Urban hospital build in good health

Whether described as a hospital without beds or a health village, a new community NHS facility in Aberdeen, Scotland, seeks to radically improve the patient experience.

**PROJECT REPORT RUBY KITCHING**

When staff, patients and visitors enter the newly built Aberdeen Community Health & Care Village from December this year, they will experience a refreshing change from the drab prison-like layout typically associated with that of ageing general hospitals. This hospital-without-beds is curvy, not boxy; airy, not claustraphobic; and attuned to human sensitivities, not just function.

The £29m development will be a community diagnostic and treatment centre providing minor surgery, radiology and physiotherapy among other services. The structure is now complete and the building is currently being fitted out by main contractor Miller Construction.

"We worked closely with the NHS to develop the spaces in terms of their function but also had to focus on the ‘feel’ of the hospital-without-beds," says project manager Jim Hanna. "It’s a village and has open courtyards and bridges. When you walk in, it won’t feel like you’re walking into a hospital," he says.

To best serve the community, the development is located in the centre of Aberdeen, rather than on a more spacious site in the suburbs. This means that the centre can be more easily accessed using public transport. Client hub North Scotland’s aim is to shift the balance of healthcare away from an acute hospital setting to more community-based facilities.

The Aberdeen Health Village will replace other health centres and local hospitals which currently occupy buildings soon to be dissolved. A consequence of choosing an urban location for the Health Village is that the site is in a more built-up area, causing logistic challenges for Miller Construction.

**Island site**
The three-storey, 9,600 sq m facility is on a tight island site, enclosed by Frederick Street to the north, the A986 to the south, King Street to the west and Park Street to the east.

With little room for site storage, a steel framed solution with just in-time delivery of members was deemed the easiest way to meet programme requirements to build the facility with minimal disruption to neighbours.

The tight radius of nearby roads limited steel members to 12 m lengths. Steelwork contractor BHC also utilised steel framed lift cores, precast stairs and metal decking for floors.

Four internal courtyards act as large lightwells, allowing natural daylight to penetrate the middle of the building. Transparency within the centre is achieved with an abundant use of glazed partitions and fully glazed footbridges that span the open courtyards.

The Health Village has been designed to create a feeling of wellbeing using light, space and colour, incorporating the atmosphere and scale of a village with all services reached from a central ‘village square’.

**HOSPITAL WITHOUT BEDS**

Different services are arranged around open courtyards and a large main entrance with an atrium.

The building consists of consultation and treatment rooms at ground and floor plant and meeting rooms and offices on the second floor.

The building’s steel frame gains its stability from braced lift cores and K-bracing located in partition walls and above perimeter windows. Miller Construction has been on site since spring 2012 when it cleared the site, installed piles and then excavated down 4 m for a new basement car park that occupies half the site.

Due to the many different activities taking place in the centre, room sizes vary across the site. Columnless follow a 7.5 m by 10 m grid in the basement car park, changing to 7 m by 6 m above ground.

A number of steel transfer beams accommodate the change in grid. Some members are pre-curved on the building’s elevation.

"There were not many standard connections on this job," says BHC project manager Bobby McCormick. "There are very few right angles and lots of curves and skews and lots of different section sizes, although we were limited in beam depths over the car park."

**SITE CHALLENGES**
The basement comprises a reinforced concrete base slab, retaining wall on one side and a contiguous piled wall on the other three sides. Piling on the site had its own challenges due to the discovery of granite substrates of tenement buildings which previously occupied the site.

"Since the granite was too difficult to drill through or remove, some piles had to be repositioned," Mr Hanna says.

The contractor also had to build temporary propping as the spans increased.

"We had to understand what was going on in every part of the development," Mr Hanna says. "Fortunately, steel lends itself to different layouts and BHC’s computer model helped us all understand the different geometries involved."

Mr Hanna adds that since there is a demanding schedule of servicing for this building, the three-dimensional model also helped to understand mechanical and electrical requirements.

"The steel frame has been designed to accommodate future changes and partitions can be easily dismantled so that two small rooms can easily be converted to one larger room. Construction had to proceed in phases due to site constraints leaving room for only one mobile crane on site for most of the construction period."

