

# A Rational solution to the housing crisis

The Rational House concept for affordable and sustainable housing is winning industry plaudits. And this is just the beginning, say its designers



**HOUSING**  
KATIE BARKER

In 2007 the government set a target of increasing the supply of housing to 240,000 additional homes a year by 2016 to meet demand. According to figures from the Home Builders Federation, last year 125,000 homes were completed – the lowest number in peacetime since 1923.

Addressing the demand for housing has caused several heated debates, not least between the government and the National Trust over the National Planning Policy Framework. Another issue is how these homes can be both affordable and sustainable.

In an attempt to tackle some of these problems, engineer Tim Battle and architect Robert Dalziel created Rational House to build a high-density, high-quality, sustainable, urban residence. The company is close to completing its prototype house in London, and plans to use the lessons from



The helical staircase provides natural stack ventilation

this project to adapt the design process and make it scalable.

The prototype house has four storeys, three bedrooms and a top-floor study and terrace. It is completely open plan, with no sub-frame so the floor space can be used in almost any configuration the resident wants. It consists of modules constructed offsite, which means there is a lower risk of overrunning compared with traditional construction methods, and is much quicker to erect onsite.

"It took two weeks to assemble the shell of the house," says Mr Dalziel. "A lot of it is made from industrial waste. The zinc and bricks are reclaimed, 76 per cent of the panels are made from recycled materials and 100 per cent of the floors and staircase are recycled."

The house meets the Code for Sustainable Homes Level 4, but Mr Dalziel believes they can do better. "A terrace house built like this with a combined heat and power system could even reach Code for Sustainable Homes Level 6," he says. It has 1,600 sq ft of internal space, more than it appears from the outside as the house also has a basement level. "It is not always necessary to build high rise to get the required density for urban living, you just need to use space efficiently and build up and down," says Mr Dalziel.

Other sustainable features are its thermal mass system, which ensures increased thermal efficiency, solar PV panels on the roof terrace that will provide the house with about 15 per cent of its energy needs, triple-glazed windows, natural stack ventilation via the stairwell and low water-use fittings.

And while the sustainability credentials of the house were

important, the founders were keen not to lose sight of the building's original function. "This is a house first," says Mr Battle. "So it has all the technology of a sustainable house, but it is also a lovely place to live."

But this house is just the beginning.

"The house is made up of modules which can be adapted," says Mr Battle.

"We've developed the model in two ways, the shell-only model and the fit-out model," he says. "The plan is to have lots of component parts which can make up a variety of styles of houses so we are not constantly reinventing the design and saving on costs."

## Prototype pricing

The company created the prototype with a view to learning what aspects did and did not work, get an idea of costs and to show the market some evidence of their idea. Cost was one of the biggest challenges. "You need to invest to create the prototype, but you can always do it at less cost when increasing the volume. We've been brave enough to invest in creating the prototype and are delighted with how it's turned out," says Mr Battle.

Davis Langdon head of residential Ben de Waal agrees that the costs come down dramatically when looking at building in volume. "We have built the prototype but it's on an infill site, it's a one-off and has features that you would never put into a scaled product, so we can't say the cost per square foot is X



Modules are constructed offsite, making erection onsite quicker

**76%**  
of the panels are made from recycled materials

and that is how much future projects will cost," he says.

Davis Langdon is the cost consultant on the project, and is working with Rational House, 3D Reid and Arup to build capacity into the supply chain and to create confidence around the delivery and pricing of the project. At the moment they are projecting costs of around £100/sq ft for the shell-only model and £145/sq ft for the fully fitted model.

"If you built that house from scratch now from all the knowledge you've already got it would be a lot less than the price we built it for, because there is a lot of learning that went into it," says Mr de Waal.

Mr Battle sees the possibility for improvements. "This project uses underfloor heating as it is a well-

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TIM BATTLE, ENGINEER



The prototype features triple-glazed windows and PV panels

proven technology, but in a house as well insulated as this there is probably something that can be done to reduce the cost of heating on the installation side," he says.

While Mr de Waal highlights several other areas where they are already planning improvements to the prototype, including reducing the number of panels used. "This house is made up of about 84-85 panels, whereas if you took a terrace house it would probably drop to something like 65-66 panels per house," he explains.

The panels are the key to the sustainability, scalability and

## THE RATIONAL HOUSE

Main features include:

- Branded precast concrete modular house
- Open plan with no sub-frame, providing flexible and adaptable floor space
- Speed of construction – can be watertight within 4-6 weeks
- Affordable delivery – predicted cost of £100/sq m for shell-only
- Superior build quality and finish
- Code for Sustainable Homes Level 4, built from waste aggregate, high thermal mass, triple glazing, solar PV, recycled zinc and brick and low water-use fittings

structural stability of the building. "There is no sub-terrain here so the panels themselves satisfy the architectural, environmental and structural needs of the building," he says.

The company has its first large project with Barratt to build 38 houses on the Olympic legacy site, with enquiries from other developers in London, Oxford, Cambridge and Winchester.

"I am so proud of the fact that we have built a modern, urban, sustainable house which has space, light and is a pleasant place for people to live," Mr Battle says.

## COMMENT ENERGY EFFICIENCY

LISA GINGELL,  
DIRECTOR,  
T-MAC TECHNOLOGIES

## Why energy legislation can be a positive force for change

Developers today face very different challenges than they did 10 years ago. Penalties enforced through new legislation can make it costly for commercial buildings to be energy inefficient and, as a result, owners have higher expectations relating to the energy efficiency of their properties – from the planning stage through to maintaining the site once operational.

Commercial buildings account for 18 per cent of UK carbon emissions each year and the government's current goal is a 20 per cent reduction in carbon emissions by 2012 (in comparison with 1990 levels).

The CRC Energy Efficiency scheme and other legislation such as DEC's and EPC's relating to the performance of buildings should represent an opportunity for businesses to take control of their approach to energy use, and make significant savings along the way.

So how can firms monitor, measure and cut their energy consumption and carbon emissions to meet CRC requirements?

Even with this legislative pressure, many businesses continue to underestimate the potential savings that a good energy management strategy can provide.

The education of staff on energy use is critical if a business is to achieve its environmental and cost-saving objectives, as ultimately staff will become responsible for using and operating the buildings and equipment on a day-to-day basis.

T-mac Technologies has helped businesses to identify major energy reduction opportunities by

isolating a business's hidden energy wasters, such as equipment sitting idle and running up costs, unnecessary lighting, or heating and air-conditioning fighting against each other.

The T-mac system operates by gathering energy consumption information from utilities or sources of power such as lighting and air conditioning units. By monitoring and controlling their energy consumption and emissions, businesses can develop a solution for minimising waste and reducing financial outgoings.

Businesses should view energy efficiency legislation as an opportunity to review their approach to energy use. T-mac works with companies to identify opportunities to assess, plan and maintain the efficiency of building operations and achieve energy savings of up to 40 per cent with a return on investment in 12-18 months. T-mac's Building Management System gathers energy data from utilities at all sites and breaks it down on a site-by-site basis. This information can then be used to help firms manage their energy consumption and educate stakeholders on building use.

T-mac also enables businesses to fulfill the reporting requirements of the CRC legislation by issuing automated documentation for business submission and evidence of compliance.

With a range of in-depth energy information available, using cutting-edge technology can help businesses to assess opportunities for improvements, reduce energy consumption, increase efficiency and ultimately manage legislation.

**"Firms should view this legislation as an opportunity to review energy use"**

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For full details of the first CRC league table