

# Learning from Passivhaus living

Reflections after 7 years



# Why?

- Professionally involved in sustainability agenda (bioenergy; water resources; plant-based material; sustainable built environment)
- Keen to build own place to high sustainability standards
- Looked for a suitable plot for ca 10 years
- Through professional networks met company who helped to source plot and deliver Passivhaus
- Keen on Passivhaus due to double benefit:
  - Low energy
  - Allergy-friendly: air/pollen filtration in MVHR
- Additional drivers: ease of maintenance, low running costs

# Key features

## **Timeline:**

2012: plot purchased ; 2014: moved in; 2015: final completion

## **Energy:**

- Certified PassivHaus
- Zero fossil fuel; no gas connection; 100% renewable electricity
- No central heating
- Energy costs ~halved

## **Materials:**

- Timber frame and walls (1 steel T-bar)
- Warmcel insulation for walls (recycled newspaper); Earthwool (formaldehyde-free) for roof

## **Water:**

- Underground rainwater harvesting tank, for lavatories and garden

## Passivhaus principles

The reduction of the heating demand to the point where a traditional heating system is no longer required...

Means the typical features of a Passivhaus are :

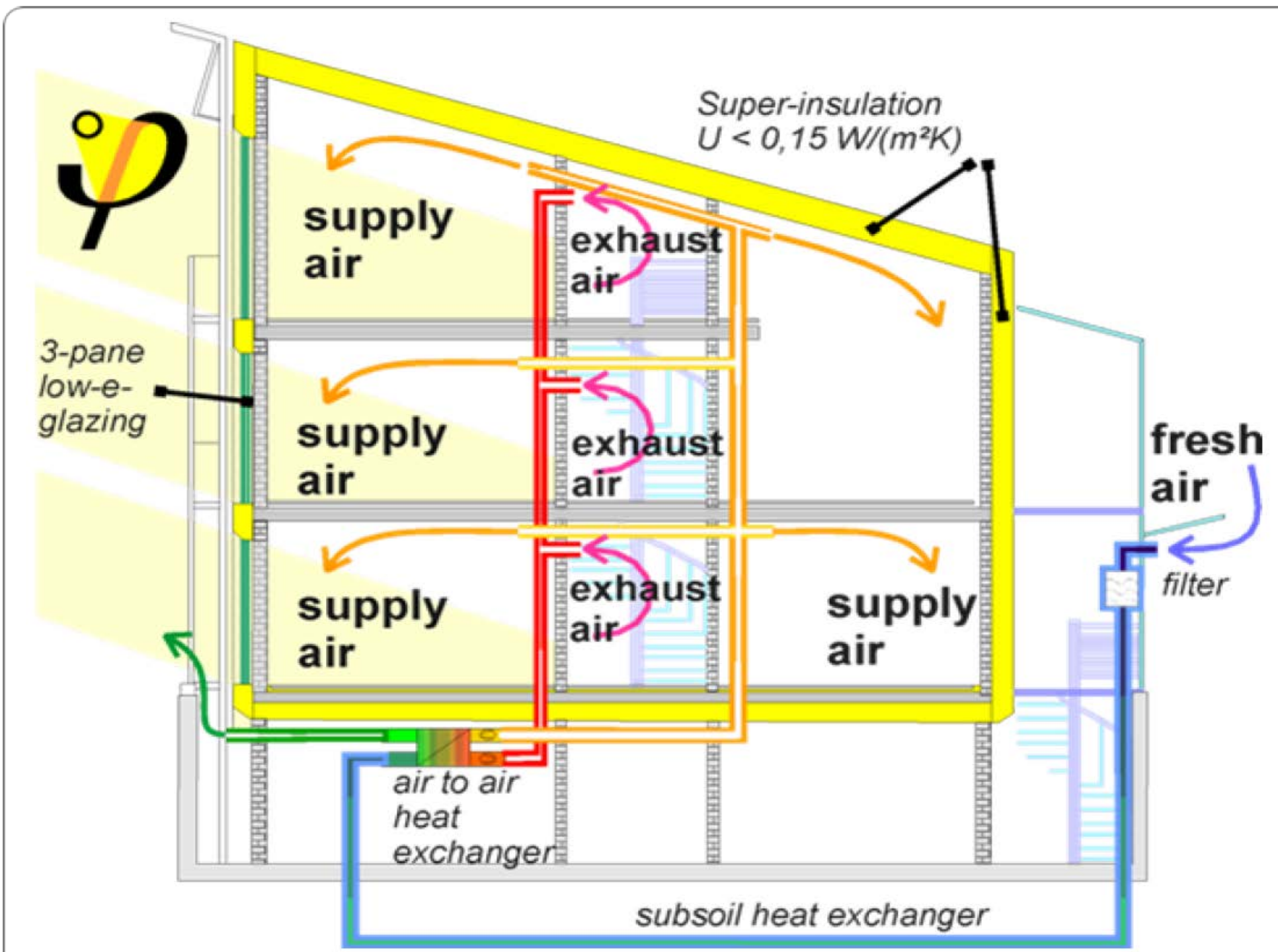
- Super-insulated
- Minimized thermal bridging (ideally eliminate!)
- Extremely airtight building envelope
- Mechanical ventilation with heat recovery (MVHR)
- Triple-glazed windows, largely south oriented
- High thermal comfort

