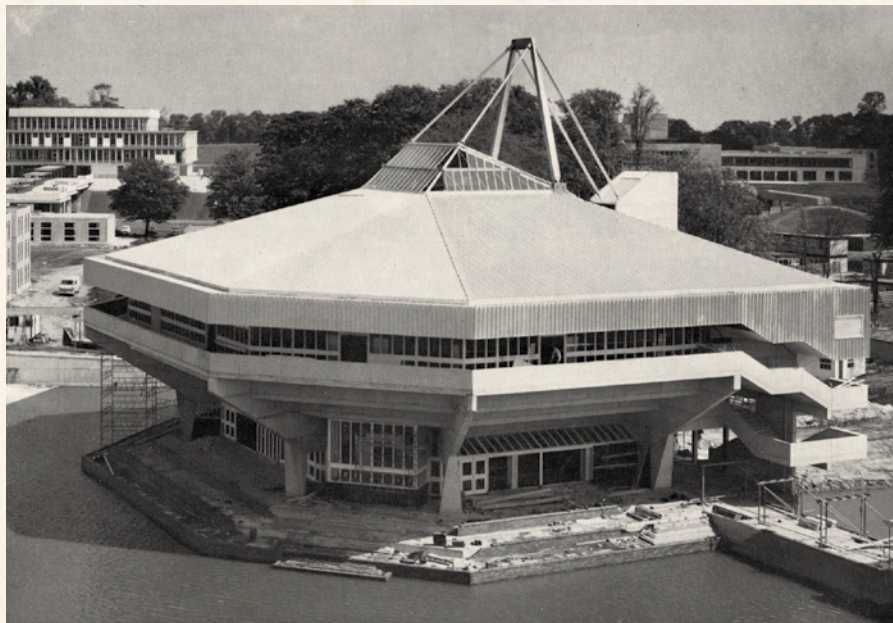
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# University of York – unusual roof structure



The shape of the new Central Hall at York University is of particular interest in that it differs completely from the traditional contours of university buildings, both past and present. The building encloses an auditorium seating 13,000 with a large stage and is sited on a brick-faced podium surrounded on three sides by an artificial lake. It has three floors of ancillary accommodation with the main foyer at ground level below the auditorium. The roof and upper vertical parts of the superstructure are clad in aluminium. The design of the steel-framed roof, which is suspended from an 'A' frame, is also interesting and unusual. The design evolved from the wish to provide a visually acceptable structure which would avoid the need for a suspended ceiling and yet provide an acoustically satisfactory space. The intention was that the roof should provide a strong visual statement externally. The plan of the auditorium consists basically of a rectangle with two corners splayed at 45 deg. raked seating being arranged round the stage through 180 deg. in a manner similar to the classical Greek theatre. Two columns 60 ft high and 28 ft apart pass through the building, framing the stage opening. These

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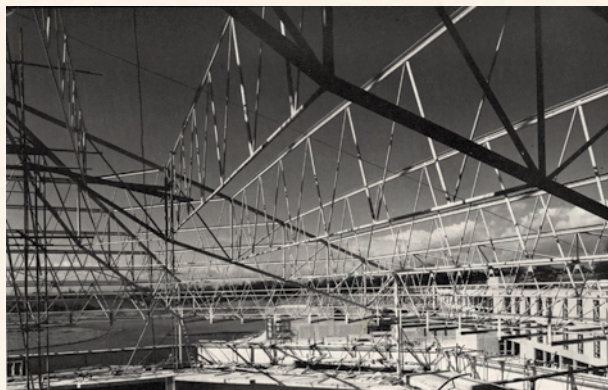
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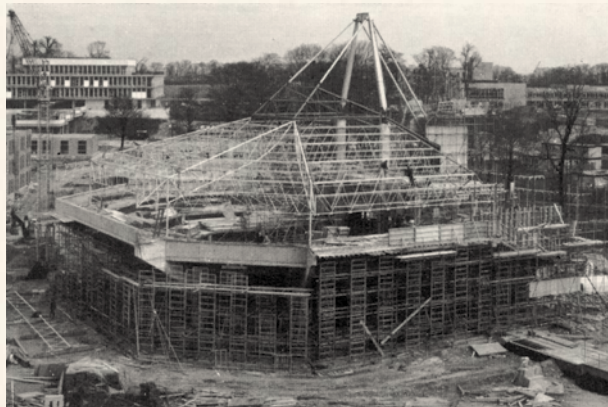
are topped by a 30-ft high 'A' frame fabricated from mild steel plate and standing externally above the roof line.

