
SOLD


HOLD
ON TO
HOPE

1920s Semidetached

It was a bit smaller than we wanted, but we knew we could extend it

We moved in 12 years ago

AFTER WE BOUGHT IT, WE FOUND:

- Newish double glazing was at or below the legal minimum, and had been fitted badly
- Extremely cold and draughty, especially when it was windy (common for similar houses in Brighton)
- When the wind got above 20mph, something in the rear wall sounded like a sad person playing a kazoo
  - I never found out what

MORE DEFECTS

- All of the cavity wall ties on the SW wall had rusted right through (probably decades earlier)
- Recent Cavity wall insulation had made it worse:
- Damp on the rear (SW) wall
- Oak flooring on the ground floor had no insulation (in the kitchen it'd been mopped to death)
- Under the Oak, the Suspended pine timber ground floor had active woodworm

BEEN HERE BEFORE

Used to live in a slightly older flat in Hove

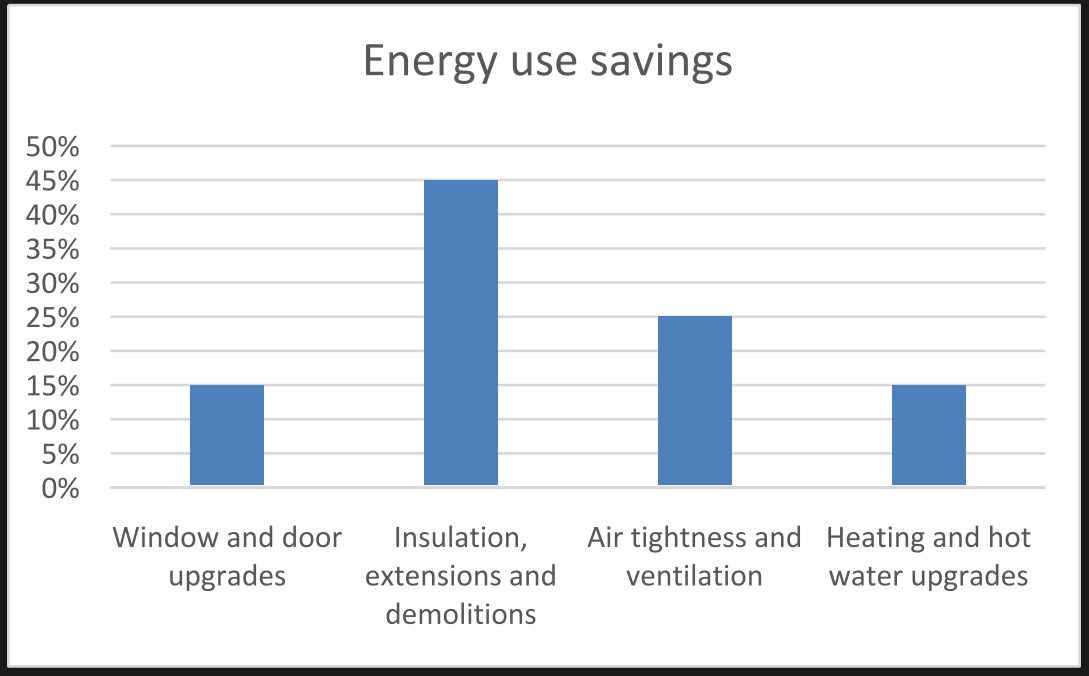
I'd made a few instructive mistakes when living there, and learned roughly what to do and avoid

I had a Physics A-Level, I learned about the **Passivhaus** voluntary low energy building standard, and thought it made sense