Passivhaus dwellings do not need to differ aesthetically from conventional dwellings

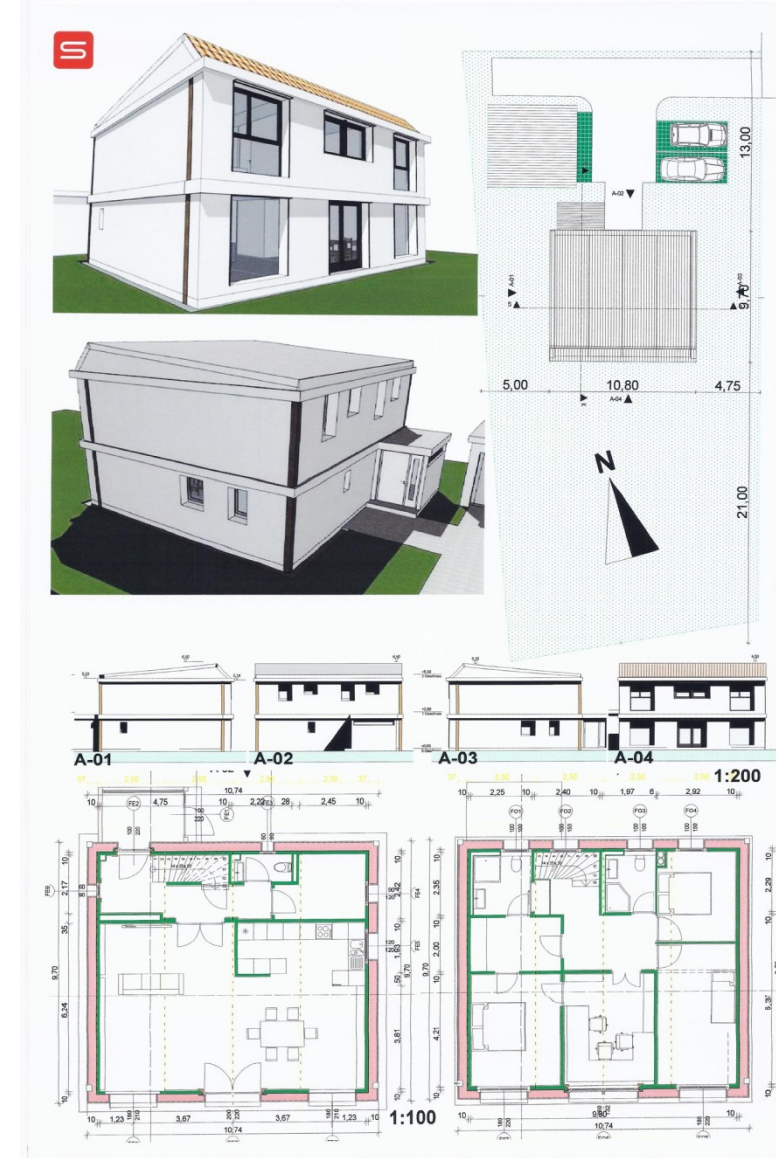
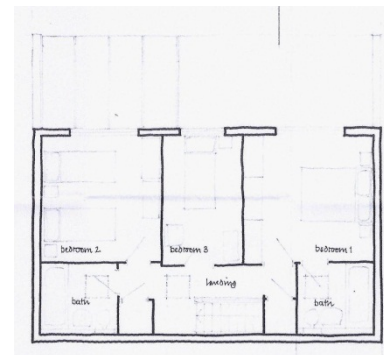
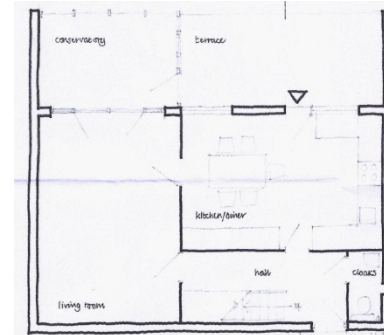
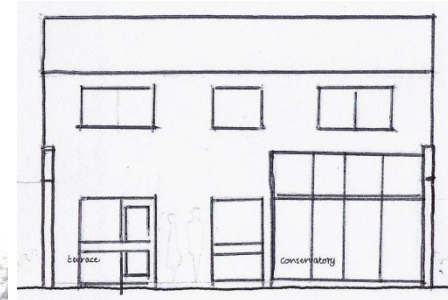
## Passivhaus headline specifications

