GOING GREEN

RETROFITTING SUSTAINABILITY INTO AN EXISTING 1950s HOUSE

How an experiment to turn an existing 1950s 2-bed into a sustainable energy efficient home resulted in a thermally efficient home with a U-value of 0.2, as well as a profit of £25,000.

Interview & Words:
Heidi Moment

Tor Høie, Daniel Ransom & Michael Breen, from Thir13en & Mayfair, are developers who are paving the way in the area of sustainability. The purpose of this experiment was to establish just how much more efficient they could make an existing property, with a view to informing their plans for a 34-unit residential development they are currently working on in Kent.

With a lifetime of experience in sustainability, material scientist and innovator Tor was perfectly positioned to head up this kind of test, working closely with Daniel who deals with all the technical aspects of the project, including writing the specifications and selecting the products. Property developer and entrepreneur, Michael, completes the partnership, dealing with the business side of things.

THE PROPERTY

The test property was a small, two-bed, brick-built 1950s terraced house in Eastcote Avenue, West Molesey, which they managed to buy below market value through someone Michael knew from his network. The property was in a pretty bad way and was in desperate need of a full refurbishment.


Tor Høie


Daniel Ransom


Michael Breen

WORKS

The aim was to make the house as sustainable as possible, through increasing thermal efficiency and airtightness and obtaining as low a U-Value as practical.

The main works included:

- **Add a single-storey rear extension under permitted development and a porch to the front**
- **Add a functional insulated home office in the garden**
- **Aimed to achieve some green credentials by adding 100mm external insulation**
- **Sealing up as best as possible to aid with airtightness**
- **Low energy LED lighting and appliances**
- **Solar assisted heat pump (SAHP) for hot water**
- **Installation of a mechanical ventilation and heat recovery (MVHR) system.**

The products selected are products that will be used on future developments, and this project has been a really good experiment to find out how easy the products are to install and how well they do their job.

Thir13en & Mayfair
DEVELOPMENTS

Hot water

The hot water for the showers and basins comes from the Magic Box, which is a solar assisted heat pump with a thermodynamic panel that hangs off the gable wall. It's a bit like a solar panel but it provides heat instead of electricity and it doesn't rely on sunlight, as solar panels do.

Through the science of thermodynamics, in this case the phase change of a gas to a liquid, this is able to heat water all year round, as opposed to traditional solar water tubes that are only effective on sunny days.

It's very similar to the hot water tank we're all familiar with - it's insulated and it stores the hot water. This one heats to an average maximum of 55 degrees (65 once a week for an hour) and when dropping 15 degrees the heat exchanger very cost-effectively kicks in again to generate more heat.

Heating

Instead of using gas in the property, they chose to use electric under-floor heating, using a heating foil, which is basically an electric cable that's laminated in a foil mat and laid directly under the wooden floor on top of insulation.

As they were having an electric oven and induction hob and using Magic Box for the water, it wouldn't have been efficient or cost effective to put gas and a boiler in simply for the under-floor heating.

The heating is only on the groundfloor, as the heat recovery system pumps the heat from the ground floor to the rest of the house. There are no radiators in the house at all, except for a single digital electric radiator in the upstairs family bathroom (see below).

Airtightness

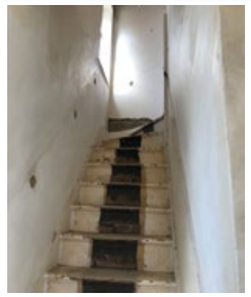
In order to use a MVHR system the house needs to be airtight, particularly for the whole house model that requires a rating of 5 or less to achieve the unit's maximum efficiency.

To make the house airtight was challenging, but aided slightly by the fact that the house was built in solid double brick with no cavities. Once all the areas of heat loss had been identified, it was just a matter of sealing everything up. To do this everything had to be stripped back to the brickwork, and any cracks sealed over. Then a whole plaster coat was applied to 100% of the building. New windows were essential and Part L light fittings had to be used (these are specific for air tightness).

Then everything was sealed using airtight foams or tapes around any penetrations going into the walls, fire alarms, lights and anything that goes into the ceiling or penetrates the plasterwork. The skirtings were also sealed to the floor.

Luckily, there were no joists penetrating into vented cavities and the flat roof is actually recessed into the building, so there were no gaps associated with a pitched roof sitting on top of the wall. Although the roof had to be insulated, and the slightest gaps between joists and insulation needed to be sealed too.

Making the house airtight would certainly have been more complicated on a house that had cavity walls and a pitched roof. It would still have been achievable, but it would have been a bit more work.