IT COSTS A LOT LESS TO DO IT RIGHT IN THE FIRST PLACE THAN TO GO BACK AND FIX IT LATER

"Permitted Developement" planning rules, allowed loft and rear extensions

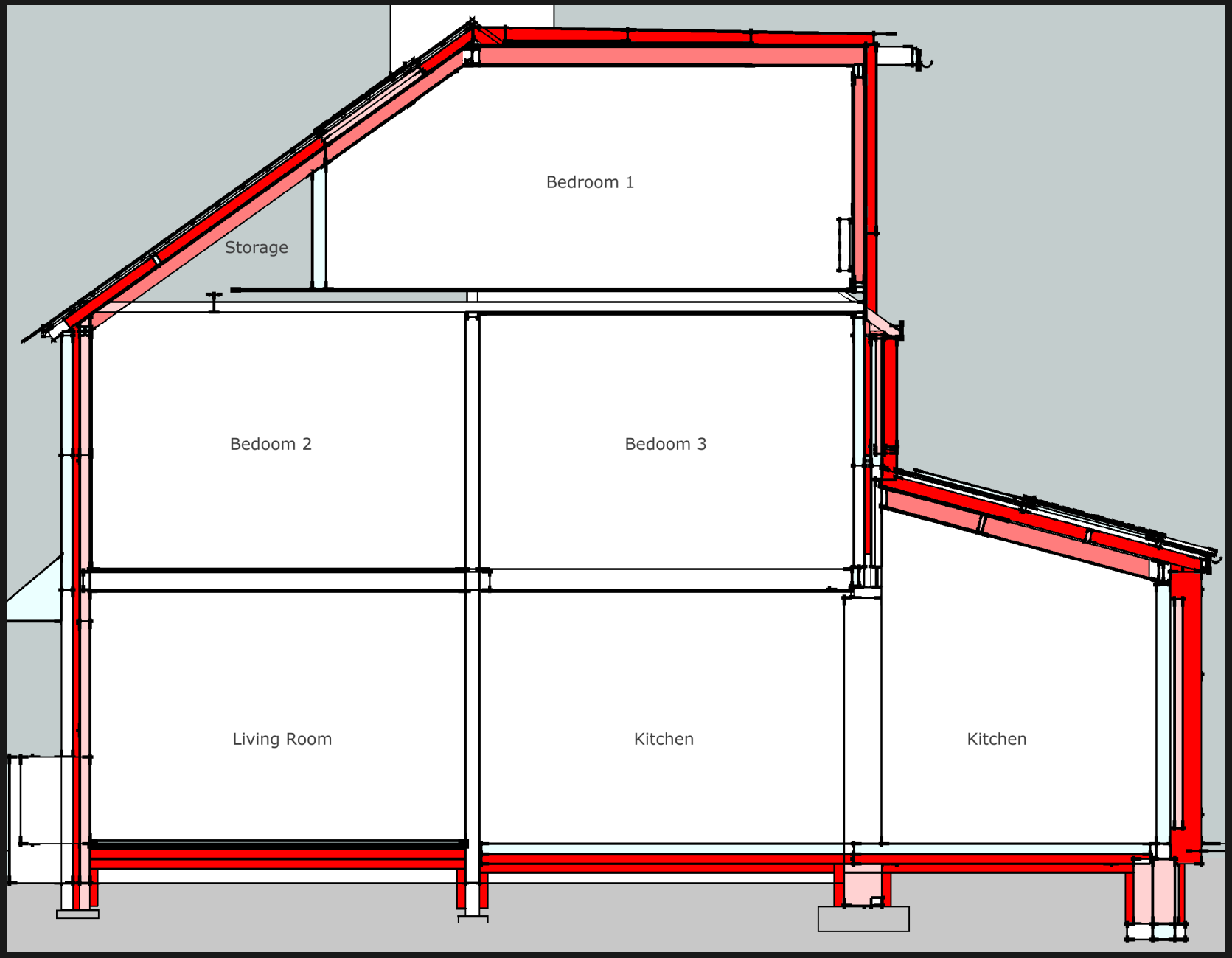
- Loft extension required an entirely new roof
- Extensions provide opportunities to do it right, and fix things
- Overall increased living space by 55%