- Space heating demand <math><15 \text{ kWh/m}^2/\text{annum}</math>
- Primary energy demand <math><120 \text{ kWh/m}^2/\text{annum}</math>
- Passive use of solar energy is a significant factor
- Insulated to achieve a U-Value <math><0.15 \text{ W/m}^2/\text{K}</math>
- Triple glazed windows, U-Value <math><0.80 \text{ W/m}^2/\text{K}</math>
- Air leakage must be <math><0.60</math> times the house volume per hr @50Pa
- Heat recovery rate >75%

# Passivhaus Basics (courtesy of BRE)



# Our journey



# Clearing the plot





# Preparing for foundations



# Piling



# Foundations



# Concrete slab helps with thermal mass



# Timber frame pre-fabricated in sections off-site



# Ground floor walls and internal partitions



# Upstairs – floor and walls



# Preparing to fill cavity with Warmcel insulation

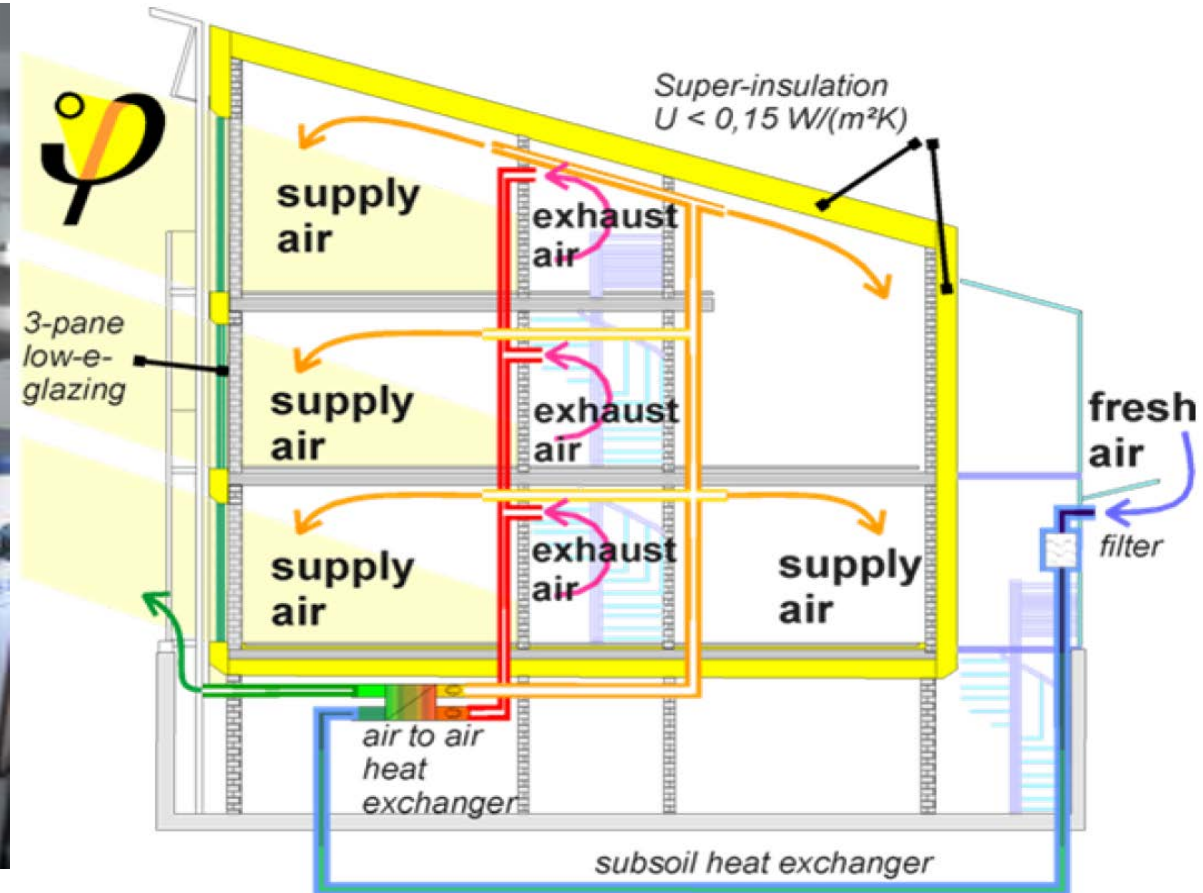




# Triple-glazing and airtight membrane installed



# MVHR (Mechanical Ventilation with Heat Recovery)



# Rainwater harvesting system





**RainBackup<sup>®</sup>**  
in a **Box**

**Quick Install**

The Rain Backup in a Box Direct Feed System  
For House & Garden With F-Line Tanks





**Uses For This System**

- Toilets
- Washing Machines
- Garden Irrigation
- Vehicle Washing

1. Tank: F-Line single piece shallow dig tank.
2. Overflow Pipe: Making sure that there is sufficient fall to encourage flow to the soakaway.
3. HydroForce Series 3 Pump: Supplied with 25mm outlet connector, must be primed before use. See *comprehensive pump manual*.
4. Level Sensor: Connected to the control unit.
5. McClean Self-Cleaning Filter: Pre-Fitted.
6. Black & Green HDPE Pipe: Running from the pump to the property using 4-inch service duct.
