

Simple building services

Economical heating and ventilation for Passivhaus

1. Heating

- Passive houses need a bit of heating
- This is the standard: 10 watts/m²
- This is on top of internal & solar gains
- But only 10% of traditional heat load



How did we heat in the past?

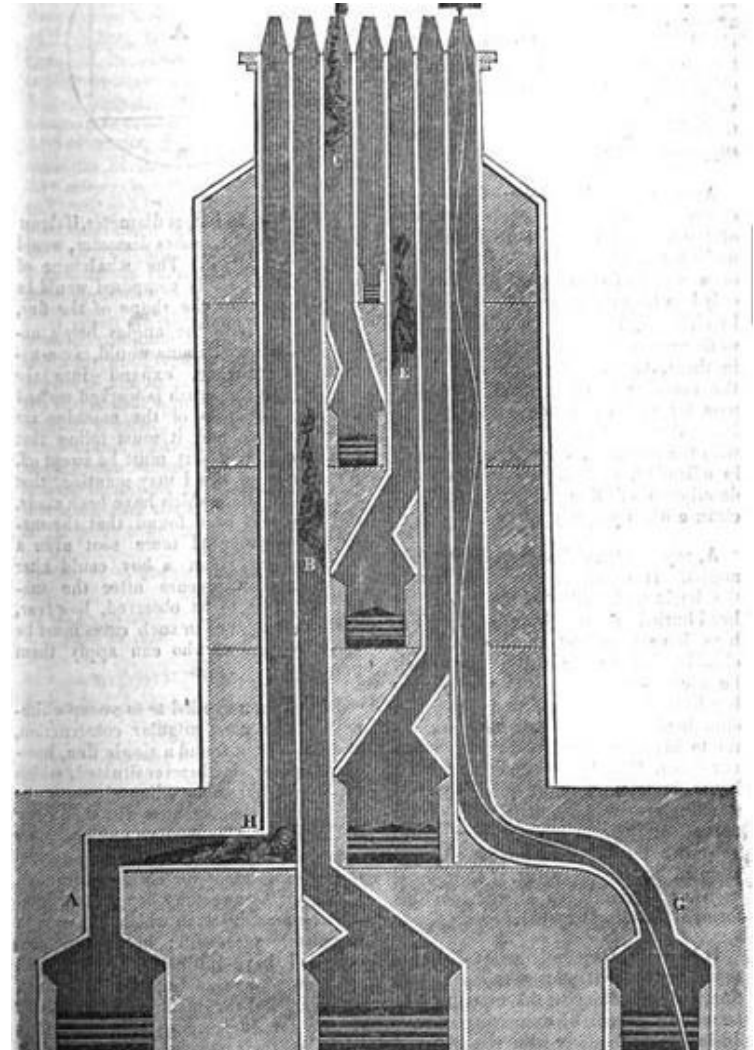


Then individual room heating



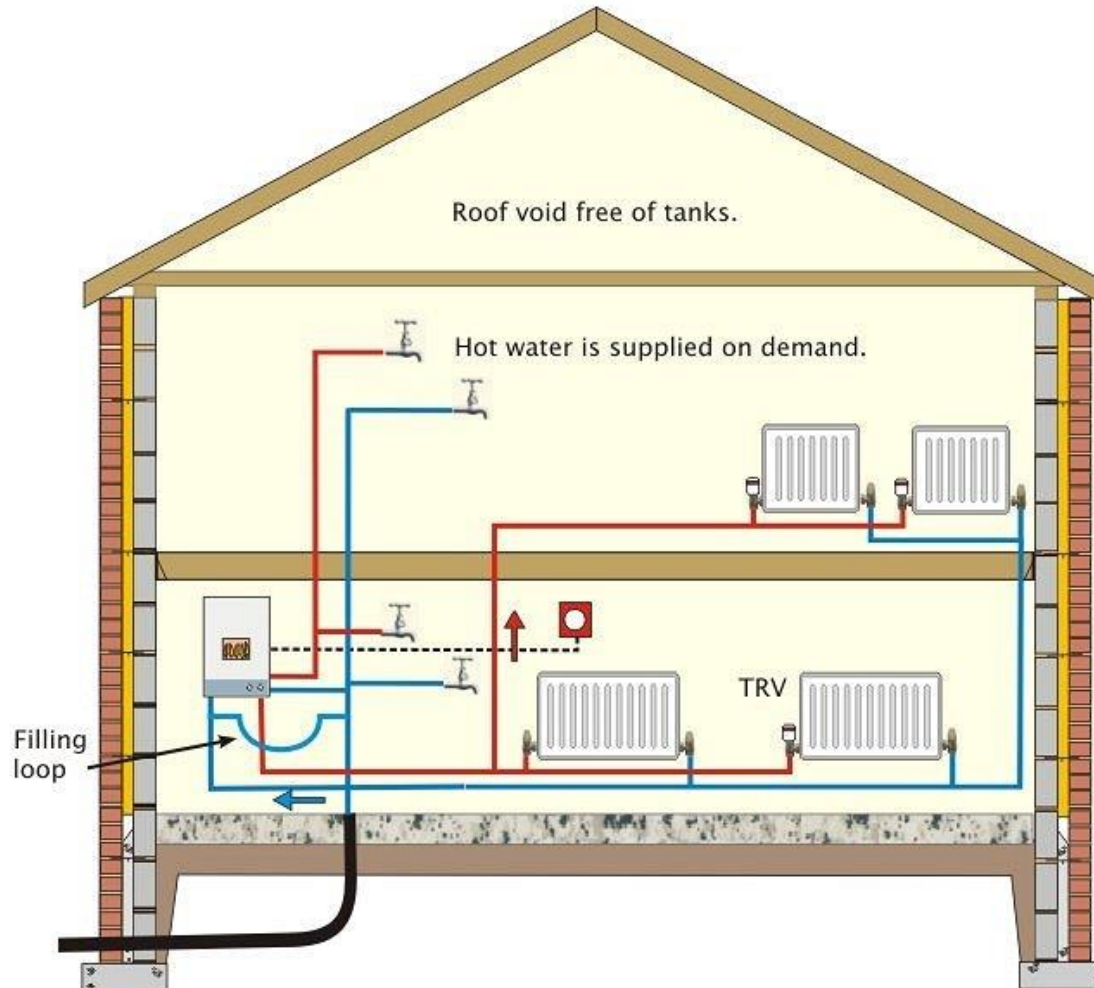


Getting complicated...





Now quite simple again



Heat & HW box in cupboard: £1000



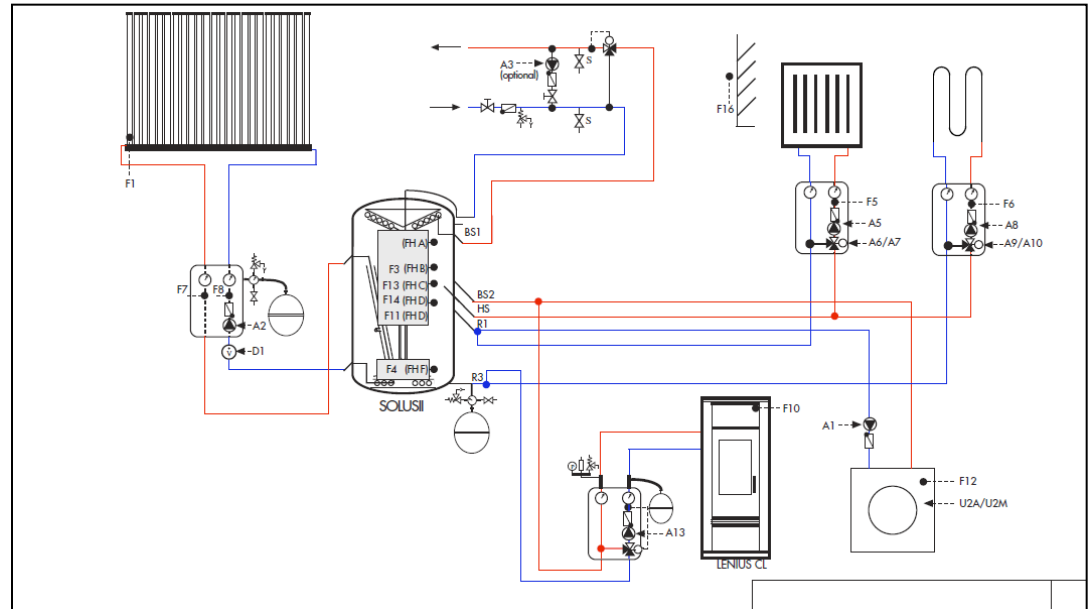
But this is Passivhaus – let's be Eco:

