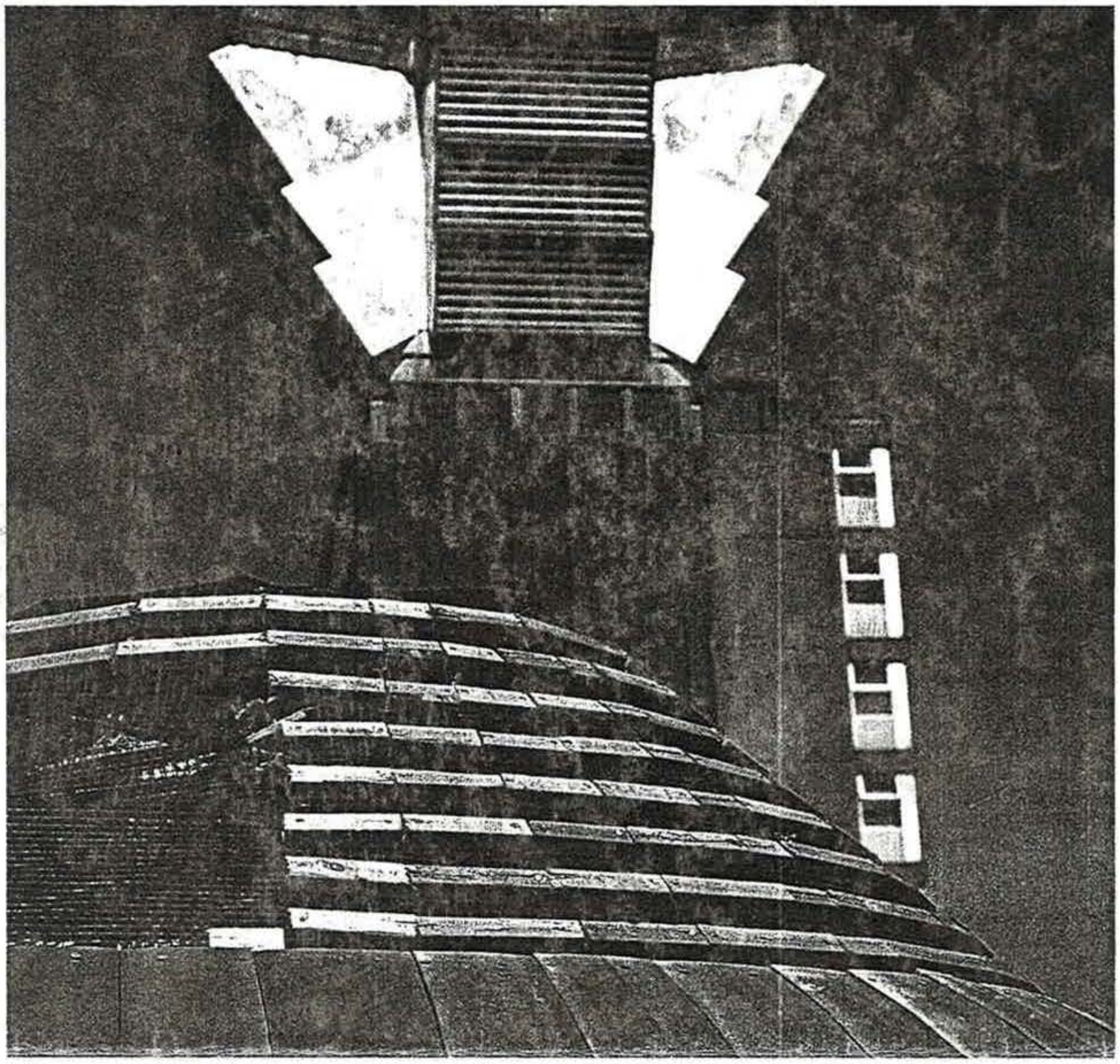

What better way for a university to research environment friendly building methods than to build a full scale model on campus? Helena Russell *reports, photographs by* Grant Smith.

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TEST CASE

When the new engineering building at Leicester's De Montfort University opens later this year it will not only increase the teaching space by 10,000m² but will provide a living experiment on the university's doorstep.

Billed as De Montfort's flagship and a sign of its rosy future, the new building will be studied for the next few years and fine tuned until it is behaving as it was designed to. This approach may seem a little unusual, but the building itself is far from the norm for a university.

"We wanted a building that was traditional, in terms of being labour intensive, innovative, environmentally sensitive and which responded to its users," says De Montfort's executive pro vice chancellor Prof David Chiddick.

The whole process of the project's conception, design and construction has been something of an experiment, which the university's executive board has watched with interest. It is the biggest element so far of the rebuilding programme, which the university's stock badly needs.

