



# THE QUIET REVOLUTIONARY

**M&E** Don't be fooled by the lack of windmills and solar panels - this Innovate Properties building in Leeds is the greenest office in the UK, even with its mechanical ventilation. **Eleanor Cochrane** finds out how it was done

Robert Greshoff

Who owns the UK's most sustainable office building, and what does it look like? If this question brings to mind images of natural ventilation, wind turbines and solar panels, then the answer might come as a bit of a surprise.

The building that has just been awarded the highest ever BREEAM score - 87.55% - is a developer-owned speculative office in Leeds. You would probably never guess that just by looking at it, particularly as it includes such traditional office features as mechanical ventilation.

"We were just so far beyond Part L on insulation and energy conservation that submitting it for building control approval was a formality," says Doug King, principal at King Shaw Associates, the environmental and building services engineer on the project. "Our calculations showed that the building emits 80% less carbon than a typical



surveyor were then brought on board and the project team came up with a design. The team's approach was fundamental to the project's environmental success. Rather than designing a conventional office building and tweaking it – or adding what King terms “green bling” – the team ensured that each element was designed with its overall effect on the building's sustainability credentials in mind, as well as the developer's need for flexible, commercially viable office space.

“The trick with this building was deciding where it went on the site, what shape it was, what colour it was and how big the windows should be,” says King. The careful positioning of the building and its windows mean that electric lighting will only be required for 20% of the working year; despite that, the building's north-south orientation and the elimination of windows on those facades will keep thermal loss and solar gain to a minimum.

The real key to the building's eco credibility, though, can be found in its services. The developer did not want to rely solely on natural ventilation, as it thought that the

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model building.” In fact, the building produces just 22kg of carbon dioxide per m<sup>2</sup> per year.

The project started life in autumn 2002 when Rio Architects persuaded client Innovate Properties to aim for a BREEAM “excellent” rating for its next office. King Shaw was then called in.

“I said: ‘The most significant thing we can do for you is not just achieve a high BREEAM score. We can save you a lot of money,’” says King. “Compared with Innovate's existing offices, we estimated that we could produce energy savings of about 80-90p a square foot a year, which represented 5-6% of the rental value of the building.” Such savings were enough to convince the client to go ahead, and when regional development agency Yorkshire Forward decided to back the project, its future was secured.

A structural engineer and a quantity

market risk would be too great. That meant that the challenge was to design the building so that the mechanical ventilation could be kept to an absolute minimum.

“We thought the best approach would be to make the building as passive as possible through lots of thermal mass and external insulation,” says King. “Then we could just top it up with a bit of mechanical refrigeration when required.”

To get the best possible results, the whole building was designed as a thermal store: the concrete structure was externally insulated and internally exposed to maximise its thermal mass. To maximise heat exchange between the structure and the interior spaces, the floors and roof have been constructed using Termodeck – hollowcore slabs through which air is circulated. In the winter, heat recovery air-handling units collect heat gains from people and computers and store them in

#### Project team

**developer** Innovate Property  
**architect** Rio Architects  
**sustainability and  
building services engineer** King Shaw  
Associates  
**building performance analysis**  
IES Consulting  
**structural engineer** Cameron Taylor  
**project manager and cost consultant**  
Mirus Management Services  
**contractor** GMI Construction Group

the Termodeck. They are then used to heat the incoming air.

In the summer, the building uses passive night cooling, whereby air-supply fans circulate cool night air through the Termodeck. Unusually, this is topped up by a chiller that runs at night. This means that rather than using a chiller sized to deal with the peak summer temperatures during the day, the building relies on a smaller 50kW unit that is set to deal with the average load over 24 hours. This is more efficient because a chiller running at full capacity uses less energy than a larger one running at less than full capacity. And to make it all even more environment-friendly, the chiller is powered by a 30kW tri-generation combined heat and power unit.

The design team's initial brief was to come up with a low-energy building, and they quickly realised how successful they had been. “We got to the point where we realised it was going to be an exceptionally low-energy building and that we should start looking at the whole sustainability package,” says King. “The focus shifted slightly to addressing all the aspects of resource conservation.”

The final project includes rainwater harvesting and a vacuum drainage system, that eliminates the use of treated mains water for toilet flushing and reduces the overall volume of sewage discharged from the building by 75%. The building also uses the site's natural gradient, combined with permeable paving and a natural wetland area, to ensure that stormwater is not discharged for off-site drainage.

The building is expected to achieve an 80% reduction in carbon dioxide emissions. When compared with a typical office building, this will not only save more than 350 tonnes of CO<sub>2</sub> a year, it will also save Innovate £1.30 per square foot each year – even more than was originally estimated.

Proof, if it were needed, that sustainability and profitability do mix.

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