

# The two-bed thermal envelope

In a Somerset village, a builder is creating zero-carbon homes for less than the cost of conventional ones. By Ashley Seager



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It's unlikely that you would turn up at a pretty, quiet Somerset village in search of any kind of revolution. In fact, you'd be hard pushed to spot anything revolutionary in the village of Chewton Mendip, save perhaps for a few solar panels on top of the local school.

Blink and you'd miss three terraced houses forming a corner of two streets in the village. They blend in perfectly with the other traditional stone houses. But behind the facades lie brand new homes built with ultra-modern materials and which already meet the government's strict zero-carbon rating that all new houses will have to meet from 2016.

And, crucially, they have been built to a comparable cost to conventional houses, blowing away in an instant the claims of the big housebuilders that meeting the 2016 target will entail huge cost and put up property prices.

It's generally true that in any industry, innovation comes from the small start-ups rather than the big incumbents, and local builder Arthur Bland, combining for the first time some advanced new floor, wall and roof technologies already available in Britain, is proving the point.

"These are the most thermally efficient houses built in the UK in 2008 and are twice as good as the PassivHaus [energy efficiency standard] in Germany," says Bland. "And if I had built them on a larger scale on a larger plot, they would have been cheaper to build than conventional houses; I am quite sure of that."

They say the three most important things in building an eco-house are insulation, insulation, insulation. And maybe airtightness too. And that is what Bland's house embodies: it is so efficient at retaining heat that it does not need any form of heating. In an English house? Surely some mistake?

Bland explains that the revolutionary insulated floor system, from a company called Ecoslab, combined with a polystyrene-and-concrete wall system from Logix and a roof system from Unilin, give the house a "thermal envelope" from which heat and air cannot escape. Daily living generates enough heat - from TVs, kettles, the warm backs of fridges and the people who live in it - that no further source is needed.

Airtightness might sound suffocating, but in fact the houses have a circulation system that changes the air five times an hour. And the clever bit is an exchanger that captures the warmth from stale air, which is extracted from the house by vents, and reuses it to heat water and the air in the rooms. That system is made by a Swedish company called Genvex and costs about £6,000 to install - but once you deduct the cost of a traditional heating and hot water systems, Bland says you are left with a negligible extra cost per house of £500. For the homeowner, the advantage of Genvex systems is that they last much longer than traditional boilers, which need replacing at least every 10 years.

The windows are all triple-glazed and wood-framed to keep heat in. They can, of course, be opened if the house gets too hot in the summer but the Genvex will also provide cool air to keep the places at a constant temperature.

The windows and walls are also very good at keeping sound out - a significant advantage for future homes being built on brownfield sites near other houses and roads. The absence of radiators leaves walls freer than they would have been and the airtightness, if nothing else, means there are no nasty draughts in the winter.

Bland's former wife Linda lives in the middle house with her two children and loves it. She moved in last December when it was completed and so tested it through the cold snow of the spring, when temperatures dropped to -9C.

"For a few days I had a small electric heater on in the living room just to raise the temperature a bit. But after half an hour the house was too hot and I had to turn it off," she says.

"It is a great house to live in and I have no complaints at all. The air does feel dry, though, and I have to water the plants more than I would have done. But that is the only thing I would say. I don't have to lug solid fuel around any more like I used to in other houses I have lived in so I love it."

The house has low-energy lightbulbs, not only because they consume less electricity but also, explains Bland, because the heat from conventional ones would make the house too hot.

He points out that the best thing to do when you have had a bath is to leave the hot water in it to cool, since the heat will be sucked through the bathroom's vents and recycled by the Genvex system into more hot water. "You can get obsessed by this heat business - but it is important," he says.

The three houses share a rainwater harvesting system via a big tank in the communal garden to the rear. The rainwater is used for dishwashers, washing machines and toilets. About 75% of the houses' annual water consumption is provided in this way.

The houses are not yet zero-carbon in the true sense of the phrase since the planning laws in the village's conservation area prohibit the use of renewable

energies such as solar panels or wind turbines. As a result, each uses about £600 a year of electricity from conventional sources.

But Bland stresses that the houses meet all the Code Level 6 requirements of the government's code for sustainable homes - a set of rules which is gradually tightening the regulations for new buildings to reduce their carbon output - in terms of the construction.

The addition of, say, solar photovoltaic panels would easily make them zero-carbon or even carbon-negative in the sense that they generate more clean energy than they consume, exporting the surplus to the grid.

The building cost for the three houses was £300,000 for a total dwelling space of 280 square metres. That sort of figure - about £1,100 a square metre - should make the big housebuilders sit up and take notice, especially as Bland says the awkward plot shape and stone frontage added about 20% to his costs. In other words, slightly more standard houses would be cheaper than conventional dwellings even if the solar panels were added on. His system is also quicker than conventional housebuilding.

"There is no great mystery to building houses. If I had not faced the constraints I did on this project, I could easily come in cheaper than conventional houses," he says. "I have simply put some new kinds of products and processes together for the first time. But they can be used flexibly to create any kind of building."

But the big boys, of course, don't like change. Bland took his system to the Ministry of Defence, who had a long-running contract with a volume housebuilder for homes for service personnel. The big housebuilder is charging the MoD £2,000 per square metre for the homes - a high price - and was, not surprisingly, impervious to the MoD's request to copy Bland's model, which would have saved the public purse money both in construction and running costs.

Although producing concrete needs a lot of energy, the Bland houses use much less than traditional houses and require many fewer truck journeys, saving on emissions as well as noise and disturbance - because they use the excavated earth from the foundations as a base for the Ecoslab floor system instead of carting it away to landfill.

You no longer have to imagine the future of housebuilding. It is already here.