- 70 % output to water to a buffering thermal store e.g. a Consolar SOLUS II
- 30 % to room heating
- Maximum nominal output 8 kW
- Integrated water heat exchanger with 21 content
- High grade double walled construction from steel and cast iron
- Fuel selector for optimised wood burning
- Thermal drainage protection, boiler thermostat, and also an integrated filling/emptying valve and bleeder valve

Image: LENIUS CL - elegance for your living-room



- ✓ Solar
- ✓ Wood burner
- ✓ Thermal store
- ✓ Under-floor
- ✓ Gas back up



Solar pump

Pipes to gas boiler

Heating pump

Thermal store

Solar controls

Under-floor controls

Stove pump

DHW pump

Heating manifold



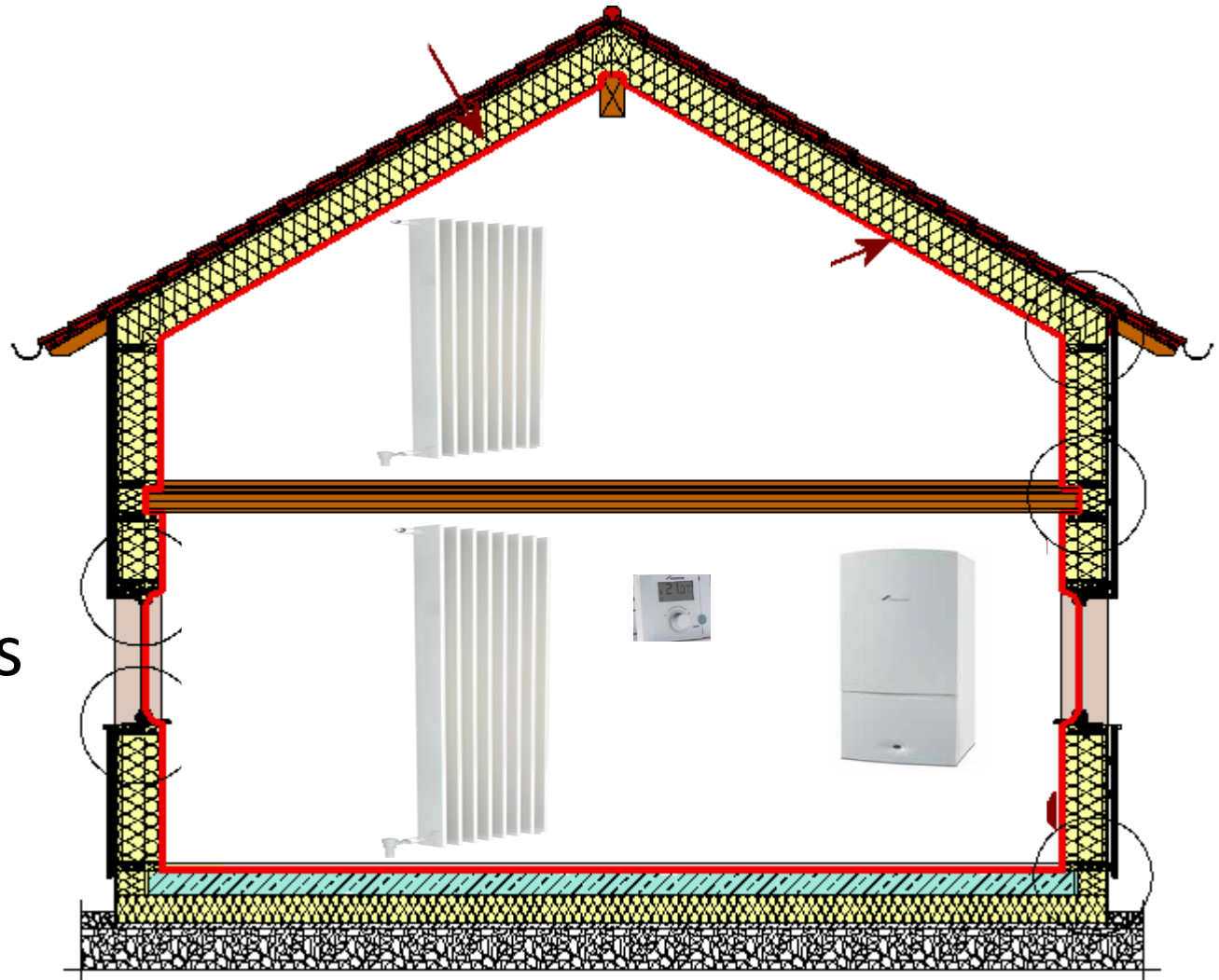
All that kit: £20,000

Lifespan 20 years: £1000/year

Heat + hot water: 5000kWh/year

Gas @ 6p/kWh: £300/year

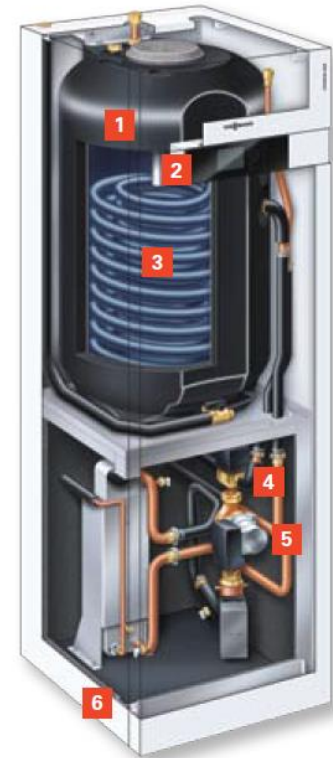
- ✓ Combi boiler
- ✓ 2-3 radiators
- ✓ Good controls
- ✓ Cheap



No mains gas?

- LPG
- Air source heat pump
- Ground source heat pump

Choose easiest & cheapest!



Passivhaus heating conclusion:

Expensive fabric = cheap heating



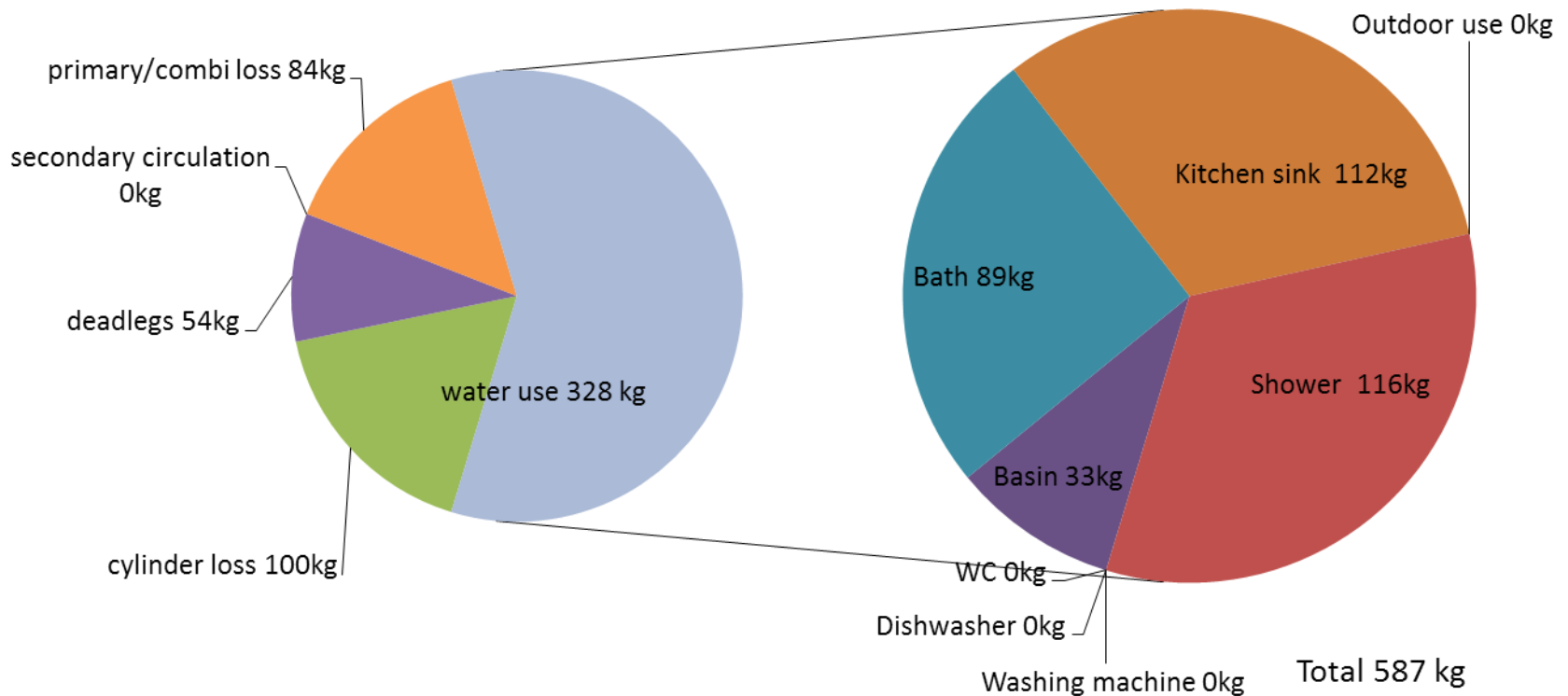
2. Hot water

- We still want this in passive houses
- Exceeds heating energy consumption



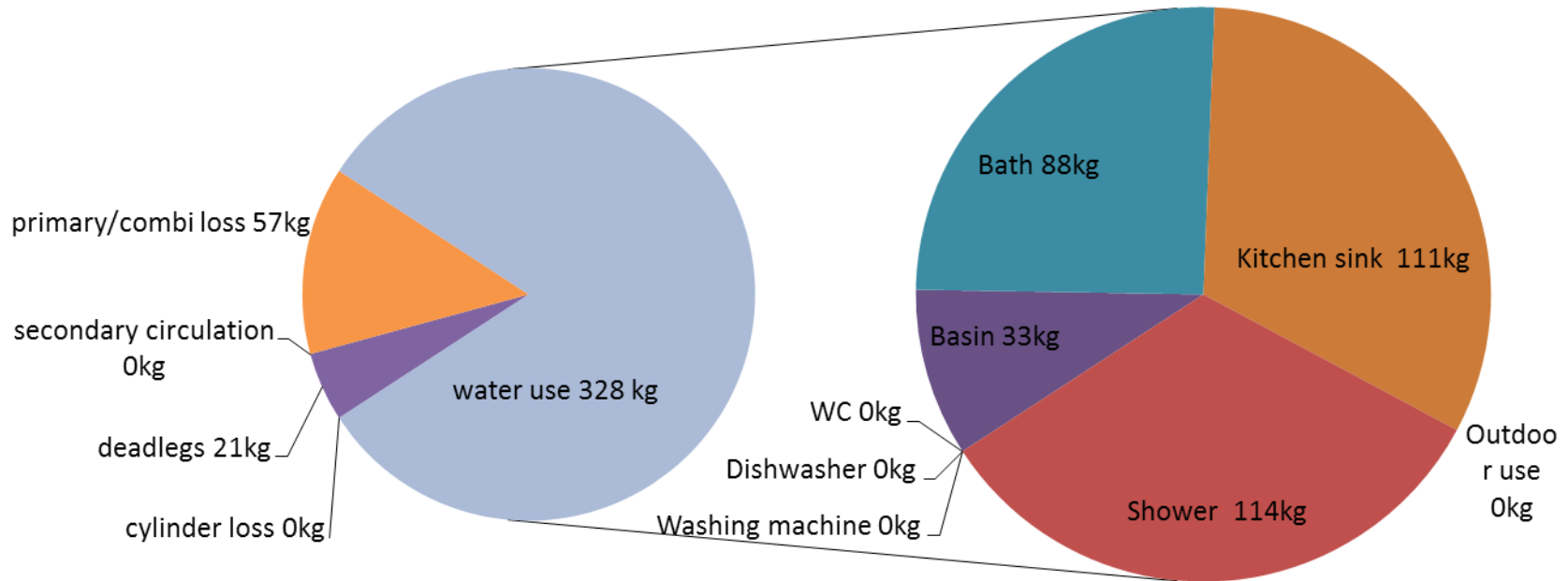
2 people, typical system

Annual CO₂ emissions



Combi, minimise distribution

Annual CO₂ emissions



Total 423 kg

System losses

- Significant – may be 50%
- Higher for very efficient user
- Designer can address losses easily

Put hot water taps near boiler

- ✓ Short pipes – reduce losses
- ✓ Small bore pipes – reduce losses
- ✓ Quick response – works better

Solar thermal

- Needs big cylinder – higher losses
- Expensive compared with savings
- Additional maintenance costs
- Hard to justify for 1-2 people

3. Ventilation

- Always needed
- Design into airtight houses
- Key to healthy internal environment

