



Information sheet No. 32

Simple guide to retro fitting our homes to make them zero carbon.

Back in 2018 The Intergovernmental Panel on Climate Change, (IPCC) warned the world that we had only 12 years to prevent catastrophic damage from a changing climate. World average temperatures are rising due to increasing carbon emissions and any increase above 1.5 degrees C would trigger far worse effects than previously thought in terms of droughts, poverty for many people, extremes of weather and catastrophic loss of biodiversity. We are now in 2022 and have just 8 years until the “tipping point” of 2030 is reached, yet CARBON EMISSIONS ARE STILL RISING.

The U.K. has 28 million homes, and the majority were built before much thought was given to energy efficiency, heating costs or carbon emissions. They are responsible for 25% of all the energy used in the U.K. Retrofitting our homes to make them more comfortable, warmer in winter and more energy efficient needs to be addressed urgently.

Church Stretton Town Council declared a Climate Emergency in 2019 and are working towards setting their own targets to carbon neutrality in keeping with many other local authorities.

What follows is a brief and simplified guide to retrofitting our homes. For a comprehensive guide see the “Net Zero Carbon Toolkit” produced jointly by The Forest of Dean, Cotswold and West Oxfordshire District Councils. <https://www.westoxon.gov.uk/environment/climate-action/how-to-achieve-net-zero-carbon-homes/>

Retro fit can be carried out:

- during routine maintenance and repairs.
- when taking measures to reduce energy consumption, e.g., improving insulation, replacing a boiler.
- making improvements such as a new bathroom, kitchen or conservatory.

But rather than undertaking tasks piecemeal, consider if it is possible to use them - as steps towards the Zero Carbon goal - in an integrated and long-term plan to improve insulation and energy efficiency. Every house is different. There is no one fit all approach. Consider the building fabric, services available, who lives in it and their needs, the surrounding environment. Consider the construction of the house and its age. Solid or cavity walls, roof style, loft or room in loft. The home is a system with interactive elements, e.g., improving loft or wall insulation could in some circumstances create damp issues. Such possibilities need to be identified first.

A full retrofit can be expensive and disruptive but is necessary if carbon emissions reduction targets are to be met. The best time to consider this work is before an existing property is occupied but this is not always possible and retro fit may need to be done room by room. The starting point might be for an EPC survey (Energy Performance Certificate) to be undertaken. This will superficially look at construction, existing levels of insulation, lighting and heating efficiency and give an efficiency rating, A = very good, G = very poor. This survey will also provide some basic recommendations as to the improvements that can be made **but in many cases a specialist survey is advised**. The U.K. average E.P.C. is currently D. The Government Future Fit Building Standards is likely to see existing homes subject to higher standards and new homes expected to produce 75—80% lower carbon emissions by 2025. (From April 2020 all rented property requires a minimum EPC of E, though there are some exceptions.)

At this point some notes of caution are added. A plan as to the programme of work is needed and although some of the above measures can be relatively straightforward to install, done incorrectly without specialist knowledge they can become the cause of future problems.

- The fabric of older properties needs to breathe to prevent the build-up of moisture (condensation) inside. Making them airtight and warmer without proper ventilation could be a recipe for disaster.
- The sloping ceilings of rooms in roof spaces will need special attention to ensure there is an air flow between the upper side of the ceiling and the underside of the roof, so it is usually necessary to add insulation on the inside of the ceiling.
- Suspended timber and uninsulated concrete floors are a source of considerable heat loss and need specialist attention.

Older properties may have solid walls. Though it is less disruptive to insulate these externally, the materials used must be breathable and done in such a way that cold spots are not created and rainwater discharge from the roof is still effective. “Whenever you fit solid wall insulation to a building you need to take account of water vapour to make sure that you don’t create new damp problems in the future. This may involve using “breathable” insulation materials that will allow the vapour to carry on permeating the walls, or it could involve creating a continuous vapour barrier to make sure no vapour can get into the walls from the inside. You will need an experienced specialist installer to develop a moisture control strategy that is specific to your building.” (*Energy Saving Trust*)

If considering external insulation, planning permission may be required so the advice is check with your local planning authority.

To be efficient, heat pump heating systems run at a lower temperature than traditional oil or gas

boilers so should not be installed until the property is well insulated to an EPC rating of ideally C or above. (These systems work best with underfloor heating though oversizing radiators may be a solution. See SCC Information sheet No. 27.) The Clean Heat Grant supports Heat Pump installation and, in some circumstances, biomass heating with a one-off grant of £4,000 - £5,000.

Unfilled cavity walls should have the cavity professionally inspected to ensure the cavity is not too narrow (less than 50mm) and is clear of debris which can cause a moisture bridge. The outer wall should not be prone to rain penetration and any loose render repaired first.

