

Our Zero Carbon Phased 1905 Retrofit



Property Overview

Property age: 1905 Edwardian

Project timescale: Expected completion Dec 2022

Type: Semi-Detached

Wall type: Solid, single brick; N/E/W facing

Floor area: 200 m²

Cost of current phase of renovations:

£40k (includes significant DIY)

Occupants: 4 adults

Meet your hosts, Sally & Martin:

We bought our home in 2002. When we started on home improvements, our goals were simply to improve comfort, reduce energy costs and lower our carbon footprint. Early improvement work comprised of draught-proofing, filling rotted windowsills and frames, and secondary glazing, but these were eventually seen as inefficient, temporary fixes. We then moved onto more major improvements such as underfloor insulation. Our floors are suspended with 2-3 feet of crawl space underneath, so we decided to insulate underneath and replace our old pine floorboards with new engineered flooring.

Design, Financing & Construction

We soon realised that we needed a much more comprehensive approach which then led to our commissioning a whole house survey and plan from [EcoFurb](#) to achieve a zero carbon energy home (copy available [here](#)). This comprised of 4 stages to improve our house from the then EPC rating of 72C to 86B. Commissioning the survey helped us to build a vision of what we wanted from our home and cost out the whole plan, although costs are generally 50% higher than initial projections.

To achieve our goal of a zero carbon energy home, we managed the renovations step-by-step as time, energy, money (and my spouse's buy-in) allowed. By doing a significant amount of the work myself, we were able to go ahead with the renovations without incurring enormous upfront costs.

However, given the age of the property (1905), there were also other considerations. We wanted to maintain the look of the property at the front and the rear, so decided on IWI for the front walls, but a combination of IWI and EWI for the back walls; the large gable end to the side of the property is North facing and rarely seen, so EWI was planned for the entire side wall. Our house is a mix of original lime plaster and single brick followed by successive use of wall paper and non-breathable paints all adding to complicate the moisture management required from the planned wall insulation.

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Zero Carbon Phased 1905 Retrofit, Cambridge – 2022

Open Eco Homes is a [Cambridge Carbon Footprint](#) project. Charity number 1127376



Combining works: kitchen upgrade & underfloor insulation



Front facade with casement windows

Our top tips:

- Get your spouse/partner on-board
- Monitor energy use
- Get on with it! There is never a better time & you can't just leave it to the next person.



We have casement windows to the front of house and sash windows to the rear, so replacing the existing secondary glazing (now rather old) with heavier but high performance [vacuum glazing](#) had to be approached with care: the installation had to be adapted to suit each type of window with its varying points of pressure. The casement windows make up 50% of the surface area of the front of the house, so now that these windows have been vacuum glazed, there is less urgency to put in IWI to the front of the house, with all the associated disruption. Thankfully, this work can wait until we re-decorate each room.

Window frames have been repaired over the years and so [Tricoya cladding](#) was our solution to retaining and future-proofing the current frames and barge boards to avoid regular repainting. This gives us the equivalent of triple glazing U-values but is far lighter and slimmer and easily fits to current frames.

We are currently 50% of the way through implementing the EcoFurb plan. Works to date include: adding underfloor insulation to 75% of the ground floor - this was combined with kitchen relocation and upgrade works, done in 3 steps so far with another required; applying IWI to the rear room (15% of wall area); EWI and window glazing work are in progress - this has been combined with the cladding of barge boards due to scaffolding already being in place.

We have a wood burning stove in our large kitchen/family room. Concerns about air pollution have resulted in reduced use in the last two years, but energy price increases may bring this back into use this coming winter as the stove can heat most of house with minimal mains heating top up. An air purifier removes internal pollution concerns.

Our small 1.44kW solar array (limited by the available roof area) produces 1,000 kWh/pa, just under a quarter of our household electricity use; the rest is powered by mains renewable electricity. Our current space heating is from the new 2021 gas boiler.

In terms of lifestyle changes, our large ornamental garden now includes fruit trees, we've given over the rear driveway to raised beds for soft fruit and vegetables, and added water butts which provide around 50% of our garden irrigation needs. I've also electrified my bike by adding a [Swytch battery & motor system](#) to my well-loved Dawes touring bike. This means it is used daily and for long tours (3-30 days) plus it extends my cycling habit as I get older.

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Key Specifications

Energy Consumption	Energy kWh/m ² /pa			Carbon kgCO ₂ e/pa	
	Gas	Electricity	Total	/m ²	/person
Before Renovation	120	21	141	25.7	1283
After Renovation	Expected 33% - 50% reduction (no data yet)				

Insulation & Glazing

- Underfloor insulation to 75% of ground floor
- IWI to rear room
- EWI & vacuum glazing in progress.
- Tricoya cladding to frames & barge boards

Heating & Energy

- Occasional use of woodburning stove
- Space heating with new gas boiler (2021)
- LED lighting throughout
- Kitchen undersink water heater to avoid waste
- 1.44kW solar PV produces 1,000 kWh/pa
- Touring bike now electric

Water, Garden & Natural Systems

- Raised beds for fruit & vegetables
- Rainwater harvesting for garden use
- Water efficient downstairs toilet
- Current water use: 110L/person/day

Performance

We are very pleased with our home-energy improvements so far. They have greatly increased comfort, carbon savings and, with increasing energy costs, are likely to prove a good financial investment. They also reduce on-going maintenance. When eventually selling the house, the new buyer will not need to do major refurbishment requiring long periods when the house cannot be occupied.

And others in the neighbourhood all ask about the work, which is great! I feel that getting on and doing the work initiates similar work by neighbours - early adopters are important to the neighbourhood.

Key Contacts, Products & Advice:

Fineo 8 window glass (~£8,500 for 46 panes)

Supplier & installer: Christian Ward Thomas, Gt Abraham, 01638 570050 / 07887 986566

EWI installer: Ian Wagstaff, Strata Renderers 07786 221123

Tricoya water resistant cladding (£108 per 6mm sheet)

[Chiltern Timber](#) Hemel Hempstead 01442 248444