"We’re building the steel up on one part of the site while working on the new foundations on the other side," recalls Mr Hanna. At peak, just two mobile cranes could be accommodated on the site, assisted by MOWPs.

"Fortunately, steel lends itself to different layouts."

Mr Hanna, Miller Construction

**PROCUREMENT**

NHS Grampian, working with Hub North Scotland and building the Health Village using the new Scottish Futures Trust hubCo design build finance and maintain 25-year service concession contract. HubCo is procurement vehicle comprising of groups of public authorities that partner with the private sector to deliver infrastructure.

The trust seeks to increase the efficiency and effectiveness of infrastructure investment in Scotland. The Health Village is the first project in Scotland which has used this procurement method. NHS Grampian is contracted with Hub North Scotland, Aberdeen Community Health Care Village to create the Health Village.

£29m Cost of the development

"The building satisfies the programme requirements to build the Health Village around a nineteenth century granary building situated in the north east corner of the site. The building is currently being used as a project office and is future use is yet to be decided."

During construction of the new centre, mobile cranes were prohibited from travelling over the former granary building’s foundations to prevent the nineteenth century substructure being overrelicated.

"The construction programme was based on a computer model helped us all understand the difficulties involved."

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"The steel frame has been designed to accommodate future changes and partitions can be easily dismantled so that two small rooms can easily be converted to one larger room."
The Derby Multi-sports Arena was one of the first Olympics legacy projects to get under way following last year’s Games. Earthworks began in October 2012 on the former car park site, with the erection of the arena’s steel frame commencing in June this year.

Funded by Derby City Council and Sport England, which has invested £3m through its Iconic Facilities Olympic and Paralympic legacy fund, the 14,500 sq m arena is being built next to Derby County Football Club’s Pride Park Stadium. The arena is part of Derby Council’s £60m investment in leisure facilities for the city.

The three-storey Multi-sports Arena will contain a main sports hall the size of 12 badminton courts at ground floor; a 250 m national standard indoor cycling track on the first floor and fitness studios and offices on the second floor. Plant and meeting rooms occupy the third floor.

Main attraction
The arena has attracted attention for its cycling facilities and is already taking bookings for when it opens in 2014. It will be the sixth indoor cycling track in the UK – others are located in Manchester, Glasgow, Newport (south Wales), Southampton and London. The Derby site will also include a 1.5 km outdoor closed cycle circuit.

Designed by architect FaulknerBrowns, the arena building is diamond-shaped with chamfered corners. Its main entrance is on the western corner and the oval cycling track sits east-west across opposite diagonals of the building at the first floor.

The centre of the track is open to the main sports hall below. This layout allows the arena the flexibility to be used as a 5,000-seater concert venue as well as for sports.

Steel erection is currently focused on the roof level before the next phase gets under way. Steel erection has proceeded from the north side of the site to the south. The building has been split into four sections across the site to allow phased handover. Each quarter is completed up to roof level before the next phase.

The track will be installed on the roof in a manner that minimises materials consumption and waste generation are also being used. The building’s load from the superstructure is taken by the load from the superstructure and then come back to fit the mullions for the windows – slithers of glazing – with the cladding. “Apart from sorting out their exact geometry, we’re out their exact geometry, we’re considering the windows with the cladding. Crucially, the edge protection’s location in relation to the permanent cladding, shuttering or edge detail, has been carefully considered so that it can remain in place until the permanent edge protection can be used.

ENVIRONMENTAL IMPACT
The arena will use a combined heat and power plant to generate electricity on site and provide heating and hot water for changing rooms and toilets. The target is for a BREEAM rating of Very Good.

Low environmental impact, durable cladding systems to minimise materials consumption and waste generation are also being used. Tomkinson materials consumption and road transport to and from site as far as possible, site materials are being reused, two extra cranes are required. The cranes are erected in up to four sections, depending on their length. There is usually enough room for cranes to move into the most appropriate position for all lifts, apart from when neighbouring Derby County is playing a home match, when site activity is confined to a much tighter footprint and the site car park is given over to the football club.

Topping is everything
With so much of the building being manufactured offsite – the steelwork, precast floor, roofing, windows and doors – the quality of finish will be high, but to keep on programme the contractor has had to keep a strong focus on site progress and timing deliveries correctly.