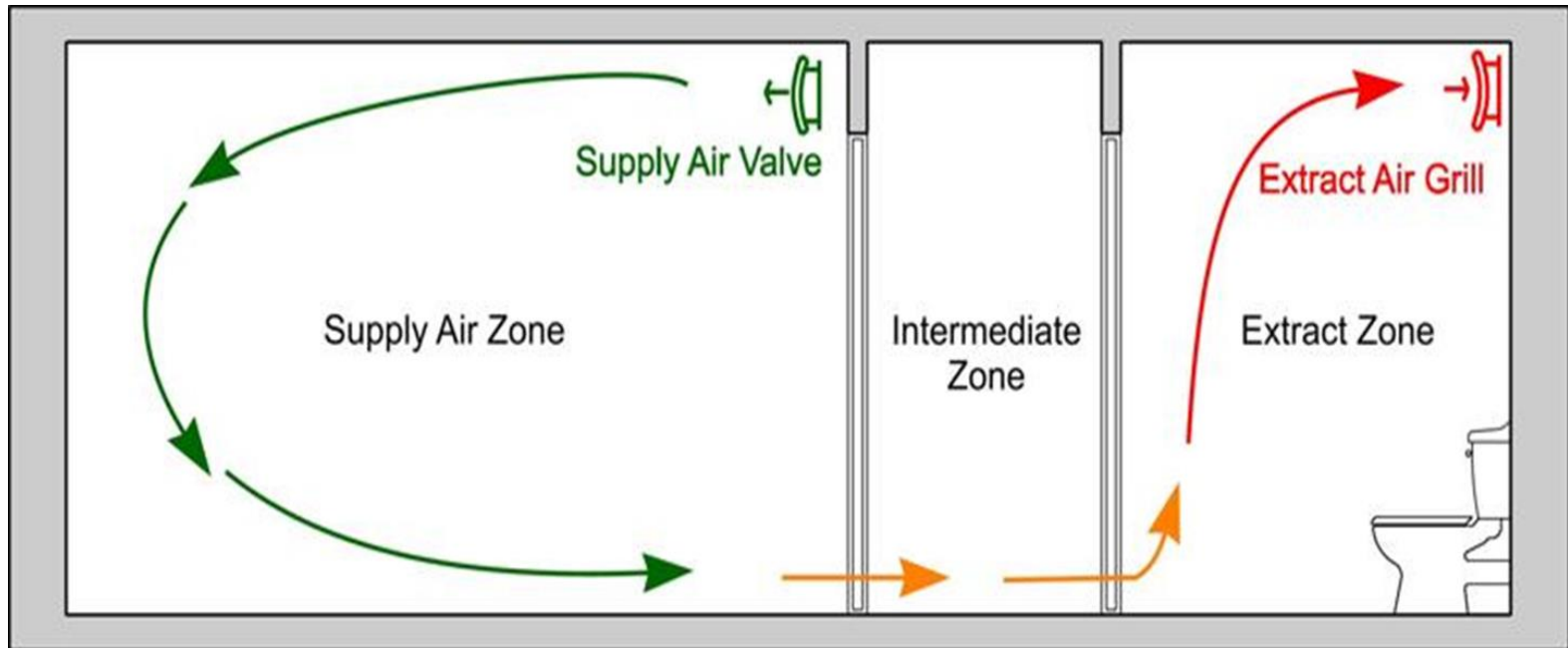


Old way: simple single sided, basic controls



The word *window* originates from the Old Norse 'vindauga', from 'vindr – wind' and 'auga–eye', i.e., *wind eye*