The 'A' frame is anchored back by two circular hollow sections (CHS) to the lift tower which acts as a counterweight on the axis of the building, thus providing a tied cantilever from which the auditorium roof is hung. The two CHS front ties each pick up two raking main trusses placed, on plan, on the bisectors of the auditorium splays forming the hips of the roof and spanning onto tubular columns placed at the perimeter of the auditorium.

In a similar manner trusses span from the feet of the 'A' frame legs to the perimeter of the auditorium, on line with the stage wing walls. Secondary trusses at 6 ft 9 in. centres span between the main trusses, reflecting the pattern of the seating below. Channel-reinforced woodwool spans directly onto the secondary trusses, the channels being bolted to tees on the top booms to provide lateral restraint.

A glazed lantern is incorporated between the two front ties and their respective compression tubes, the depth being used to span the rectangle formed by the feet of the 'A' frame and the intersection points of the main trusses. Horizontal wind bracing is provided across the lantern opening and between the secondary perimeter trusses, and vertical bracing to the pin jointed perimeter stanchions to form a canopy to the external access balcony. Access to the roof structure and the projection box is by a continuous walkway around the auditorium perimeter.

The lower booms of secondary trusses carry stage lighting equipment: the main auditorium lighting consists of tungsten fittings fixed direct to the soffit above the roof structure. All structural members of the auditorium roof are constructed from CHS. Secondary truss to main truss connections were made by site welding via a split cup and main connections were bolted through flange plates. The 'A' frame was erected in one piece, the back ties and respective compression tubes anchored to the lift shaft and the lantern structure front ties and main trusses then erected in sequence. Steelwork erection was completed in six weeks. Roof cladding consists of snaprib aluminium on felt, insulation board, a vapour barrier and 2-in. thick woodwool.



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## AD 322

### Anchorage of precast floor units for robustness

The purpose of this AD is to clarify the situation regarding the requirements for anchorage of precast floor units for robustness. Clause 2.4.5.3 e) of BS 5950-1:2000 (as amended 2007), provides recommendations for the anchorage of precast concrete or other heavy floor, stair and roof units for Class 2B steel framed buildings. The clause does not specify anchorage forces but refers to BS 8110, although the reference is general, not to any particular clause. SCI publication P341 (Guidance on meeting the robustness

requirements in approved document A) suggests (on page 21) that the anchorage force between precast floor units may be calculated from clause 3.12.3.4 of BS 8110. However, SCI publication P351 (Precast concrete floors in steel framed buildings) refers (on page 47) to clause 5.1.8.3 of BS 8110 for the tying forces between precast floor units. Reference to two different clauses, which give significantly different values of tying force, has caused some confusion. Clause 5.1.8.3 of BS 8110 gives values of tying force that should ensure that the floor slabs do not

collapse locally, should the steel frame be removed or damaged locally. Clause 3.12.3.4 of BS 8110 gives values of tying force that would be needed to tie the structural frame together, and is primarily intended for situations when the floor forms part of the frame; these tying forces are generally much higher than those given by clause 5.1.8.3, which are appropriate where the primary frame (steel or concrete) provides the main resistance to tying forces. In a steel-framed building, the steel frame itself should be designed to provide the tying resistance

necessary to tie it together; reference to clause 3.12.3.4 is then unnecessary. When the steel frame is tied together in this way, the precast slabs only need to have a tying resistance that prevents local collapse of the slab. However, the forces given by clause 5.1.8.3 are based only on the dead load of the floor and P351 recommends instead that the tying force be based on dead load plus one-third live load, to be consistent with BS 5950-1, clause 2.4.5.3 e).