Largely brick built, the engineering building has been designed by architect Short Ford & Associates (formerly Peake Short & Partners) to be naturally lit and ventilated throughout. This prerequisite has had a large influence on the building's unconventional appearance.

Eleven tall "chimneys" rise from the roof of the main section and are central to ventilation. Although they seem to be unnecessarily high, the turbulence caused by the roof ridges extends to a height of 3m and the stacks need to be above this to ensure that they are in stable condition.

Each stack connects to a shaft which runs the full height of the building and serves rooms on every floor. Ventilation requirements vary enormously between lecture theatres, computer labs and small classrooms. The block contains two main lecture theatres, which each seat 150 students, and an efficient ventilation system will be essential if only to keep them awake.

Large grilles in the external wall allow fresh air to enter the room, and the acoustic splitters which cover them keep traffic noise down. In the winter the acoustic splitters can be heated to warm the air as it passes through. Underfloor ventilation provides fresh air at the theatre seating; the warmer air rises and is drained out into the chimney stack at the back of the room.

The walls of the central courtyard are dotted with panels on each floor, which can be opened

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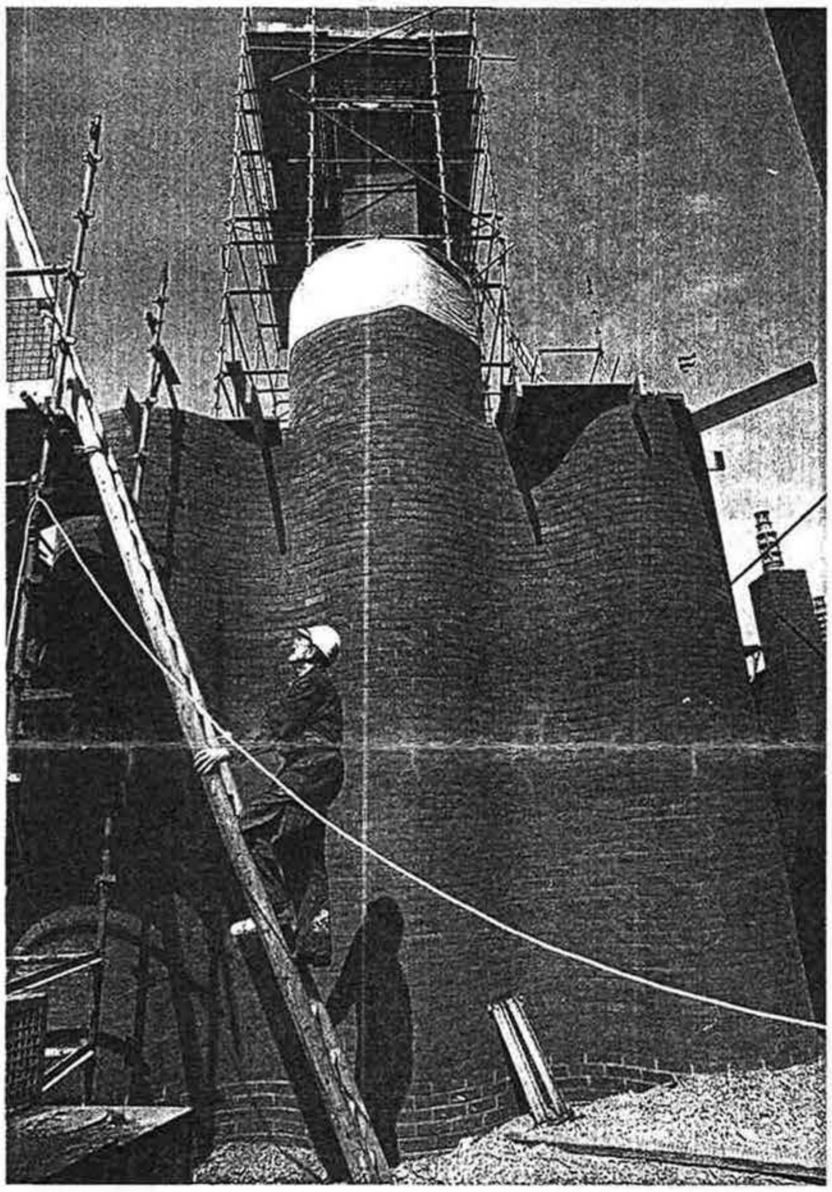
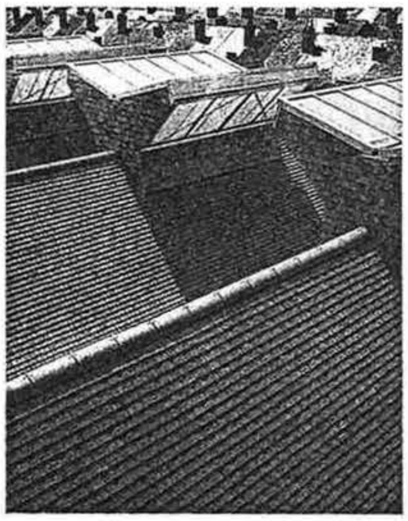
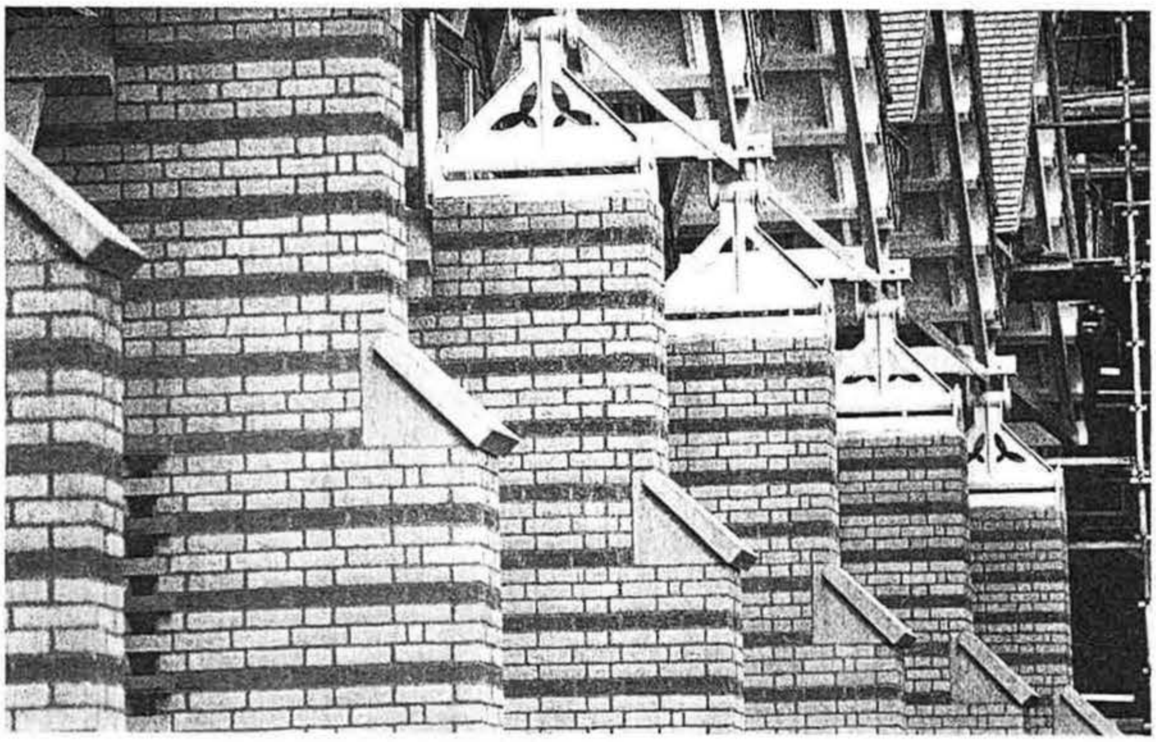
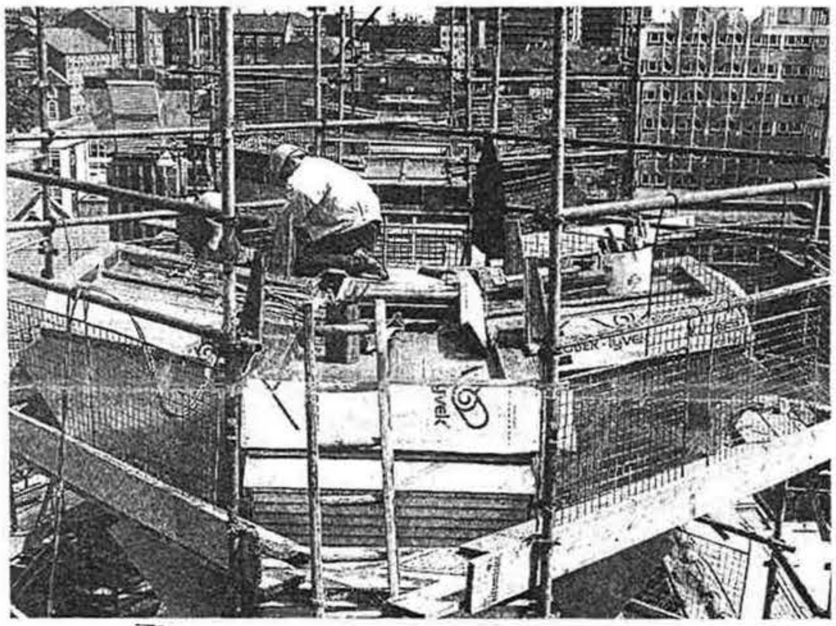




OPPPOSITE PAGE: eleven chimneys are central to the natural ventilation of the building.
FAR LEFT: the diesel testing laboratory has a crinkle crankle wall which provides acoustic shielding.
LEFT: labour intensive forms of construction are common throughout the building.
BELOW LEFT: natural lighting depends on numerous small windows at strategic positions.
BOTTOM: skylights provide additional ventilation on warm days.