Energy use savings
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Window and door upgrades
Insulation, extensions and demolitions
Air tightness and ventilation
Heating and hot water upgrades

INSULATE

Biggest gains came from insulating

- Make an uninterrupted "tea cozy" around the house
- Insulation as part of the design, not an afterthought
- Repairs an opportunity for cost-effective insulation
- Suspended timber ground floor was replaced entirely (insulation and underfloor heating pipes)
- Don't allow air to travel from the warm side of the insulation to the cold side


Bedroom 1
Storage
Bedoom 2
Bedoom 3
Living Room
Kitchen
Kitchen

BEFORE VS. AFTER

The container on the left loses as much heat in 20 mins as the container on the right does in a whole day

WINDOWS LOSE HEAT 5X FASTER THAN WALLS

- All new windows are triple glazed
- We upgraded the remaining existing windows to triple glazing
- Insulated the door

No "chill" felt near windows even on the coldest days

THERMAL BRIDGES

Gaps and weak spots in insulation

- Leak heat
- Internal cold spots lead to mold patches
- Design them out in advance where you can, it's much easier that way

Hard to avoid, but there are usually clever fixes

DRAUGHT PROOF

- Previous owners had tried draught proofing with limited success
- They'd reopened the lounge fire place for coal fire
- Chimneys are machines for removing warm air from inside a building
- We removed the remaining chimney flues and our half of the stack
- More interior space, simpler loft conversion, boxed-in steel beam could be removed (reused elsewhere)

"BUILD TIGHT..."

- Airtightness is much easier if you design it in upfront
- The loft and rear extensions both use interlocking timber sheets to achieve air tightness in a robust and straightforward way
- Elsewhere common materials like cement render and plaster form airtight barriers
- Specialist tapes, membranes, seals and liquids used where needed to join everything up

Test as you go

"...VENTILATE RIGHT"

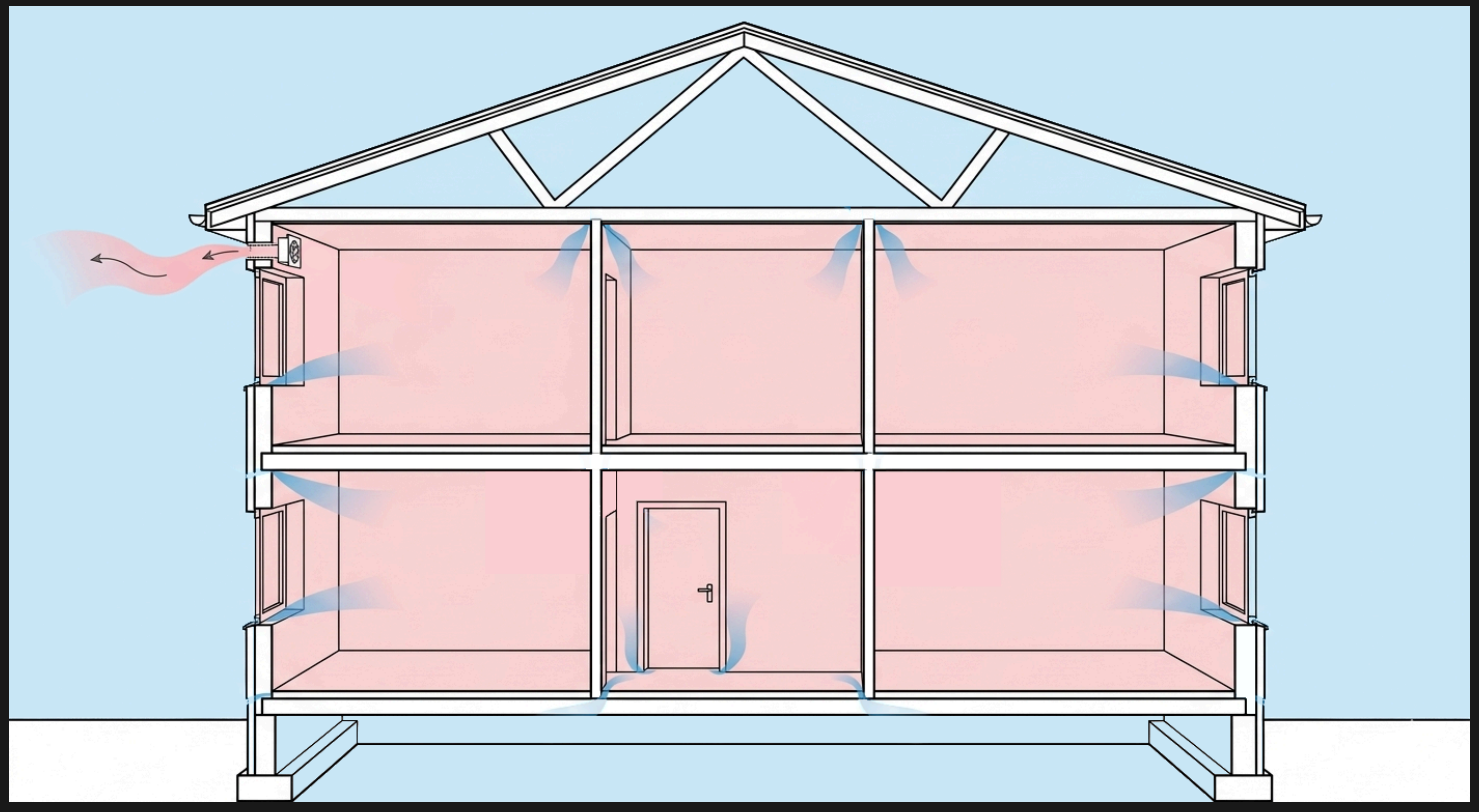
If you rely on draughts to ventilate your building, you're at the mercy of the weather:

- When it's windy you have too much ventilation
- When it's calm you don't have enough
- Mould patches, timber rot, asthma, damp furniture and clothing, dust mites, allergies, cold, discomfort

FRESH AIR NEEDN'T MEAN COLD AIR

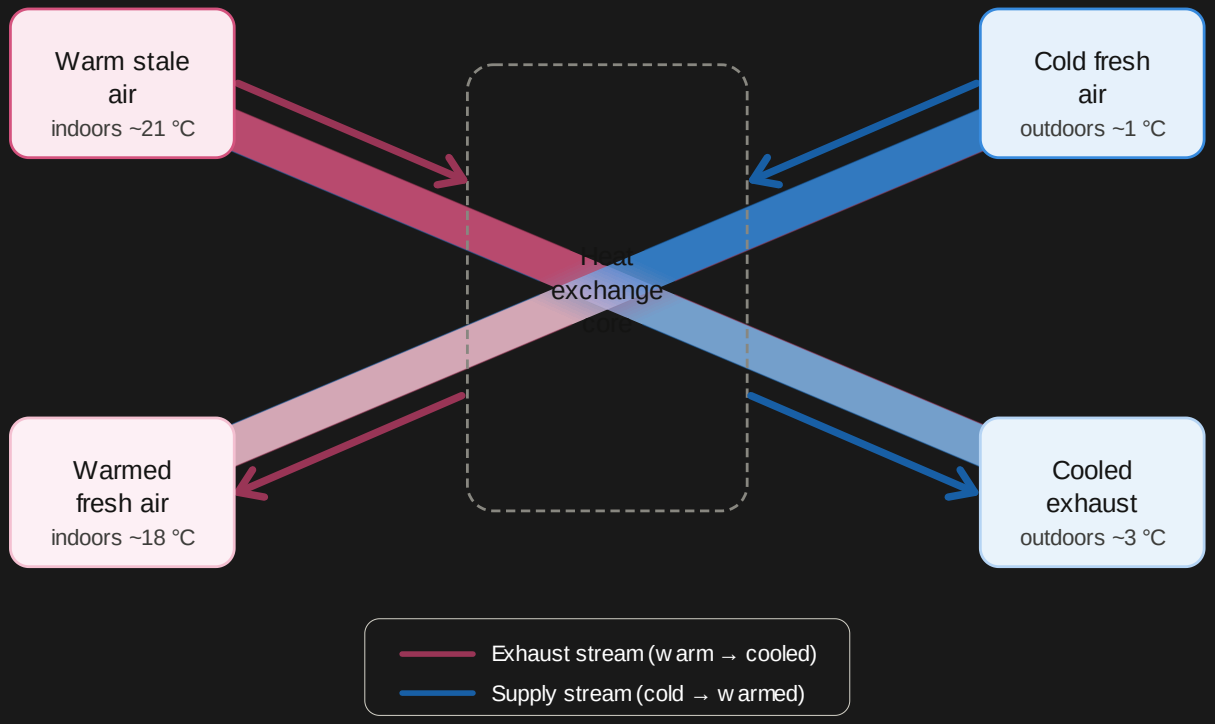
Once we'd insulated, more than half of the remaining heating demand would have come from heating up outdoor air to get the amount of ventilation recommended to maintain good indoor air quality

