



What are Natural Building Materials?

We define 'natural materials' as:

- Materials that are abundant or renewable, with minimal processing and therefore low-embodied energy.
- Materials that are healthy, non-toxic and part of a continuous life-cycle: easily reused, recycled or returned to the earth.
- Materials that are sourced responsibly, with minimal ecological damage and preferably part of a regenerative land stewardship.

Examples: woodfibre, hemp, sheep's wool, cellulose, cork, timber, lime, straw, earth, clay, natural paints, and more..



ACAN is a network of individuals within architecture and related built environment professions taking action to address the twin crises of climate and ecological breakdown.

Mailing List

Visit the ACAN website & sign up for the ACAN mailing list to hear about what we're up to:



www.architectscan.org

Events

We run free monthly events on Natural Materials. You can access past events on the ACAN Youtube channel: www.youtube.com/c/ArchitectsClimateActionNetwork

Resources

- AECB - Information, courses and a UK directory of environmental designers, consultants and builders
- ASBP - The Alliance for Sustainable Building Products
- Centre for Alternative Technology (CAT)
- Earth Building UK & Ireland (EBUKI)
- Straw-Bale Building UK (SBUK)
- Sustainable Traditional Buildings Alliance (STBA)
- Scottish Ecological Design Association (SEDA)
- Old House Eco Handbook

Hempcrete: UK Hempcrete, The Hempblock Company

Lime: Lime Green, The Limecrete Company

Woodfibre: Steico, Pavatex / Unity Lime, Ecological Building Systems

Sheep's wool / Hemp Fibre Insulation:

Thermafleece, Sheepwool, Blackmountain, Indinature

Cellulose Insulation: Thermofloc, Warmcell, Steico, Pavatex

Natural & Sustainable Building Materials Suppliers (also great sources of information):

- | | |
|-----------------------------|---------------------|
| Back to Earth | Kind Supply |
| Celtic Sustainables | Lime Green |
| Chalk Down Lime | Mike Wye |
| Cornish Lime | Old House Eco Store |
| Ecological Building Systems | Passivhaus Store |
| Ecomerchant | Ty Mawr |
| Green Building Store | Wormersleys |

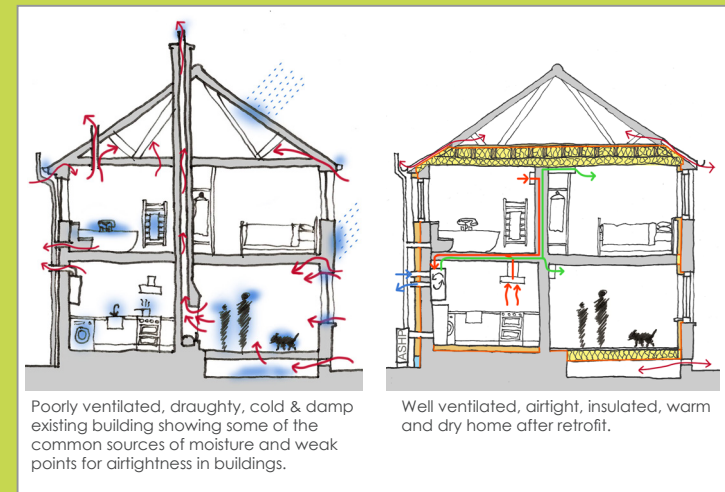
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How should we retrofit our homes?

To make the biggest energy savings and create a healthy home, retrofit projects should take a "fabric first" approach by prioritising:

- Fixing defects like leaking gutters and damaged roofs
- Improving airtightness to minimise draughts and heat loss
- Ventilating properly for the health of occupants, the building, and the environment
- Providing a continuous layer of insulation around the entire building using natural materials to keep heat in without trapping moisture
- Upgrading the heating system with a low-carbon solution.



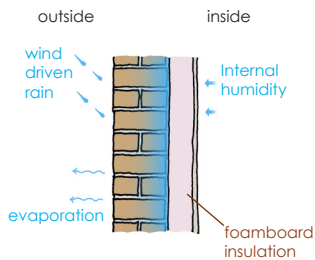
Poorly ventilated, draughty, cold & damp existing building showing some of the common sources of moisture and weak points for airtightness in buildings.

Well ventilated, airtight, insulated, warm and dry home after retrofit.

If you go hiking in the hills you want to have a waterproof, windproof & breathable jacket that keeps you dry, avoids wind-chill, and doesn't trap moisture from sweat. If it's cold, a breathable fleece under the jacket will help keep you warm.

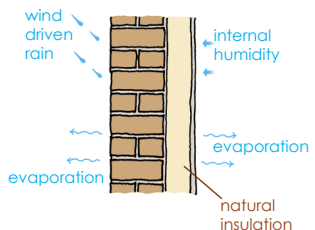
Treat your house the same, by making it airtight to minimise draughts, and add natural insulation to keep it cosy and warm! Using breathable materials avoids trapping moisture, which can happen when you use plastic/spray foam insulation and impermeable vapour barriers.

Why are natural materials so important for retrofit?



Conventional systems use vapour closed insulation such as foamboard with a vapour barrier to stop moisture getting into the existing structure.