ABOVE: Laing Midland expects to hand the building over in time for use in the next academic year.
RIGHT: the building is considered a bargain, partly because builders' rates for traditional trades were reasonable.

PROJECT TEAM
Client: De Montfort University
Architect: Short Ford & Associates (formerly Peake Short & Partners)
Contractor: Laing Midland
Quantity Surveyor: Dearle & Henderson
Structural Engineer: YRM Anthony Hunt Associates
Mechanical & electrical consultant: Max Fordham Associates
Landscape consultant: Livingstone Eyre Associates

to increase ventilation in the rooms overlooking it. Once the building is in use, computer terminals will be placed next to these panels so each user can control the ventilation.

Acoustic protection has been incorporated into a couple of the laboratories, but in these cases it will keep noise in rather than out. The large machine laboratory on the end of the department block has areas of perforated brick in its external walls, which allow fresh air in but prevent the noise of metal cutting and drilling from getting out.

The university's diesel testing lab, housed in a separate building, lies only feet from the pavement and designing acoustic shielding for it proved challenging. Short Ford & Associates partner Alan Short says: "Machines in the laboratory can generate up to 106dB and the maximum allowable noise at the pavement was 35dB. The best way of solving the problem was to build a separate wall around the building, which was not connected to it in any way."

A traditional method turned out to provide the best solution. A "crinkle crankle" wall gave strength to the brickwork so it needed no ties to the lab.

Only two rooms in the building make use of a mechanical ventilation system. The small labs are used for precision work and need to be completely dust free. Short points out the amount of space taken up by the plant for this relatively small area; significant additional space would be needed if the whole building was mechanically ventilated.

Providing natural lighting has proved much more difficult, because of the size and depth of the building. Some task lighting will be necessary in laboratories where precision work is done, but extensive experiments have led to sufficient light being available in most of the rooms.

From the outside it looks as if natural light will be in short supply, because the windows seem too small. But there are many in strategic positions, and with the rooflights and internal windows a surprising amount penetrates to the centre of the building.

The sizes and positioning of the windows are the result of extensive testing and redesigns. A large scale model was built and tested in an "artificial sky" to see how the lighting arrangements would perform at different times of day and year.

One of the biggest challenges was lighting the courtyard — it is narrow and surrounded by high buildings. "Almost nobody had any faith in our scheme, they all thought it would be too dark, and it got to the point where even we began to have doubts," says Short.

White matt cladding on the internal walls contributes to the brightness in the courtyard, and ensures that computer users are not blinded by glare. Excessive light can be just as much of a problem, so "fins" have been included at certain points on the internal walls to provide shading for the rooms inside.

Two drawing studios nestle below the gables of the roof where light is plentiful. Rooflights act as ventilation, with vents which drop vertically to allow the warm air to get out. There are no partitions between the studios, and the open plan nature of the building means they overlook the central foyer. Services in the building are all visible, allowing easier access for maintenance and deliberately highlighting the structure's purpose.

At a total cost of £8.4M — around £870/m² — De Montfort's engineering block is something of a bargain. Short puts it down to the traditional building methods used, and the lack of finishes. "Builders' rates for things like bricklaying are still pretty cheap, and there are very few areas where finishes or plastering are used."

Wooden shingles contrast with the brick as cladding to the fire escapes and on the gables of the mechanical lab. Short is enthusiastic about them: "Up until a few years ago they could only be used on houses, but now they can also be used on public buildings as long as they are impregnated to make them fire resistant." Like the brick, they are labour intensive, each one being nailed on individually.

Contractor Laing Midland is building the project and intends to hand it over to open for next year's intake. But even when the building is in use, the experiment will still be going on. It will be studied for a minimum of three years so it can be fine tuned, for example by adjustments to the computers that control the vents for the air conditioning.

The building can also be used for examining the effect of variations on the operation of the structure, such as what happens when a particular window is blocked. The importance of the new block as an experiment has been recognised by the Department of the Environment in the form of a £12,500 design award. The money was used to commission specialist consultants and researchers to assist the architects in the design of the building. **nb**