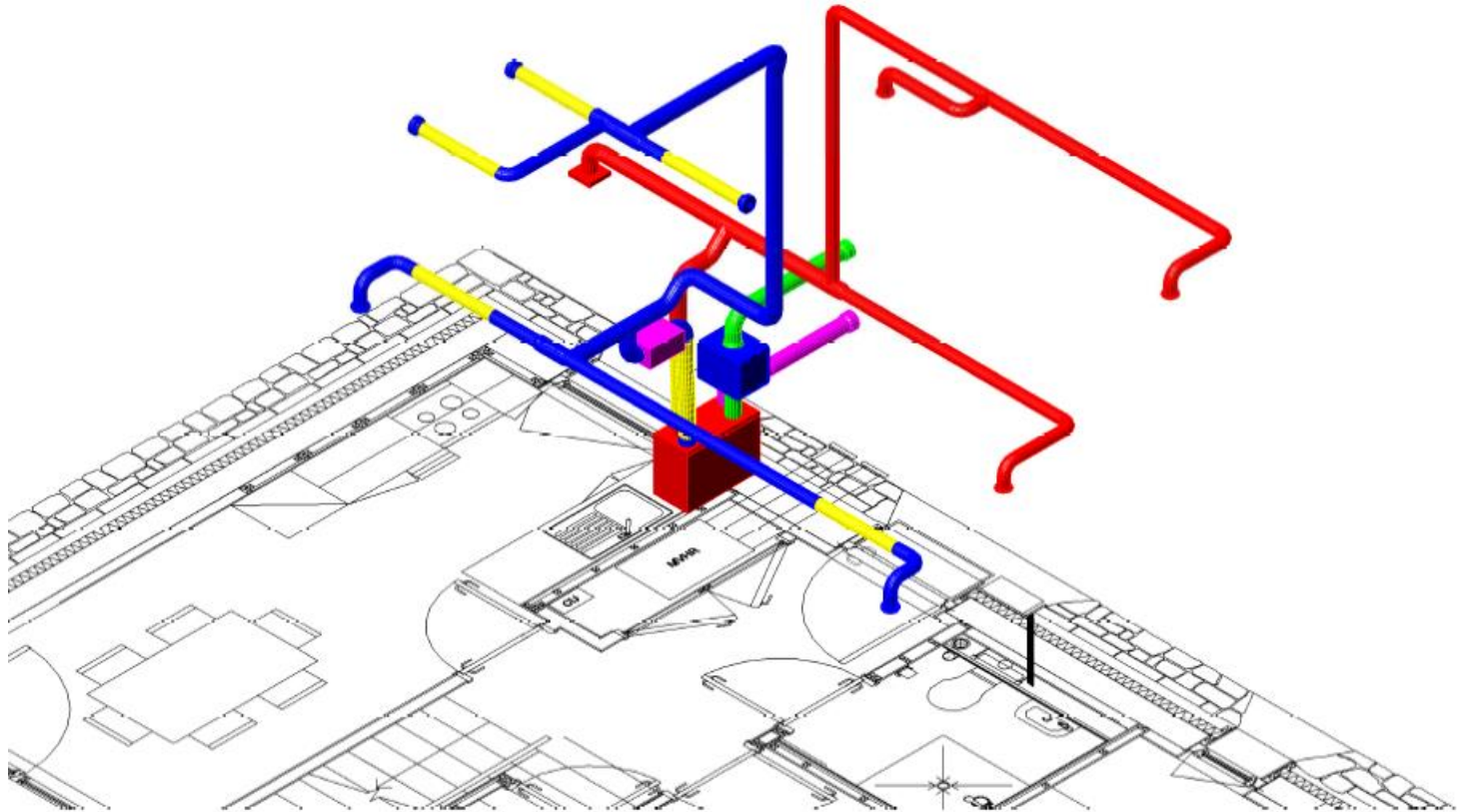
Passivhaus version



Air moving through rooms



Minimise duct layout



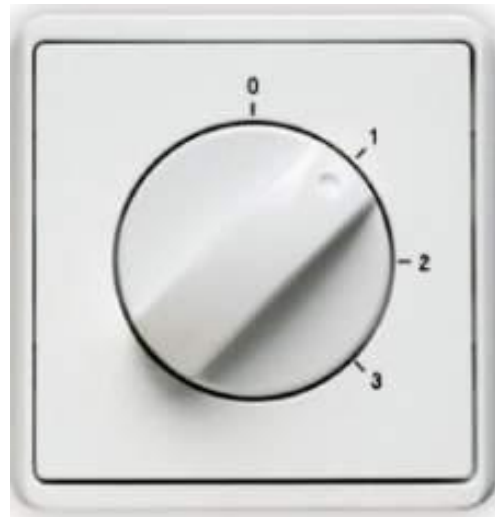
Ventilation unit location

- ✓ On external wall – short cold ducts
- ✓ Easy access for filter change
- ✓ Not in noise sensitive room
- ✓ Take as little space as possible





Easy to use controls



New MVHR developments

- ✓ Single do-it-all box
- ✓ Humidity recovery – no condensate drain or frost heater
- ✓ Radial semi-rigid ducting
- ✓ Pre-set room flow rates
- ✓ Self balancing fans

"Everything should be made as simple as possible, but not simpler."