“Our main challenge on this project is to co-ordinate deliveries so that once the steelwork is up, we’re not waiting for the precast units to arrive,” says Bowmer and Kirkland project manager Scott Millington. By September, the steelwork will be complete and the roof cladding will go on. A specialist contractor is installing the cycling track to ensure it is built to the correct specifications and performance standards for competitions. “The track will be installed next February, when the building will be enclosed and the internal temperature is within the correct range,” adds Mr Millington.

As with any design-and-build contract, Bowmer and Kirkland is looking closely at the design to see how details and processes can work more efficiently.

The contractor is currently working on the building’s ‘eyeball’ windows – slithers of glazing – which punch through the cladding. “Apart from sorting out their exact geometry, we’re also looking at ways in which we can install the mullions for the windows with the cladding and then come back to fit the final glazing panels,” Mr Millington explains.

Bowmer and Kirkland will hand over the building to client Derby City Council in October 2014. The arena is due to open the following month.
Walk through the fire protection process

A new guide from Tata Steel and the British Constructural Steelwork Association offers advice for fire-protecting most steel-framed buildings.

**Fire Safety Rubby Kitching**

Fire safety engineering involves a specialist designer modelling to understand how a unique building will react in a fire and designing fire protection measures to allow occupants to escape safely. Such a building could be unique due to its height, shape, occupancy or location. However, for the majority of buildings, approved documents and British Standards give some pretty straightforward rules for how steel frames should be fire-protected—so for most cases, fire-engineering is not necessary. Until recently there has been a number of documents, the subject of fire protection that could be referenced.

![Image](image1.png)

**Fire safety engineering involves a specialist designer modelling to understand how a unique building will react in a fire and designing fire protection measures to allow occupants to escape safely.**

**Tata Steel** and the British Constructural Steelwork Association have produced a single, comprehensive guide for fire protecting steelwork. Steel Construction: Fire Protection is a guide aimed at construction professionals rather than fire engineering specialists.

It “walks them through the process,” says BCSA manager of fire and sustainability John Dowling, adding: “The guide will appeal to the majority of people working on the majority of building types.”

The guide outlines the three-stage process for determining fire protection:

- Determine the fire period through Approved Documents, EN999 or specific sector requirements.
- Determine the ‘section factor’ for the structural steelwork.
- Determine the required ‘fire protection’.

Fire periods define the length of time during the event of a fire when the load-bearing capacity of a building must function to allow all occupants to escape. The section factor is governed by the shape of a steel member’s cross section and exposure to the effects of a fire on each of its sides.

The section factor describes the time taken for that member to reach its failure or limiting temperature. For example, a heavy, massive section will heat up more slowly than a light, slender section.

The required fire protection, for systems such as intumescent coatings or board, can be determined from published tables.

The guide outlines how to fire protect steel members and points to which documents to look in order to gain more detailed instructions.

**Historically, steel is a material which has undergone more tests to determine its behaviour in a fire than most others, so the new guide also references these results via web links to the actual documents online or via www.steelconstruction.info.**

**Steel Construction: Fire Protection**

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**The guide will appeal to the majority of people working on the majority of building types**

John Dowling, BCSA

Intumescent coatings are usually applied to beams,” Mr Dowling explains. Intumescent coating is the most popular technique for fire protection (see box). “Applying fire protection is a mainstream activity,” he says. “Because of steel’s high market share, most contractors are experienced in its installation, so it is very economical.”

The guide outlines how specific building types have requirements for additional fire protection measures, such as sprinkler systems. Sprinklers are an expensive form of fire protection, and are generally used only when they are stated as mandatory in Approved Documents, such as within school buildings.

“Boards are generally used on composite steel decks, where the beam is cast into the depth of the floor slab and, as such, are often no longer seen on buildings in the UK.”

Another system in the market involves “partial protection” where the beam is cast into the depth of the floor slab and, as such, are often no longer seen on buildings in the UK.

The unique properties of composite metal deck floors are also detailed in the guide and point to the fact that for this form of construction, fire protection only the columns and primary members is adequate (see box). Mr Dowling says: “It is an up-to-date document that describes how to provide fire protection to steelwork.”

More information on fire protection is available on Tata Steel and the BCSA’s website www.steelconstruction.com.

