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The heart of the matter

A constricted site overlooking live hospital wards has given the University of Leicester a new Cardiovascular Research Centre, Mark Smulian reports

When the University of Leicester was offered free land to build a cardiovascular research unit, there was problem. The site was part of Glenfield hospital; it was small and immediately adjacent to wards.

Leicester's medical school has long had an association with Glenfield, in particular for cardiovascular work, although the hospital is some miles from the university's main campus and medical school.

University researchers were keen to proceed, but what could be built in such a constricted space?

To make matters worse, it could not be designed with researchers' windows looking straight at patients in wards, and an emergency entrance for fire vehicles had to be kept open at one side of the site.

The answer was a building of 2,300sq m on four storeys, with a 500sq m plant room on top. Given the nature of cardiovascular research, architect ADP and main building contractor Morgan Sindall had to create a building for academics and research students in which several distinct types of work could be carried out in different conditions.

On the ground floor is a 'biobank'. The centrepiece is a machine that looks a little like a giant bank safe in which blood samples from hospital patients are stored, with their consent. Samples can be kept from up to 100,000 individuals, all anonymised. Above that is a floor of conventional laboratories used for various experiments and analysis.

The second floor comprises staff offices and meeting rooms, and then the really clever stuff is on the third floor, where computers take the blood samples and analyse them right down to their DNA.

Only specialists understand what happens on the third floor in detail, and indeed the whole field of cardiovascular research



'It is an international facility and if people are coming from all over the world we wanted it to look like they have arrived somewhere special.'

Ian James,
project manager, ADP

The frontage appropriately boasts a sculpture of a heart (opposite); The saw tooth window arrangement admits light while preventing hospital wards being overlooked by researchers (left)

is sufficiently esoteric to be beyond the experience of most architects and projects managers.

Guided by the requirements of the academics who would use the building, ADP set out to give them what they needed on this highly constricted site.

The building is a concrete frame with brick elements and some curtain walling and solar shading.

ADP's project manager Ian James explains: "We spent a lot of time working with the professors on what they wanted to have there and in getting right the relationship between different laboratories, offices and research areas, so it took a lot of coordination.

"The building slots into quite a confined space as there is a route into the hospital alongside which had to be kept free and operational throughout the construction phase, so we had to squeeze around that."

This was done by building the research centre so that it

almost joins the existing hospital – indeed there are mere centimetres between the two buildings' walls at some points. Two fixed links are provided so that staff can pass from the new research centre to part of the hospital already in use by the university for cardiac and respiratory work.

James says: "There was an issue with views into live wards, so it is designed with windows at an angle so that the researchers get light but cannot see into where the patients are.

"Construction noise issues were quite challenging on a live hospital site, and it was quite tricky. There was nothing unusual in the ground conditions though."

One striking thing about the centre is that it looks nothing like any of the adjacent buildings. Not even Glenfield hospital's warmest admirers would find much to comment on in the non-descript brick structures that make up the bulk of its premises.

The cardiovascular research centre though was designed to stand out. University project manager Pete Bale says:

Continued overleaf...



“The building was designed to make a statement and deliberately not to blend in. The hospital is red brick but we are blue and white.

“It is an international facility and if people are coming from all over the world we wanted it to look like they have arrived somewhere special. Because of that we got the planners to agree to a four-storey building on an otherwise two-storey site.”

A key issue in any new building nowadays is its energy performance. While the techniques needed to make a building energy efficient are well known, the nature of cardiovascular research again presented a problem – laboratories need air conditioning and refrigeration or the materials in them will be damaged. There is no way round this.

The building’s form and orientation were chosen to benefit from natural daylight balanced with achieving useful solar gain without overheating.

James says: “The insitu concrete frame was chosen for its thermal mass properties. It also assists with the air tightness of the building as the fabric junctions to the super structure are

simplified in comparison with a steel frame.”

The building takes advantage of night cooling to purge excess heat and cool the building fabric.

“A building with sufficient thermal mass, which can be exposed to night time ventilation, can reduce peak daytime temperatures,” he says.

“Night cooling offered the potential to minimise the use of mechanical cooling and improve the internal conditions to the naturally ventilated office spaces.”

There are significant elements of exposed mass to help regulate the internal temperature and minimise the need for refrigerated cooling. Exposed concrete was employed to absorb heat generated by occupants, equipment, lighting and through solar gain during the day.

The building has gained BREEAM Excellent status, but Bale feels the BREEAM programme’s criteria are ill-suited to the design of buildings to be used for science.

“You cannot really do BREEAM for laboratories,” he says. “The building has an Excellent rating but you cannot really get

‘The building has an Excellent rating but you cannot really get to Outstanding for a science building because of the conditions needed. Laboratories have to have air conditioning.’

Ian James,
project manager, ADP

Continued on page 25...



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The complete centre stands out clearly from the surrounding hospital buildings



The research centre takes shape close by existing hospital buildings (opposite); researchers work in the new laboratories (left); staff gather to discuss work in the 'Café Cardiologique' lounge (bottom)

'Many people know someone who has had heart disease and when we appealed to the public and former students for donations they came in from a fiver up to hundreds of thousands of pounds.'

Pete Bale, University project manager

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In the plant room, an arsenal of equipment works to give each floor of the building the heat or cold that it needs. There is both gas heating and a gas combined heat and power facility, together with chillers. These all work together to deliver the temperatures needed in different part of the building, with air treated appropriately as it reaches each floor.

The CHP machine uses 204kW of gas input to generate some 105kW of waste heat to drive the absorption chiller, and some 70kWe of electricity. Louvre windows on the staircases let in fresh air and can be closed by sliding panels in cold weather.

The staircase is mainly intended for emergency use but, as Bale says: "Obviously in a cardiovascular building you encourage people to take exercise!"

Only limited air comes in from the office and laboratory windows. Where these face into hospital wards they are design to let in light but are opaque, with only the narrow west facing windows next to each of them made from conventional glass.

"The saw tooth design means windows to wards let in light but cannot be seen through, as the adjacent live wards meant we had privacy and dignity issues with patients there to juggle," Bale says.

"The whole work programme had to be designed so as not to disrupt the hospital. I was worried about the piling in particular, since pile drivers are hardly the quietest things, but it proved not to be a problem."

The building is fully accessible to people with disabilities with a Disability Discrimination Act compliant lift to all floors and disabled toilets located on each floor.

Cardiovascular researchers are pleased with their new facility. Departmental head Professor Nilesh Samani says: "The

new Cardiovascular Research Centre provides us with an outstanding facility to undertake research into heart disease.

"From a working perspective, the building has been constructed to allow maximum interaction between staff to provide a highly productive and creative environment."

One unusual aspect of the building was the financing. When visiting it is noticeable that even the smallest meeting rooms are named after a different benefactor.

Bale says: "The NHS gave us the land but did not put in money. The university and donations paid the £12.6 million cost, of which about £6 million was the construction cost and within that about 25 per cent went on plant.

"Many people know someone who has had heart disease and when we appealed to the public and former students for donations they came in from a fiver up to hundreds of thousands of pounds."

Scientists using the biobank, computers and laboratories may even now be devising some cures.



Client:
University of Leicester

Architect: ADP

Main contractor:
Morgan Sindall

Mechanical and electrical contractor:
CPW

Structural engineer:
CCE

Quantity surveyor:
MDA

Client project manager: DBK

Planning and building control authority:
Leicester City Council