

Timber and Sustainable Building
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Lighthouse Zero Energy Home



The prototype building was unveiled at BRE's OFFSITE 2007 exhibition and conference in June

A self-build package with cutting-edge green credentials that looks good, too! David Castle reports on the award-winning Lighthouse net-zero carbon home that closes the lid on soul-less boxes

When Kingspan Off-Site revealed its innovative Lighthouse net-zero carbon home earlier this year, a few eyebrows must have been raised (Timber Building Summer 2007).

With its curved roof design and futuristic aesthetics, the prototype building pushed the boundaries of modern house design, while, at the same time, offering a blend of cutting-edge green technologies.

Now, less than four months later that prototype is a fully-fledged self-build package thanks to Kingspan subsidiary Potton, which has worked with the project's architects Sheppard Robson to develop what is claimed to be the most advanced house produced for the self-build market.

The project won the inaugural achievement in engineered timber award at the TTJ Awards in September.

It is certainly an eye-catching design and one with which Potton sales and marketing director Joe Martocchia knew he wanted to be involved. "I was completely blown away by it as a piece of architecture first and foremost," he said. "We have a range of traditional designs and we've been searching for a couple of years to develop a contemporary range."



The biomass boiler is just one of the renewable technologies in the Lighthouse

“We’d engaged with a couple of designers, but it just wasn’t meeting the mark. They were coming up with soul-less boxes, whereas Potton is all about design, style, quality and lifestyle. The minute I saw the Lighthouse design, I knew we simply had to have it.”

Thanks to efficiencies in construction, energy use, CO2 emissions and carbon footprint, Lighthouse by Potton is the first self-build home to achieve the government’s Code for Sustainable Homes Level 6, the standard to which all new homes will be designed and constructed from 2016.

The house, by Potton standards, is relatively small in terms of floor area – around 1,000sq ft, compared with an average Potton build of around 2,000sq ft, a typical family home, right up to 12,000sq ft. However, Potton already has plans to develop a range of self-build Lighthouse-inspired homes, using the DNA of the pilot house.

“We’ve already started looking at how these could be developed when we were designing the prototype house,” explained Martin Rose from architects Sheppard Robson. “We engaged a team to look at how we could terrace it and develop multi-unit developments and how could we modify it to deal with orientation changes.”

The Lighthouse range will offer intelligent contemporary design. Based on a simple timber frame barn-like form, some designs feature a sweeping roof that envelopes the central space providing an open-plan, top-lit, double-height living space, with the sleeping accommodation at ground level. However, the living space uses a glulam portal structure so floors can be slotted between the frames or left open as required.



Sweet chestnut was sourced locally for the external cladding

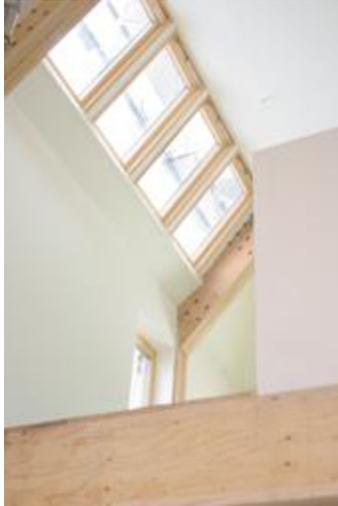
The foundations have been developed using timber floor cassettes supported off the ground using screw fast pile heads, which ensure that the disturbance to the ground is minimal and that these houses can be erected quickly and easily.

While the design blends practicality with contemporary aesthetics, it's the eco-credentials and the Level 6 rating that really stand out, although the basic Lighthouse by Potton package will start at Level 4.

"The reason we've chosen that, with Shepherd Robson's recommendations, is that beyond Level 4, the building envelope really doesn't change significantly: it's about the energy generation," says Mr Martoccia. "If we started at below Level 4, to get to Level 6 from a building envelope perspective, the buyer would have to spend a serious amount of money to get it up there." To achieve Level 6, Potton is offering buyers a 'renewables energy package' to boost their green credentials.