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**UK FIRE PROTECTION MARKET SHARE OVER THE LAST 20 YEARS**

<table>
<thead>
<tr>
<th>Year</th>
<th>Board</th>
<th>Spray</th>
<th>Intumescent</th>
<th>Other</th>
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</thead>
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<td>5%</td>
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<tr>
<td>2017</td>
<td>40%</td>
<td>40%</td>
<td>20%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Full guide available via weblinks.**

The BCSA and Tata Steel have produced a freely downloadable guide aimed at construction engineers explaining the fire protection process. The BCSA’s Fire and Sustainability Manager, John Dowling explains how the guide walk the reader through the fire protection process.

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**NO EXTRA COST**

Steel has dominated the multi-story, non-domestic building market since the late 1980s and enjoys a market share of nearly 70 per cent.

The cost of fire protection is included in the overall price that has afforded steel its position, it is not an additional extra. Advances in the science of fire protection system over the years have further reduced the costs involved, making steel construction increasingly economic.

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**Steel Construction** Fire Protection will shortly be available to download freely from www.steelconstruction.com. More information on fire protection is available on Tata Steel and the BCSA’s website www.steelconstruction.com.
Steel Spotlight

Steel brings new life to Longbridge

Longbridge in the West Midlands is undergoing radical transformation as a new town centre emerges from the former MG Rover car factory site.

PROJECT REPORT

Ruby Kitching

At the heart of the tidy regeneration of the former car factory site in Longbridge, West Midlands, is a new park with the River Rea running through it. When Austin Park – named after the Austin Motor Company which first occupied the site in 1905 (see box) – opens to the public this summer, it will mark a rebirth of the area.

For more than 100 years, this river has been buried and, along with the surrounding ground, suffocated extensively from pollution from the car factory which extended across the site. After an extensive clean-up operation where soil was removed and bio-remediation offline and 20,000 plants, 500 trees along with grass and paths added, this much-needed green space for the area will demonstrate that Longbridge can move on from its industrial past.

Surrounding Austin Park will be the buildings which make up Longbridge’s new £70m town centre: a college, hotel, residential blocks, a supermarket, restaurants, offices and shops.

The common theme of all these buildings, except for the college, is that they have all used steel-framed construction.

In fact, developer St Modwen has specified in its contract documents that steel construction is a “requirement”.

Material of choice

“I’ve been here for 14 years and usually all the buildings are steel,” says St Modwen construction manager Mark Batchelor.

“We like it because of its speed of construction. You can still put it up in bad weather, it doesn’t require much back-bopping and you can span large distances and build in future flexibility.”

Even the recently-opened footbridge that crosses the River Rea in Austin Park is of steel construction (see box).

Phase one of the town centre development began with Bourneville College, which was completed in 2011. But the main bulk of town centre construction has taken place since February this year and includes a 1,900 sq m Sainsbury’s supermarket with offices and retail units (see box) which is due to open this month.

A four-storey “island block” of retail units, office blocks and a 19-bed hotel is also under construction. Here, restaurants and shops occupy the ground floor, and either the hotel or offices occupy the upper levels.

Most of these units will be open by the end of this year.

St Modwen is submitting planning applications for phase two of the development, which will include an 11,150 sq m major retail unit, and 1,200-space multi-storey steel-framed car park as well as other retail units.

Phases three and four of Longbridge’s regeneration will include more residential units and leisure facilities.

“Sustainability is high on our agenda and we aim to recycle as much as we can,” says Mr Batchelor. “We like using steel because we know it can be reused in its later life.”

He says that since contracts are signed with retailers before most units are built, all parties are keen to get construction under way as quickly as possible so that the businesses can gain returns on their investment as quickly as possible.

This is where steel holds court as St Modwen’s construction material of choice. Steel-framed buildings are known to be quick to erect, he says, adding: “Offsite fabrication also means that the steel frame which is designed for long spans means we can take out or put in partitions and we can accommodate these requests.”

Mark Batchelor, St Modwen

Sustainability is high on our agenda. We like using steel because we know it can be reused in its later life.

St Modwen expects to be building on the site for the next five years to complete the regeneration of Longbridge.

It has a government-approved masterplan, known as the Longbridge Area Action Plan, which was developed in conjunction with Birmingham City Council and Bromsgrove District Council as well as many local landowners and transport bodies.