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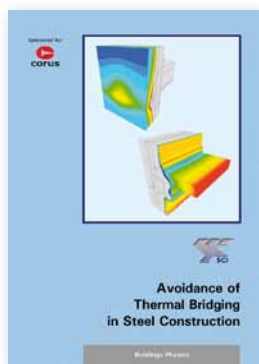
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## Avoidance of Thermal Bridging in Steel Construction

Practical guidance for avoiding thermal bridge heat losses in steel framed buildings; supported by thermal modelling data.



*Catalogue Reference: P380  
Author: A G J Way and C Kendrick*

Energy efficiency is becoming an increasingly important parameter in the design of buildings. The thermal insulation provided by the building envelope is key to energy efficiency but thermal bridges, weak spots in the insulation, lead to local heat losses that reduce the efficiency.

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### New and Revised Codes & Standards

(from BSI Updates April 2008)

#### BRITISH STANDARDS UNDER REVIEW

##### BS EN 10056:-

Specification for structural steel equal and unequal angles

##### BS EN 10056-1:1999

Dimensions

##### BS EN 10058:2003

Hot rolled flat steel bars for general purposes. Dimensions and tolerances on shape and dimensions

##### BS EN 10059:2003

Hot rolled square steel bars for general purposes. Dimensions and tolerances on shape and dimensions

##### BS EN 10060:2003

Hot rolled round steel bars for general purposes. Dimensions and tolerances on shape and dimensions

##### BS EN 10061:2003

Hot rolled hexagon steel bars for general purposes. Dimensions and tolerances on shape and dimensions

#### DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT

##### 08/30128144 DC

**BS EN 1993-1-11** UK National Annex to Eurocode 3. Design of steel structures. Part 1-11. Design of structures with tension components

#### ISO PUBLICATIONS

##### ISO 13918:2008

(Edition 2)  
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## Technical

### Buckling modes of angles and channels in compression

Continued from p34

In this expression  $\bar{\lambda}_z$  is calculated as given in 6.50 or 6.51. This expression is applicable provided the channel is appropriately restrained at the ends (at least two bolts if bolted, or welded). In any other case provision for the eccentricity must be made by following the rules for combined bending and axial force, given in clause 6.2.9 of BS EN 1993-1-1.

The new Blue Book to the Eurocodes follows this approach when calculating the resistance of angles and channels. Future articles will cover the contents of the publication, and how the design data is to be used.



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# The British Construction Steelwork Association Ltd

You can find email and website addresses for all these companies at [www.steelconstruction.org](http://www.steelconstruction.org)

BCSA is the national organisation for the steel construction industry. Details of BCSA membership and services can be obtained from **Gillian Mitchell MBE**, Deputy Directory General, BCSA, 4 Whitehall Court, London SW1A 2ES  
Tel: 020 7839 8566 Email: [gillian.mitchell@steelconstruction.org](mailto:gillian.mitchell@steelconstruction.org)

## KEY

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- E** Large span portals
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### Notes

- 1** Applicants may be registered in one or more categories to undertake the fabrication and the responsibility for any design and erection of the above.
  - 2** Where an asterisk (\*) appears against any company's classification number, this indicates that the assets required for this classification are those of the parent company.
- \* For details of bridgework subcategories contact Gillian Mitchell at the BCSA.

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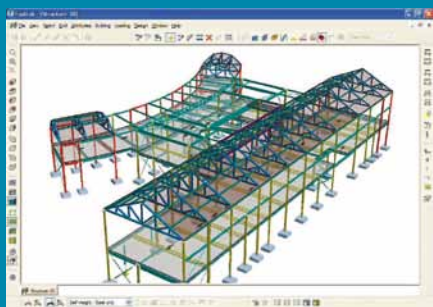
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