Mechanical ventilation heat recovery system

The MVHR (mechanical ventilation and heat recovery) recovers heat that would otherwise be lost through conventional ventilation. This one unit controls all the ventilation for the house. It's a continuous ventilation system, which is very different to having trickle vents and windows.

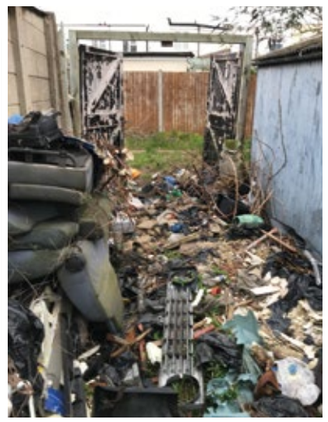
There's a vent in the centre of the ceiling of each room, to extract the air and distribute the warmth. It extracts the warmer air from kitchens and bathrooms to vent outside, but as it does that the heat exchanger within the unit heats up the cooler air coming in, so there's no cold breeze like you'd have with a trickle vent or an open window. The unit has a humidity sensor and also a summer bypass mode. The system can also be boosted/purged at times when the house may be busier or cooking has created odours that you wish to vent quicker.

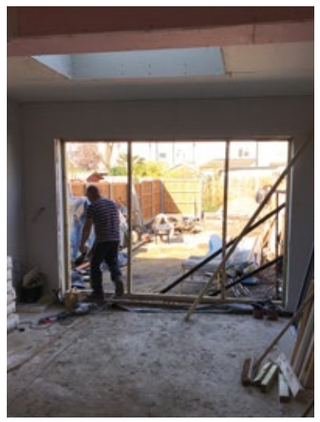
External insulation

As well as making the house airtight, it also needed to be insulated well, which helps to improve the U-value. There are several options for how to do this, including filling the cavity with insulation, or fitting insulated plasterboards to the inside walls. As there were no cavities on this property and fitting boards on the inside would have lost valuable space, it was decided to wrap the entire building in external insulation and render.

The external insulation is made from 100mm thick graphite-infused EPS (Expanded Polystyrene), which is fully recyclable. It's grey in colour and is fairly dense, but lightweight. It was mechanically fixed to the walls using expanding fixings, then fibre-glass mesh was applied and an elastomeric render went on top. It's all fire-resistant and is also fairly impact-resistant.

There is always such a thing as insulating too well, and if you don't get it right excess moisture can build up and the house can sweat. But the continuous ventilation from the mechanical ventilation and heat recovery system means the humidity is controlled, so no excess moisture will build up.





The downside to the Magic Box system is its size. It's a substantial unit and needs access space above for installation and maintenance, so you need a minimum of 300mm in addition to the height of the unit. For example, a 200L model stands at 1680mm, so needs a minimum height of 1980mm, which is not always easy to find under the stairs and if there's no loft. At Eastcote Avenue, they made it work by extending the under stair space to create a small utility room. The only problem with this was that it took a little space away from the dining area.

It's also pretty hefty, weighing 85kgs when empty, which would be troublesome to lift through a loft hatch, depending on where the hatch is positioned and the pitch of the roof.

FURTHER WORKS

- **Strip out all existing plaster ceilings and plaster from walls**
- **New plaster throughout**
- **Strip out all existing cables and plumbing systems**
- **Insulate and seal existing roof and new GRP top**
- **Insulate intermediate floor**
- **New cables, consumer unit and smart meter**
- **Satin steel power sockets with USB ports and dimmer light switches**
- **Electric foil underfloor heating over insulation boards**
- **Wren kitchen with integrated A rated appliances including induction hob**
- **Thermodynamic panel and tank**
- **External insulation and render**
- **New UPVC windows and rear French door double glazed**
- **Fixed skylight, double glazed with polycarbonate dome**
- **New bathroom suite**
- **New carpets and underlay to first floor and stairs**
- **Engineered wood throughout ground floor**
- **Vent Axia Sentinel Kinetic unit**
- **Dual-colour resin driveway**
- **Composite decking**
- **Synthetic turf**
- **Stone pave pathway**
- **Close board fencing and concrete posts**
- **Insulated garden office with LED lighting, USB sockets and Vent Axia Tempra unit**
- **Full decorating throughout.**

U-VALUE VS AIRTIGHTNESS

The U-value measures the thermal performance of a house. It looks at how effective the materials chosen provide insulation and prevent heat loss, in particular looking at the composition of the walls, party walls, ground floor and the roof insulation values. That, combined with airtightness, allows for heating a micro-climate efficiently.

