Climate Conversations

A vision of what buildings could look like

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Torbay Climate Action CIC

Passivhaus Homes Images:
Winner Best Private House 2013 (Passivhaus Trust)
Winners of the Ashden Award 2020 (showcasing sustainable energy solutions)

THE CLIMATE EMERGENCY – A Call To Action

We are in a climate emergency, and urgently need to reduce carbon emissions. Here in the UK, 49% of annual carbon emissions are attributable to buildings

The energy used in homes accounts for more than a quarter of energy use and carbon dioxide emissions in the UK

Action in this decade is critical to capture the mitigation potential of buildings

We need to decarbonise and build net zero energy houses by 2030

Based on the latest IPCC (2022) Report

CARBON CHALLENGE ENERGY EFFICIENCY LOWERING SPACE HEATING DEMAND

Energy Use in Average UK Home

- 60% Space Heating
- 24% Water Heating
- 3% Cooking
- 3% Lighting
- 3% Electronics
- 3% Fridge/Freezer
- 2% Washing Machine/Dishwasher
- 2% Miscellaneous

Ref. Institute for Sustainability

Typical building regs compliant home
Space heating 86kWh/m².yr

LOW CARBON TRANSITION WHAT IT LOOKS LIKE FOR HOUSES

ECONOMY BUILT ON OIL, COAL & GAS (HIGH CARBON)

Average UK House 2022

Average UK three-bedroom house uses total energy at the meter **129 kWh/m2/yr.**

OFGEM (2022)

ECONOMY BUILT ON ELECTRICITY (LOW CARBON FUTURE)

Low Carbon House 2030

By latest 2025, total energy use at the meter should be equal or less than **35 kWh/m2/yr.**

