Stylish low energy new build

by the author of 'Housebuilder's Bible'

Meet your hosts Mark and Mandy

Mark says:
Mandy and I sold both of our homes so we could build our 'forever home' together. We wanted to build something contemporary and worked with Meredith Bowles and Sasha Edmonds of Mole Architecture in developing a new build design.

We demolished a 1930s warehouse, the only commercial building on an otherwise Victorian residential street, and replaced it with a contemporary-style house. Whilst the planners and neighbours have generally been very supportive, the fact that the neighbourhood has recently become a Conservation Area has meant that our plans have been through a few modifications during the 18-month planning process. At each turn in the planning process, the size diminished and the shape became a little more interesting and a little harder to build. As a result the design is interesting but not as energy efficient as it could be.

Building design and the Low Energy Building Standard
I have been interested in low-energy building since the 1970s, and have been delighted by the growing interest in Passivhaus in recent years. But because of the nature of the build site we decided it would be just too troublesome to make ours a Passivhaus. The further you get away from a rectangular box, the harder it gets to build in an energy-efficient way. We now have a design which mixes single with double storey, and includes no less than 19 surface planes, about double the ideal Passivhaus number.

The Passivhaus design software can cope with this but it also demands increases in the wall thickness. On a narrow site, which of course is what we have, wall thickness is a critical factor. 50mm here and there is the difference between getting a wardrobe that works and one that is an annoying waste of space.

We balanced conflicting desires, budget considerations and site restrictions and decided to go for what could be described as a Passivehaus lite standard known as the 'Low Energy Building Standard'. LEBS is still exacting and significantly better than current British Building Regulations.

Wall construction
The walls are constructed using structural insulated panels (SIPs) manufactured by Kingspan Potton with an extra 70mm of external insulation. These are factory manufactured and cut to fit wall panels, made up of two OSBs (oriented strand boards) with foam insulation in-between. They are exact, very fast to build and easily achieve good U-values and air tightness.

Heating

Heating costs are very low compared to most new-builds, because of the LEBS standard. Our space heating bill is around £150 per annum. Full Passivhaus would be about £90. Underfloor heating in the kitchen is the primary heating source. We also have a mechanical ventilation and heat recovery (MVHR) unit called 'Paul'. This extracts heat from stale air as it leaves the house, which is then used to warm cooler fresh air being pulled in.

Energy

We fitted as many solar PV panels as we could onto the upper roof, which generates a maximum of just under 2kW. We have an iBoost diverter which directs unused solar electricity to heat the hot water cylinder. We have no secondary heating - no stove of any description.

Glazing

The site has also dictated the window positioning, size and type. The house can't have windows to the South and North because of planning restrictions, and the East faces the street. As a result, the large West-facing triple-glazed windows are Low G to reduce the chance of summer over-heating. Low G glazing reduces the amount of solar radiation that passes through the glass from 60% to 30%, keeping the house cooler than it otherwise would be. This reduces potential solar thermal gain in the winter, but this is less of a problem than summer overheating. We also have a sliding flat roof window in the kitchen manufactured and installed by Cantifix. This increases daylighting in the kitchen/dining room area without overlooking the neighbours.

Working with the neighbours

We set out to work with the neighbours from the off. After some initial suspicions, all of them supported the project and proved to be very helpful, as it involved access to three gardens and closing off a couple of side passages with scaffolding for nine months. It wasn't a perfect process – we upset one neighbour when we made a post-planning change to a window position and failed to notify them. In retrospect, precisely what I was striving to avoid throughout the build and managed to completely overlook. It's a tricky process — I've never had so many plates spinning at the same time and trying to do it all to a deadline was very challenging.

My top tip: *Start with a target and work out how to reach it. That is why Passivhaus is so helpful for new home builders!*

Key Specifications:

Property age: 2018
Type: New-build detached
Walls & roof: Structural Insulated Panels (SIPs)
Floor area: 137 m2
Cost of Build: £500,000
Occupants: Two adults

Insulation & Glazing

- Low Energy Building Standard construction
- 140mm SIPs (includes 120mm insulation)
  + extra 70mm phenolic foam fixed to panels
- 260mm floor insulation
- Low G triple glazing
- Sliding flat roof window

Heating & Energy

- High spec underfloor heating by gas boiler
- Mechanical ventilation with heat recovery (MVHR) with air tightness of 1.0
- 2 kW PV system with Iboost diverter inset into roof
- Electricity usage: 3,000 kWh p.a.
  + 1,900 kWh p.a. from solar PV
- Gas usage: 6,350 kWh p.a.

Other features

- Zinc roof panels
- Louvered cedar wall cladding protected with Organo Wood, a natural wood treatment
- Limestone & timber floors; timber exterior

Key Contacts, Products & Advice - all recommended:

Architect: Mole Architects
Architectural glazing: Cantifix
Builders: Burwell Building Services - 01638 604 897
Carpentry: Artisan Structures
Demolition: C.Jackson & Sons
Electrics/renewables: Huttie
Garden Landscaping: Cambridge Grandscapes
Groundworks: Mead
Kitchen: Tomas Kitchen
Low energy design: Enhabit
Roofing: White Roofing Services
SIPs Construction: Potton
Site prep: Latham Construction
Solar PV: Midsummer Energy
Structural Engineers: Conisbee
Studio: My Space Studios
Windows: Livingwood