Run an extractor fan to get rid of warm damp air and…



…cold outside air comes into the building elsewhere to replace the warm air you've just thrown away

HEAT RECOVERY VENTILATION



Warmed fresh air into the building whilst saving >90% of the energy needed to heat it directly

MOSTLY "MAINSTREAM" BUILDING MATERIALS

- So-so PVC windows had been recently installed
- Neighbours had then installed identical windows to restore external symmetry
- Upgraded most windows instead of scrapping them
- Half the insulation was diverted building site or factory waste
- Half of the remaining were imperfect "seconds"
- Most of the demolition bricks went to a reclaim yard

MAKING STEEL AND CONCRETE IS CARBON INTENSIVE

- Concrete and screed used 85% less Portland cement than usual by using blast furnace waste products instead
- 2 out of 5 steel beams were reused
- In hindsight both of the steel beams in the roof could have been replaced with timber too (saving money and carbon - lazy design by the original architect and structural engineer)

HEATING AND HOT WATER

Considered getting a heat pump at the time but:

- Gas boiler was only 3 years old (pipes and radiators were 30 years old).
- Heat pumps weren't as good or cheap 12 years ago
- UK grid electricity is FAR greener now - 75% less carbon than 2014

…In 2014 in the UK, heat pumps had roughly the same climate impact as gas boilers

NOW HEAT PUMPS ARE DEFINITELY A SIGNIFICANT CLIMATE BENEFIT

In 2026 they have 75% less climate impact vs. gas boilers

If implemented carefully should be 30% cheaper to run too

HEATING SYSTEM

Runs at 35°C instead 70°C (commonplace in 2014):

- Underfloor heating and radiators all run at the same temperature ➔ cheaper and simpler
- More comfortable rooms - no "hot head, cold feet"
- Set boiler to use its minimum power output for heating

Boiler uses ~25% less gas

EASY HOT WATER UPGRADES

- A really good 6 Litre per minute shower head
- Spray taps for hand washing basins
- Used slim (e.g. 10 mm) pipe to supply hot water where high flow rates weren't necessary
- Hot water temperature set to 42°C on the boiler
  - Enough for a hot shower, and to run a bath
  - When someone wants a long bath we turn it up to 60°C so that they can "top up" and try to remember to turn it down again afterwards

MORE HOT WATER SAVINGS

- A (free!) "Passive Flue Gas Heat Recovery Device" to reduce the gas usage by about 10% - ...refPFGHRD
- Added a waste water heat recovery device - saves about 50% of the energy needed for a shower ...refWWHRD
- Added bonus, it meant that the boiler was powerful enough to supply two simultaneous showers

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