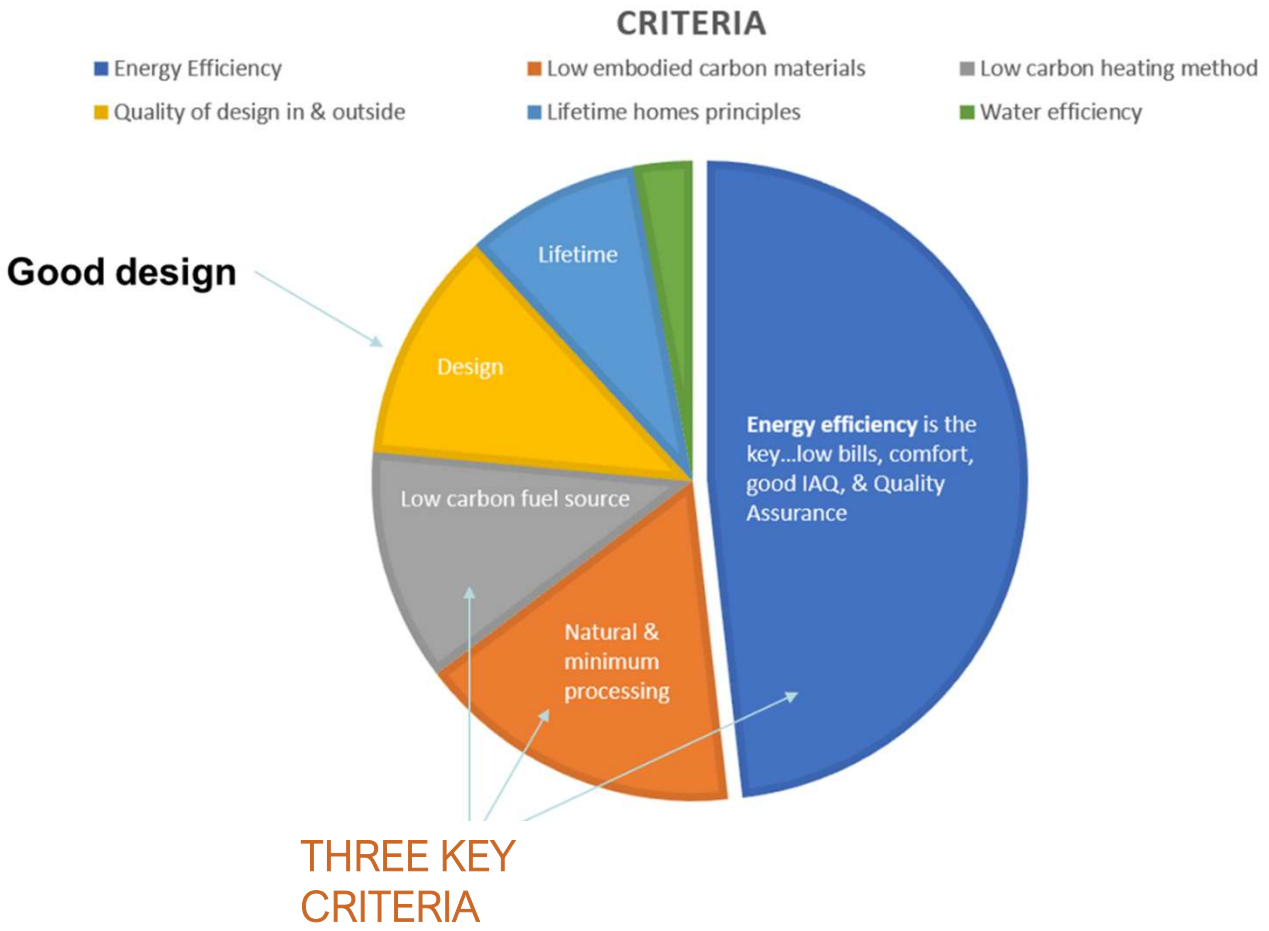
LETI & RIBA

> 70%

1 kWh = I unit of energy

What changes does this mean?

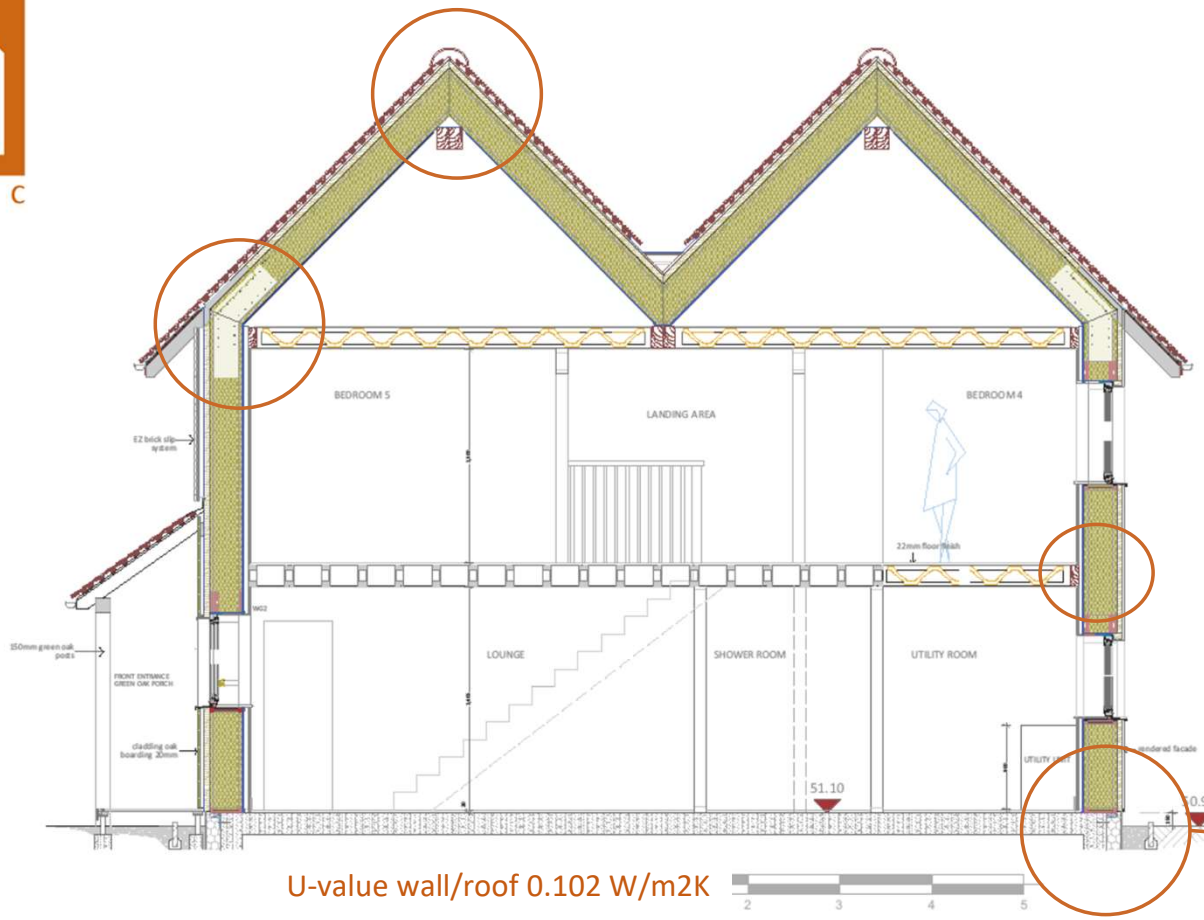
DELIVERING NET ZERO CARBON Using low carbon materials and Passivhaus principles