When modern energy efficient and draught-free glazing is installed, unless you are installing a mechanical heat recovery system, sufficient trickle vents should be added to encourage some air flow. Care needs to be taken to ensure that, as new windows are fitted, there are no gaps in cavity wall insulation around the revealed openings. Any gaps will cause cold spots and be a cause of possible condensation.

New properties should be built to high insulation standards but to date will generally not be of zero carbon or Passive House standard. * Such properties need to be very well insulated, airtight and with professionally installed mechanical heat recovery and ventilation systems. Such homes need minimal heating in winter but may become over heated by thermal gain in summer without some form of shading.

When retro fitting an existing property to PAS 2035 and Passive House standards * it is strongly recommended that specialist advice is sought in order that each stage of the work done compliments each other. Not all architects are retro fit knowledgeable, not all builders have the necessary training, not all heating installers understand the challenges of older properties and not all building material suppliers carry the appropriate stock.

In older properties materials were sometimes used which today are considered hazardous (e.g., asbestos, lead and lead paint etc.) Architects are unlikely to take responsibility should such materials be present, and the property owner should exercise caution. An example of this is when removing certain makes of clay floor tiles which may be found to contain asbestos (new information sheet being drafted).

** The 5 Passive House principles: thermal bridge free design, superior windows, ventilation with heat recovery, quality insulation and airtight construction. (Passive House Institute.)*

When retro fitting an existing property, the following areas should be considered.

Loft insulation, wall insulation (if solid either internal or external) cavity wall insulation, existing ground floors insulation (solid / suspended), windows, ventilation and internal air quality, lighting, heating and hot water generation, renewable and low carbon technology ie photovoltaic panels and solar hot water, water usage and rainwater water storage.

It is important to plan work in a logical order to avoid potential problems and reduce overall costs.

- ***If you are changing your electricity supplier*** switch to a 100% renewable supplier
- ***If replacing a boiler,*** improve the home insulation first so the new heating system is not over specified
- *Is this the time to consider an air or ground source heat pump? (Insulation should ideally be at least EPC standard C)*
- *If initially unable to install a heat pump ensure any new radiators are suitably sized and cupboard space for a hot tank, control gear etc. anticipated*
- ***When improving insulation*** consider the new ventilation and breathability characteristics of the materials used
- *Anticipate the requirements for airtightness, shading and possible mechanical ventilation and heat recovery*
- *New windows should be installed before any external insulation*
- *If adding insulation to solid floors this would be the time to consider underfloor heating pipe work*
- *If external insulation is considered, guttering will need to be repositioned, possibly replacing with deeper sectioned to cope with expected heavier rainfall and effective rainwater discharge off the roof into the guttering must be planned. Down pipes will need to be moved. This may also be the time to consider underground filtered rainwater storage.*
- ***If the property needs re-roofing,*** this is the time to consider solar hot water and P.V. and any strengthening required.
- *Maximise use of any scaffolding to combine measures.*
- ***In possible flood zones*** take advantage of major internal work to consider one way toilet and wastewater valves, raised electrical sockets and floor tiles instead of carpets.

Recommended further reading:

- The Carbon Co-op <https://carbon.coop/>
- Energy Saving Trust <https://energysavingtrust.org.uk/>
- Centre for Alternative Technology <https://cat.org.uk/>
- Herefordshire Green Network <https://hgnetwork.org/>
- Passive House institute <https://passivehouse.com/>

- PAS 2035 standards <https://www.trustmark.org.uk/ourservices/pas-2035/>
- Greening our Existing Homes <https://www.fmb.org.uk/resource/greening-our-existing-homes.html>
- Centre for Sustainable Energy Bristol <https://www.cse.org.uk/resources>
- Hazardous building materials <https://www.hse.gov.uk/construction/healthrisks/hazardous-substances/index.htm>
- Sustainable Traditional Buildings Alliance Responsible Retrofit Wheel

<https://responsible-retrofit.org/greenwheel/>

- Historic England energy efficiency guidance

<https://historicengland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings>

- Green Register website—where to find constructional professionals

<https://www.greenregister.org.uk/>

- Green Building Forum—tips, discussion. Inside info from real green professionals

<https://greenbuildingforum.co.uk/>

- Green Building Encyclopaedia

<https://greenbuildingencyclopaedia.uk/>

Finding Contractors

- Trustmark website <https://trustmark.org.uk/homeowners>
- National Insulation Association <https://www.nia-uk.org/find-an-installer>
- Microgeneration Certificate Scheme

<https://mcs-certified.com/installers-manufacturers/>

Funding (means tested)

Home Upgrade Grants Scheme (HUGS) Central Gov. Funding

LEA led schemes, mostly off gas properties, wall and roof insulation, low carbon heating, heating controls

Energy Company Obligation (ECO)

Cavity wall, party wall, loft, underfloor insulation, replacement mains gas boilers (only if with other measures) new gas central heating.

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