Wind driven rain and internal moisture passing through weak points in the vapour barrier can become trapped behind the impermeable insulation and build up over time.



Natural insulation like woodfibre and hempcrete can absorb water vapour when it's humid and release it safely when it's drier when used with breathable natural paints and finishes. Moisture is not trapped, but evaporates away.



Improve Airtightness

Improving airtightness is one of the best ways to save energy in your home!

Seal up any chimneys, around leaky windows/doors and gaps around services such as pipes as a first step.

Aim for a continuous airtight layer with no interruptions, ideally on the inside of the insulation. Make sure to use a vapour open or variable (sometimes called smart) airtight membrane, its even more important to use a vapour open airtight layer if its on the external side of the insulation.

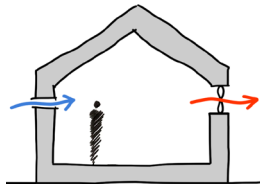
Ventilation

Ventilation is key for good indoor air quality and a healthy building! Extract fans running on a timer from light switches with trickle vents are not enough to properly ventilate even a moderately airtight building to create a healthy internal environment.

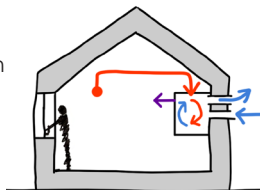
You can make a start by unblocking trickle vents or installing humidity controlled air inlets. And make sure any airbricks under suspended floors are clear from obstruction to allow ventilation to dry the space.

Ventilation systems for high air quality:

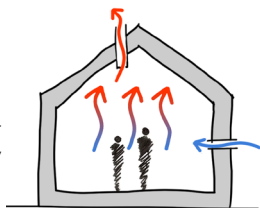
a. Humidity controlled extract fans in wet rooms (bathrooms, kitchen, utility, etc.) that run continuously at a low background rate with a humidistat controlled boost mode. This avoids over-ventilating and losing heat unnecessarily by only ventilating at the rate needed.



b. Whole house Mechanical Ventilation with Heat Recovery (MVHR). This needs careful design and commissioning, can be the lowest energy option, but is expensive, and filters need replacing every 3-6 months. And you can still open windows when you want to.



c. Humidity controlled passive stack ventilation which uses rising warm air to drive ventilation without using any electricity.



Insulation

Aim for a continuous layer of insulation with no interruptions (thermal bridges) using natural insulation and breathable finishes to avoid trapping moisture and causing damage to the existing structure.

Use flexible/loose fill insulation between timber joists, roof rafters, and wall studs, which easily fully fills the spaces between timbers without air gaps.

Use semi-rigid boards, such as woodfibre or cork either side of timber and masonry structure. Insulation can also be cast such as Hempcrete or insulating lime render/plaster, particularly on masonry and between timber framing.

Lofts

(1) Lay 300mm insulation between and over ceiling joists in alternating layers, with an airtight breather membrane and loft boards over for storage. Make sure roof and wall insulation connect - but don't restrict ventilation to the loft.

Pitched Roofs

If the tiles or membrane need replacing or you can afford to lift and replace the roof, insulating between and over rafters is better, but it does raise the roof height.

(2) When insulating between and below rafters from inside, always ensure a 50mm air space is maintained between the top of the insulation and roofing felt/sarking boards for ventilation to the loft. This can be done by fixing 50mm battens either side of rafters to create the ventilation space.

Walls

External Wall Insulation (EWI) is less disruptive than internal but can affect the appearance of a building and you may require planning permission. Make sure eaves and window cills etc. are deep enough, or can be adjusted, to suit the increased wall depth.

(3) Internal Wall Insulation (IWI) doesn't need planning and is better for thermal comfort as wall surfaces will be warmer. Take care not to add too much IWI as it makes the existing wall colder and can cause moisture problems.

Cavity Walls

We only recommend retrofitting Cavity Wall Insulation (CWI) if you are also adding EWI, never combine CWI with IWI. Retrofitting CWI on its own can lead to moisture problems, follow guidance from the NIA. Use a polystyrene bead system or consider cork granules / mineralised woodchip as a more sustainable material to use above DPC level.

Floors

(4) Insulate between joists in suspended timber floors from below if accessible, or from above by lifting floorboards. Support insulation with a vapour open airtight membrane to avoid a draughty floor.

Install rigid insulation over existing solid floors - even 10mm of cork will make the floor feel warmer. If you have the budget, you can dig up existing solid floors to install a fully insulated floor. A limecrete slab over compacted foamglas aggregate is a breathable solid floor option.

Windows & Doors

(5) Replace old windows and doors with triple glazed or high performance double glazed timber framed units.

Triple glazing feels warmer so is more comfortable, and is better at keeping noise out.

Avoid overheating in summer by not adding large windows. Consider adding external solar shading, it is more effective at preventing overheating than internal blinds.

Heating & Renewables

Invest in an appropriate low carbon heating system such as an Air Source Heat Pump (ASHP) with underfloor heating. There are other options and ASHPs can also work with radiators if they're sized correctly.

Consider renewable technologies such as PV solar panels, but this is normally only worth investing in after all other improvements to the building have been done!