Every building material and component used for the net-carbon zero show home has been specified for its ability to optimise the house design's overall sustainability credentials.

Kingspan Off-Site's TEK Building System provides SIPS (Structural Insulated Panel) that deliver high levels of thermal insulation and air tightness. With a U-value of 0.11W/m²K and air tightness of less than 1.0m³/hr/m² at 50P, the heat loss has been reduced by around two-thirds compared with a standard new house. It also includes effective solar control, together with integrated building services based around a platform of renewable and sustainable technologies designed by Arup. These include water efficiency techniques, such as low volume, sanitary ware and appliances, rainwater harvesting and greywater recycling, as well as renewable energy technologies, including a biomass boiler, building integrated photovoltaics (BIPV) and a solar-thermal array.



Using Kingspan's TEK SIPs system, the building delivers extremely high levels of thermal insulation and air tightness

Meanwhile, a mechanical ventilation with heat recovery (MVHR) system, and a roof-mounted wind catcher, provides secure night-time ventilation for passive cooling, and thermal mass boards built into the ceilings provide additional cooling. There are also containers for waste separation both in the kitchen and outside, so that waste can be recycled and composted too.

It is an impressive package, and one that has stretched the architects' creativity and imagination.

"It's been a proper project with decent challenges," said Mr Rose. "Yes, it's been difficult, but that's the point. If it was easy, everyone would be doing it. A project like this is something that you'd never imagined you'd get: the ability to build a prototype is something that as an architect is fantastic, because it just doesn't happen."

Choice of timber as a building and cladding material has also been carefully considered.

"What we did with this prototype was think about every single material in here and use its specification to aid its overall performance as a zero carbon house," explained Mr Rose. "Although there are small elements of different materials, they are all used very carefully. For example, we chose sweet chestnut for the external cladding because it was a low-embodied energy material and didn't require any treatment and was ultimately available locally.

"It's not something that is specifically part of the code at the moment – looking at the embodied energy in all your materials – but it is hinted at: we've gone beyond the code as it stands."

Lighthouse by Potton to Code for Sustainable Homes Level 6 will come in at a build price of around £175,000. "In terms of pounds per square foot, it is more than a conventional self-build, but when you consider that you have a power station on the roof and you're recycling all your rainwater, the big benefit is that, to run this house, costs as little as £30 a year," said Mr Martoccia.

And, despite its contemporary looks, Mr Martoccia doesn't foresee the Lighthouse designs becoming a sticking point for local authority planning departments.



Water efficiency techniques, such as low volume sanitary ware and appliances, are employed

“Planners are more in tune today with contemporary designs than they have been,” he said.

“Programmes like Grand Designs demonstrate very clearly that planners will allow the weird and wonderful as well as the conventional. They are more sympathetic to more adventurous designs, but also the carbon zero credentials of the house also help – while it’s not part of the planning application, more and more local authorities are looking favourably on these credentials. We are confident that we can put together a powerful argument for any of our clients looking to build something like this.”

The original two-and-a-half storey design is aimed at professional couples, possibly second-time buyers or couples whose children have left home. As the range evolves, Potton will be looking to add family-size houses. These new footprints, possibly six to eight designs, could be on the market by the middle of next year.

Working closely with Sheppard Robson has provided the kind of joined up thinking necessary to produce the design and technology needed to create the eco-home of the future.

“In the past, timber frame manufacturers have concentrated on wall elements, being very thermally-efficient, but now it’s got to be a holistic approach to building,” said Mr Martoccia. “The Code for Sustainable Homes really drives you down that route: design, manufacture and engineering all comes together and it’s very joined up.

“In the past potentially, we’ve worked in isolation, and design has been aesthetic but perhaps not practical when it comes to delivering. Now, design and manufacture have to dovetail together.”

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