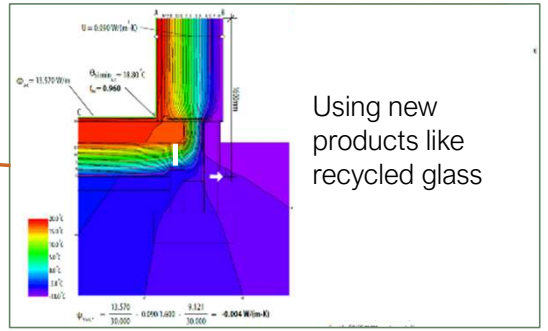
2030 CHALLENGE FABRIC EFFICIENCY AS THE FIRST STEP

2030 CLIMATE CHALLENGE ELIMINATE THERMAL BRIDGES meaning UNBROKEN INSULATION

F A B R I C



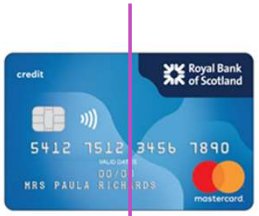
U-value wall/roof 0.102 W/m2K



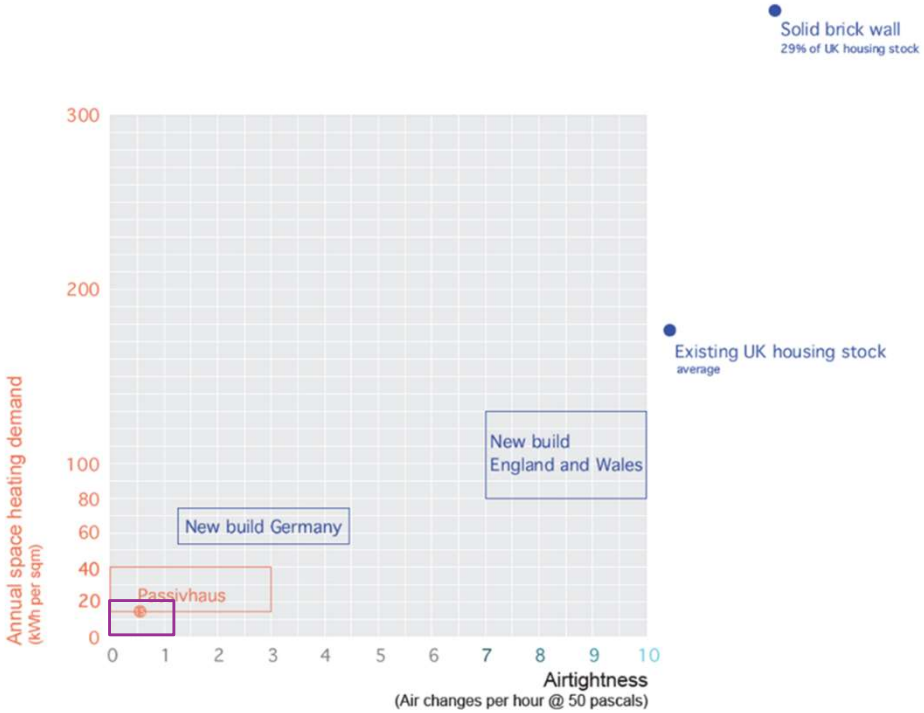
Using new products like recycled glass

2030 CLIMATE CHALLENGE SECONDLY ELIMINATE AIR LEAKAGE

AIRTIGHTNESS

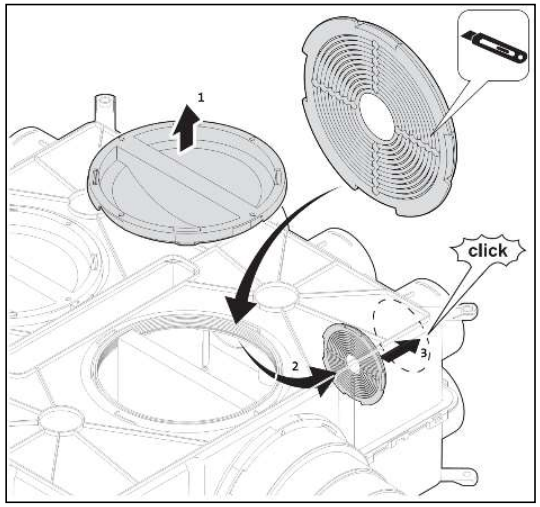


Reduce to 44x44mm hole.