Passiv Haus U-value standards are between 0.10 and 0.15. Eastcote Avenue is very close to this, at 0.2. The airtightness rating is 5.6 (4.8 with the internal bedroom doors closed). This is well below the regulation of 10. Tor and Daniel would still prefer it to be below 5 and although the house is in the process of being sold, they are still working to further improve this rating.

All in all, this is pretty impressive to say this wasn't a new build.

GARDEN

The garden is built as sustainably as possible too. The decking is made of Envirobuild composite decking, which is 60% recycled wood and 40% recycled high-density polyethylene. This is green on a number of counts; it prevents these materials going into landfill and it also uses less energy and materials throughout its life, needing no sanding or treatments, which reduces dust as well as the use of electricity, oils and VOCs.

The turf is synthetic and while it's not made from recycled material it still reduces power consumption as no lawn mowers (either electric or petrol) are needed. No chemical fertilisers are needed either, so there's no wastage of valuable drinking water and no chemicals are washed into the water table.

The garden home office comes insulated as well, with the addition of a single room MVHR unit for heat recovery in the ventilation.

BRIEFING THE TRADESMEN

A project such as this needs to be treated like a new build, following the building regulations for new builds, which are a lot tighter than on simple refurbishments. There was nothing particularly unusual about this from a building control point of view. They used a general contractor, and as usual, the electrics had to be done by Part P registered electricians, and the windows had to be registered and signed off by the council. The only addition was that the thermodynamic panel had to be installed by an F-gas registered engineer.

You might think on a project like this it would be necessary to use specialist tradesmen, but that's not necessary. As Michael explained, *"They have to have an appreciation for what you're trying to achieve, so you have to brief them well and keep an eye on them."*

"Treat it like a new build"

NUMBERS

Purchase price:	**£200,000**
SDLT (Stamp Duty):	**£7,500**
Conveyancing:	**£5,640**
Sub TOTAL:	**£213,140**
Refurb cost:	**£114,500**
Financing:	**£22,300**
Selling Fees:	**£4,900**
Sub TOTAL:	**£141,700**
TOTAL:	**£354,840**
Project Duration:	**8 months**
End value post refurb:	**£380,000**
Profit / Equity:	**£25,160**

SUCCESS

When it comes to gauging whether this experiment has been a success or not, it's necessary to look at a few things - products, sale, profits and energy efficiency.

From a products point of view, everyone is very happy with the performance of the products chosen and they will definitely use them again. The team gained invaluable knowledge and experience ready to take forward to their next development. They know it will be more straightforward when they can design the products into the actual build rather than retrofitting, which will remove the issues with lack of space.

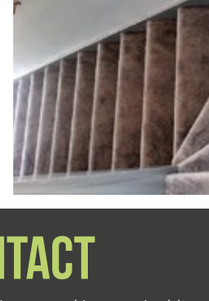
The works took eight months to complete, and a buyer was secured within six weeks. They took the ceiling price in the area from £335,000 to £380,000, which shows a 13.5% increase, and a profit of £25,000. Even though this was never a money making experiment, it's still great to walk away with a boatload of new knowledge as well as some profit in the pot.

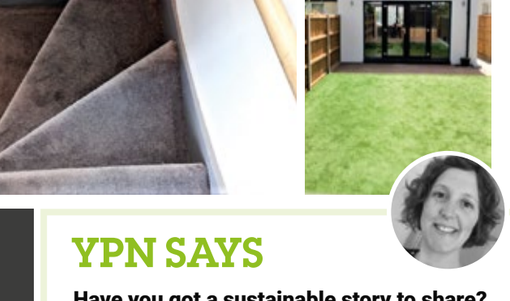
When it comes to energy efficiency, with an airtightness rating of 5.6 and a U-value of 0.2 it is highly expected that the running costs for the year will be minimal. However, it's too early to put an actual figure on it until the house has been lived in for a while. (YPN Says: *We've made a note to keep in touch so we can report back in six to twelve months time*).

"The products are brilliant"

SO, CAN YOU RETROFIT SUSTAINABILITY?

You bet you can. With a lot of knowledge of the products and how they fit together to do what they need to do, it is completely possible to retrofit sustainability to an existing house. It will cost you more money than doing a regular refurbishment but if you're looking to hold the property for a long time, it will be worth it in the long run, as your running costs will be minimal. So in five or ten years time you'll have a very sustainable home which costs you very little to run.





CONTACT

If you're interested in sustainable building, please contact Michael at **office@Thir13en-Mayfair.com**

www.Thir13en-Mayfair.com

YPN SAYS

Have you got a sustainable story to share?

Or is there anything 'green' you'd like to know more about? If so, please get in touch at **Heidi@yourpropertynetwork.co.uk** for more information.