

Passivhaus-inspired 1980s Home Retrofit



Property Overview

Year built: 1987

Location: Gunnell Close, Milton

Property type: Detached

Timeline: Oct 2024 - June 2025

Meet your hosts: Apostolos & Spyros

When we moved, we wanted a larger home that would lend itself to improvements and in particular, energy efficiency retrofits. We bought our home in June 2024, and immediately embarked on a full, deep retrofit. We both like to spend time at home, whether with friends or just ourselves, and having both worked extensively from home, we place high priority on comfort, air quality and energy efficiency.

The property had been unoccupied for over two years, giving us a 'blank canvas' to design a home aligned with our values: increasing home comfort and well-being whilst using less energy and eliminating fossil fuels for heating and hot water.

The Renovations

As an architect and Passivhaus designer, Apos was able to apply his professional skills and use his network. We settled on Coulson Building Group as the main contractor to project-manage the full scope and delivery of the project, and to have the in-house capacity to complete the outline services design. We were very impressed with them. Despite Apos' professional background, it was a very time and resource-intensive process to design, procure and complete the project. While drawing on professional knowledge, we also found value in practical conversations with tradespeople and real-world examples from the Passivhaus community.

Some internal reconfiguration of the space was undertaken in order to improve spatial flow, and metal stud partitions were used for added thermal mass and acoustic comfort. A mechanical ventilation with heat recovery (MVHR) system with rigid metal ducting was installed for managed ventilation. We provided an outline design that went through a number of iterations to suit what was possible on site once the building internals were exposed. We removed the screed from the existing floor, replaced any damaged blocks and installed new vacuum insulation panels (VIPs), applying a levelling compound on top. We also improved the rather sparse loft insulation to ensure a consistent 400mm of mineral wool insulation, cross-laid to reduce thermal bridging.



External wall insulation to front of property

At a Glance

Challenges

- Time & resource-intensive process to design, procure & complete the project

Benefits

- Extensive, deep retrofit
- Great care taken to ensure timely project completion in one go, avoiding the stress & risks of a phased approach.



Air Source Heat Pump

To insulate externally, we chose to work with [K&E Peck](#), who specialise in external wall insulation and rendering. Expanded polystyrene board was installed across the entire exterior. New triple glazed windows were then installed throughout, with special attention to ensuring airtightness. Additionally, most windows now have wide (50mm) internal ceiling-mounted, aluminium venetian blinds. These have helped a lot in preventing excessive solar gain during hot periods.

Having insulated our home, we then looked at more efficient heating and cooling systems. We installed a new single loop system, insulated with rigid polyurethane lagging, and sized radiators to work with the low-temperature output of the new Air Source Heat Pump (ASHP). We've added a single 1kW fan-coil unit in one of the upstairs rooms that provides cooling directly through the heat pump condenser. Whilst not yet fully set up, the plan is that the cooled air of the room would be used by the MVHR to distribute 'coolth', thus ensuring comfortable air temperatures throughout the house.

Energy Consumption

Due to the house being unoccupied prior to purchase, actual pre-renovation energy consumption data is unavailable. However, using EPCC data and [PHPP](#), we estimated the following for the total energy demand (heating, DHW, lighting, household etc.):

Estimated Energy Consumption	Energy kWh/m²/yr			Carbon kg CO²e/yr	
	Gas	Electricity	Total	/m²	/person
Before Renovation*	117.5	29.8	147.3	26.8	1513
After Renovation**	None	66.8	66.8	11.8	668

*estimated figures based on EPC data and lifestyle in previous dwelling

** design figure from PHPP; no actual data yet

Performance

The air quality is markedly better and the house is quieter. We are more aware of actively managing solar gains, especially during hot spells. We are slowly implementing smart controls for light, heating, ventilation and security. The switch to all-electric systems (via ASHP) and inclusion of MVHR should significantly enhance efficiency while increasing comfort.

Conclusions

Despite the exhaustion of the renovations, we feel proud of our home's potential and look forward to future upgrades. If we were to do it again, we'd allow more programme flexibility and better time allowances for contingencies.

Future plans

In future, we plan to add solar panels, install a battery and EV charging point, add a rainwater harvesting system, and improve the lagging in the cylinder store to mitigate against the pipework sweating from the moisture condensing on the cold pipes.

OEH is run by [Cambridge Carbon Footprint](#), charity no: 1127376



Internal blinds keeping the heat out

Key Features

- External wall insulation with silicon render above & below damp course
- Vacuum insulating panels to beam & block ground floor
- Loft insulation: 400mm mineral wool
- Airtightness enhancements throughout
- Triple glazed timber/aluminium composite windows
- Internal venetian blinds for solar control
- [Zehnder ComfoAir Q350 MVHR](#) system with rigid metal ductwork
- [Daikin](#) Altherma 4.3kW ASHP with low-temperature radiators & cooling via fan coil unit
- Infrastructure for future PV, battery storage & EV charging
- Smart electricity & water meters
- Rewilded garden for biodiversity & stormwater resilience

TOP TIPS

- Don't come with answers – bring questions to your contractors.
- Design thoroughly but keep contingencies in mind.
- Achieving airtightness is harder than it appears; prepare accordingly.

Professional Contacts

Main Contractor: [Coulson Building Group](#)

EWI System: [K&E Peck](#)

Floor Systems: [Kingspan Optim-R](#), [Cellecta](#)

ASHP: [Airway Group](#)

Interior Doors: [Eclisse](#)

Lighting: [UltraLEDs](#)

MVHR: [Scott Heating & Ventilation](#)

Windows/Doors: Internorm via [Glazing Solutions](#)

Photographer: Apostolos Petrakis