



Sunflower Cottage is the end result of a long held ambition to build our own house. The reality of that idea started in 2014 when we finally got planning permission to build a chalet bungalow on a plot of land adjacent to the house where we were living at that time. Back then the proposed construction was conventional cavity wall designed to satisfy the requirements of building regulations but we knew we wanted to do better in terms of insulation and air tightness and build to near passivhouse standards.

We had numerous trips to exhibitions at the National self build and renovation centre in Swindon, considering various methods of construction and almost settled on a timber framing company who would have provided a fully insulated airtight shell. However we had heard about a development of social housing at Freshwater called Cameron Close which are constructed using thermalite blocks with external PIR wall insulation and are built to passive house standard. The blocks are put together with an adhesive rather than conventional mortar ( known as thin joint method ). Unfortunately we couldn't meet minimum quantity order of the special sized blocks used with that method with just a single house to build but the simplicity of construction had certainly got our attention.



We started building in September 2016 and we chose a construction we thought would be the next best thing. Solid thermalite blocks covered with external PIR insulation and then clad with Larch. The size of the external wall blocks are 450mm x 225mm x 225mm laid with a conventional mortar with lime added. The mortar joints are re enforced every second course with a galvanised mesh. Attached to the wall blocks are external insulation sheets, these are relatively quick to install with a minimum of cutting required. They are glued and held in place with battens of wood fixed through the insulation into the block with long stainless steel spiral nails and the external timber cladding is fixed to this batten. All in all a pretty simple construction method which we thought

would give us an economic and relatively speedy construction that could be wet plastered on the internal wall surfaces and would provide some thermal mass within the building and an air tight structure.



The roof structure is hand cut using 200mm x 50mm rafters supported on steel ridge beams. The rafters are overlaid with rigid PIR insulation, the voids between rafters are filled with mineral wool insulation, internally sealed off with a reflective vapour barrier which has a 25mm unvented air space on the inside. Interestingly this vapour seal arrangement is claimed to enhance the overall insulation value of the roof by 10%.



There are conventional foundations covered with a concrete slab. Internally there is 150mm of rigid insulation laid directly on the slab with underfloor heating pipes contained in a liquid screed over this.

The windows are triple glazed units set in good quality upvc frames. Having plastic frames was a budget conscious decision but they are reasonably air tight if care is taken in the adjustment of the sashes after installation.

A mechanical ventilation and heat recovery unit ( MVHR) controls ventilation, it's pretty much essential to a well insulated air tight house. We didn't have the installation finished when we first moved in and we were surprised when we first turned it on at how much fresher the house felt and that there was no more condensation on the inside of the windows. it felt like we were living with the windows wide open, only the house was warm and no drafts.



We have 3 toilets in the house, 2 of which are flushed with harvested rainwater from a 3000 litre tank buried in the back garden. This also services a garden tap. This probably cuts our water consumption by at least 30%.



A 9KW Samsung air sourced heat pump heats the underfloor heating and heats hot water on gloomy winter days. The pump is timed to come on for 2 1/2 hours a day in the afternoon with the idea behind this timing being to utilise any spare PV output on sunny winter days. However as it turns out with this timing the internal temperature of the house doesn't peak till early evening so it works out well. The house is constantly warm in winter we have the temperature set at 21c for when the heat pump comes on and we only lose about 2 degrees or less over 24 hours. We have no heating up

stairs and the temperature rarely drops below 18c.

The constraints of the plot had very much influenced the finale design of the building and resulted in a north / south ridge line to the roof, so we had no adequate area of south facing roof to fix PV solar panels to. As we have a reasonable amount of garden space to the back of the house our most immediate solution was to ground mount the panels. We have a 16 panel 4.8kw array and although it is more intrusive than roof mounted panels it has the advantage of creating a screen between ourselves and the neighbouring garden. One day we may build a mono pitch shed and mount them on the shed roof.

An IBoost unit directs any spare PV output above 100 watts to water heating and provides almost 100% of water heating for 8 months of the year but it can give a useful amount during the winter too. Even a sunny January day will give a tank of hot water but generally the decline in early November is quite noticeable and when it kicks back in again in late February it's a welcome sign of Spring.

We've lived in Sunflower Cottage for almost 5 years now, we moved in early March 2019, it is an all electric house and there are just two of us living in the house, it's approximately 107sq m. Before moving in we didn't have any clear idea about how the house would perform in it's energy consumption and how we would like living with the systems. it's been an interesting discovery as we've gone along. Previously we'd always lived with a wood stove but the heat calculations would mean that even a small one would over heat the house, we put the construction in the roof and floor joists for if we felt we ever wanted to fit one it would be easy, we miss the sight of watching the flame but not the chopping of wood.

In nearly 5 years our PV generation has been 24143 kWh and we have drawn 9807 kWh from the grid. Just over a year ago we had a 9KW battery fitted and in the last year our actual consumption from the grid has been 1455 kWh with the annual average for the previous 4 years being 2088 kWh. The house has an EPC of B but this was done before the renewables were fitted so it will certainly be an A now.

The total cost of building the house, not including land was approximately £125,000 materials and labour.

We did a lot of the work ourselves, employing a man and digger for the foundations/groundwork, a bricklayer for the block work with Martin labouring for him, electricians and plasterers. We undertook most of the plumbing with help to fit the heat pump and did all the roofing, cladding and fit out as well as hand making the kitchen and staircase, we also had some valuable help with carpentry work at times from a friend.