7. Mains Water Supply: Running from the control unit to the underground tank.
8. Outside Tap: Must be plumbed directly from the pump. See *plumbing schematic in the Rain Backup in a Box installation manual*.
9. Mains Water Supply: Running into the control unit.
10. Rain Backup in a Box Control Unit.
11. Rainwater to appliances.

# External blinds to avoid overheating



# Reflections after 7 years of PassivHaus living

<b><i>Benefits promised</i></b>	<b><i>Reality</i></b>
Maximum energy efficiency	✓
Significantly reduced heating costs	✓
'Green-Cube' next gen MVHR – heating, cooling & hot water (< energy than hair dryer)	✗
High user comfort	(✓)
Constant fresh, pollen free filtered air in all rooms	(✓)
Easy accessibility for maintenance and servicing	✓
Minimal acoustic values	(✓)
No unpleasant domestic odours	✓
No humidity problems	✓

# Some lessons learnt

- Aim high, but accept one will likely need to compromise
- Late changes in design will drive up costs and may lead to unintended consequences
- Communication is key: Make sure everyone is singing from the same hymn sheet

**Questions?**



## Next steps

- Please give quick feedback: [form.jotform.com/211853362329052](https://form.jotform.com/211853362329052)
- Make a donation: [cambridgecarbonfootprint.org/donate/](https://cambridgecarbonfootprint.org/donate/)
- Share on social media: #OpenEcoHomes

**Thank you for your support!**



# Further Resources

- Find out how you can [get started with your retrofit](#)
- [Book another tour or talk](#)
- [Case Studies](#): Research our past homes
- [Borrow a thermal imaging camera](#) and get training
- Use Transition Cambridge's [personalised home energy advice tool](#)
- Take political Action e.g. [Households Declare!](#) and their [resources](#)