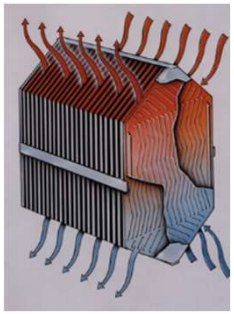


Average Leakiness of New UK Housing – two ATMs

2030 CLIMATE CHALLENGE THIRDLY INSTALL GOOD MECHANICAL VENTILATION WITH HEAT RECOVERY



The heat exchanger recovers 90% of heat from the outgoing air.
1kWh energy used will typically recover 16kWh energy.
Gain is constant fresh filtered air.



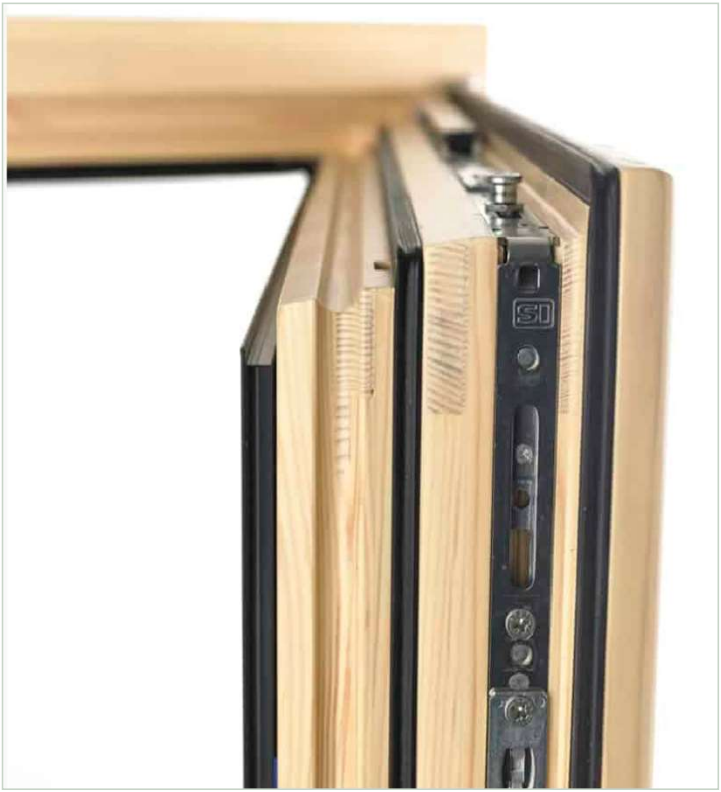
2030 CLIMATE CHALLENGE MVHR

Increased comfort, improved material durability, excellent indoor air quality, improved HEALTH.

Ledbury House – Kate de Selincourt Passivhaus + Magazine

2030 CLIMATE CHALLENGE FOURTH SPECIFY AND INSTALL TRIPLE-GLAZING

WINDOWS



Thermally the weakest element. Must invest £ to improve them significantly.

Requires minimal air leakage

Good thermal efficiency e.g. warm spacers

Good installation into the wall or roof, thermally unbroken and no air leakage to the perimeter.

2030 CLIMATE CHALLENGE FINALLY MONITOR THE OVERHEATING RISK

WINDOWS

If houses are too hot they will not be comfortable or healthy...

Be aware of impacts of large areas of glazing.

Always energy model to assess the overheating risk and then mitigate.

Model for future climate scenarios.

External shading may be needed.

Houses must become more ‘Mediterranean’ where cooling is more important than heating.

2030 CLIMATE CHALLENGE BUILDING MATERIALS AND EMBODIED CARBON MATTER

TRADITIONAL MASONRY

Walls: Cavity brick/block with 300mm mineral wool in cavity. 250mm intermediate joists with 100mm rockwool insulation, Roofing slate, timber joists with 300mm mineral wool insulation.

55.6 tCO2 total
25.5 above ground, 30 tonnes of slab/footings.

159KgCO2/m2

x4

SIPS - PART TIMBER
(+OIL BASED INSULATIONS)

Walls: 15mm OSB sterling boards, total 182mm Kingspan insulations, render finish. Roof with roofing slate, OSB boards and 172mm Kingspan insulations. Intermediate floor 250mm timber joists with 100mm Rockwool.

49.4 tCO2 total
19.4 above ground, 30 tonnes of slab/footings.