Mr Batchelor says that the timescale for development very much depends on the time taken to process planning applications, as well as the demand for new units. Regeneration of Longbridge is expected to create up to 10,000 jobs and 2,000 homes.

FOCAL POINT

In June this year, the 35m-long footbridge across the River Rea in Austin Park, Longbridge was opened officially. It is the main pedestrian link between the newly created town centre, Bourneville College and future development phases.

With its single support, the steel structure aims to be a focal point for the park. St Modwen centre development surveyor Mike Murray says: “The bridge’s minimalistic design is in keeping with our aims to create a high-quality green space, featuring town centre, domestic views and public art reflecting the site’s automotive history.”

Steelwork contractor

Holder Mathias

Main contractor

Morgan Sindal

Structural engineer

Leonard Landscape

Steelwork contractor

James Killian

£70m Value of the Longbridge project

The 20,000 plants, 550 trees along with grass and paths added, the surrounding ground, river has been buried and, along with the grass and paths added, this much-needed green space for uch-needed green space, featuring much back-propping and quality green space, featuring much back-propping and quality green space, featuring much back-propping and quality green space, featuring
Power plant walks with dinosaurs

A new energy-from-waste facility in Oxfordshire follows the path of the three-toed Megalosaurus, which roamed the site 168 million years ago.

PROJECT REPORT
RUBY KITCHING

To divert municipal waste from landfills in Oxfordshire, recycling and waste management company Viridor is building a new energy-from-waste facility on a plot of land adjacent to its existing landfill at Ardley.

Construction of Ardley EfW began on the former limestone quarry site in 2011 after it had been meticulously cleared of Megalosaurus dinosaur footprints (see box). These three-toed carnivorous beasts inspired the shape of the sculptural, steel-framed building, which will process 300,000 tonnes of non-hazardous post-recycling residual waste from 2014.

Working on behalf of Clugston, Bourne Steel is erecting steelwork up to 31.8 m above ground level. Bourne’s contract also includes design, installation and commissioning of building services as well as design and construction of a new access road, highways and reservoir.

To understand how the building works requires some understanding of the energy-from-waste process. Refuse lorries enter the building and tip waste down shoots in the ‘tipping hall’ and into a 7,200 cu m waste bunker. Overhead cranes with mechanical grabs then move the waste in batches from the bunker into a burning area, above which flare gases are filtered before they are released into the air.

Steam-driven

The burning waste heats water in pipes in the boiler hall and create steam that drives turbines in the turbine hall to create electricity, which is fed into the National grid. Three to four large turbines in the boiler hall to create electricity, which is fed into the National grid. Three to four large turbines in the boiler hall.

The roof over the boiler area will be designed as a roof over the boilers and the structure will be supported by a separate structure.

Work on site is currently proceeding on at least four fronts using two mobile cranes and a host of MEWPs. The whole MEWP ACCESS TEST

Working around the huge pieces of plant that make up the facility has been one of Clugston and Bourne’s biggest challenges.

“Bourne Steel’s Mr Springett. ‘Where a simple fillet weld uses one or two runs of welding and simple bolts, here we have up to 30 of welds and tension-control bolts,’ Mr Springett says.

The specified fabrication tolerances and geometrical accuracy on this project are higher than the industry standard (National Structural Steelwork Specification 4th edition) to prevent the movement of the crane during any load.

This is also standard practice for Bourne and means that, at any time in the future, the building can be easily dismantled. On visiting the site, it is easy to appreciate how essential these systems of work are as the wind tends frequently build up due to the low-lying surrounding area.

‘It can often be too windy to erect light sections of steelwork high up. When this happens; we revert to erecting heavier sections below the lower wind, we’re often planning by the hour on site,’ explains Bourne site manager David Loan.

The roof over the boiler area will be built using long-reach cranes lifting complete prefabricated cassettes of cladding and structure, including 2.5 m deep trusses. Operators in MEWPs on high level temporary platforms will fix the cassettes in jigsaw-fashion to complete the structure. The 420 m facility will be complete in 2014 and will divert at least 98 per cent of Oxfordshire’s residual municipal waste from landfill, while generating enough electricity for about 18,000 homes.

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