120 KgCO2/m2

x 3

TIMBER FRAME
(+TIMBER BASED INSULATIONS)

Walls: Cedar cladding, 18mm spruce boards with 275mm cellulose and timber studs, 10mm Fermacell boards. Intermediate floor, 115mm stud cavity with 18mm spruce boards, 100mm cellulose insulation and 10mm Fermacell board. EPDM rubber roof, 18mm spruce boards, timber I-joist 290mm with cellulose fully filled, 12.5 mm Fermacell board.

7.26 tCO2 total
1.26-0.76 tonnes for screw piles.

40 KgCO2/m2

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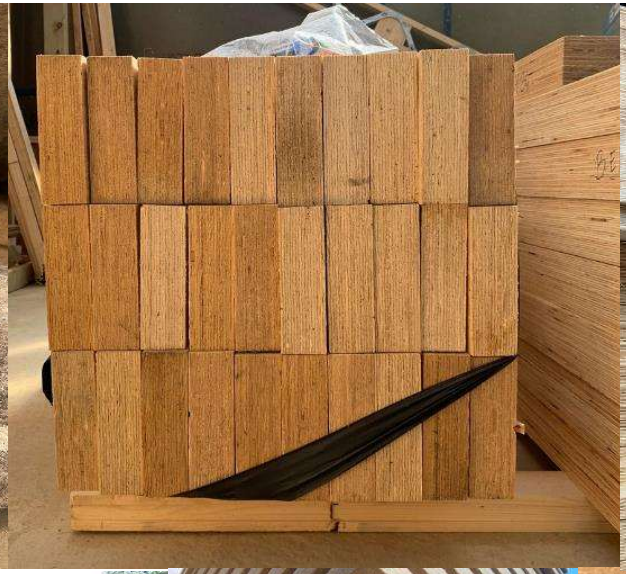
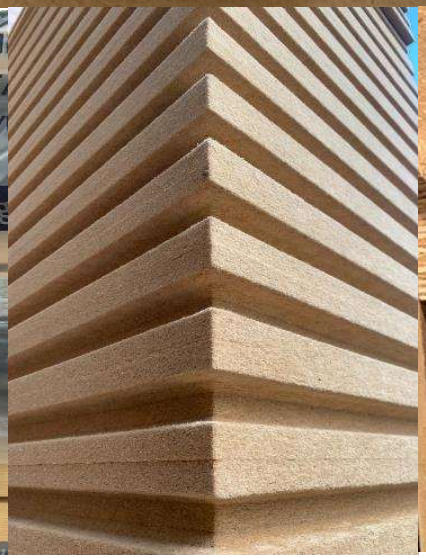
2030 CLIMATE CHALLENGE BUILDING MATERIALS AND EMBODIED CARBON





Need to grow our markets for sustainable products - support their production through purchasing and specification.

Better for the environment better for workers on site, healthier.

NET ZERO CARBON IMPACT OF FUEL CHOICE

GAS

Gas boiler + 5.5kW PV array

65tC02e over 60 years.

ELECTRIC

Air Source Heat Pump + 5.5kW PV array

12tC02e over 60 years.

5X MORE CARBON with GAS.

NOTE: A DECARBONISED ELECTRIC GRID WILL NOT SUPPORT OUR CURRENT PROFLIGATE DEMAND FOR ENERGY

2030 CLIMATE CHALLENGE UK Climate Change Committee Conclusions 2019

UK HOUSING FIT FOR THE FUTURE

From 2025 at the latest, ***no new homes should be connected to the gas grid.*** *They should instead be heated through low carbon sources, have ultra-high levels of energy efficiency alongside appropriate ventilation* ***and, where possible, be timber-framed****.*

Where properly planned and used, our homes can be low-carbon, more comfortable to live in, better for our health, and more affordable to run.

The health cost to the NHS of conditions exacerbated by poor housing is currently estimated to be £1.4 – 2.0 billion per year in England alone. The negative impacts of fuel poverty are significant and will become more critical.

2030 CLIMATE CHALLENGE INNOVATE WITH SIZE AND OWNERSHIP MODELS - AFFORDABILITY

Thirty-eight square meter ‘tiny’ homes.
Meeting all the 2030 criteria for sustainable houses.
Ultra low energy demand, high quality.
From Passivhaus Homes Ltd. Using the PH15 System.

2030 CLIMATE CHALLENGE DIVERSE BENEFITS TO BE VALUED

"You could hear the raspiness in her cough... she doesn't suffer from that anymore — since we've been here, she doesn't cough in the night." Passivhaus Plus Magazine

Mitigate Climate Change

Eliminate Fuel Poverty

High Comfort

Improved Health

Extended Durability

Low bills