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Internal Wall Insulation

Most of the houses we live in now will still be homes decades from now. However, it will be difficult for us to meet their current heating demand with only renewable energy. For us to make a zero carbon future possible, we must therefore take measures to improve old houses. Effective external and internal wall insulation techniques are a vital part of this.

For some older houses that have very thick stone walls, internal insulation may be more suitable than external cladding. It may also be appropriate if your house is in a conservation area, with restrictions on changing the appearance. Sometimes it's necessary because narrow streets and pavements leave no space for external cladding. Internal insulation can be practical as part of a spread out retrofit where you are upgrading your home in stages.

Inside and out

You may find that a combination of internal and **external wall insulation** will work well. This could be partly to satisfy planning permission requirements, but also for practical reasons. For example you could use internal wall insulation at the front if you can't change the existing façade. But you could switch to external insulation for a mostly blank side wall.

Internal insulation may be impractical if a staircase runs alongside the external wall – because it would make the stairway too narrow. You must overlap the insulation when externally-insulated and internally-insulated walls meet. If you don't you'll get a 'cold bridge' at this corner – a weak point in terms of heat loss. To prevent this, continue the internal insulation layer around the corner to give an overlap of around 300mm to 600mm. This will leave a step in the wall, so you could add a bookcase or some other detail to give a tidy finish.

Choosing insulation materials

Conventional insulation panels are slabs of mineral wool or plastic foam. We promote low-impact alternatives made from natural fibres because these involve lower pollution and energy use in manufacture. Natural materials should also be easier to recycled or dispose of at the end of their useful life. In addition, natural materials tend to promote breathability and this is often vital for older homes. Natural low-impact internal wall insulation options include wood fibre boards, hempcrete, or perhaps fluffy insulation batts within a timber framework. Rigid wood-fibre insulation usually comes as a package – including screw & plug fixings, mesh, membrane, and renders.

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Using a system like this should ensure the materials are compatible, so you don't get cracks and damp ingress.
Hempcrete is a mix of hemp fibres with a lime binder. The hemp and lime mixture can be sprayed on, or hand-filled behind wooden shuttering, with timber uprights for structural support. Experimentation is going on into the use of other fibres (such as miscanthus grass) and other binders (such as clay). You could perhaps use fluffy insulation like sheep's wool or hemp batts within a timber framework. You can't just put these materials against a cold wall – you need an approach to protect from damp. A layer of cork is a possible solution.

Risk management
Some types of plastic foam insulation can be thinner than natural materials for the same insulation value. However, there are risks from using an impermeable layer on an internal wall. Moisture build-up within the wall could eventually result in damage to the building fabric and the insulation. Check if the insulation you plan to use is certified for use without a vapour control layer (VCL). Foil-backed plasterboard is sometimes used to give a vapour control layer on the warm side of the insulation. However, it's hard to get continuity to this layer with all the joints, and this could cause problems. It may be better to have a separate membrane as the VCL and then a standard plasterboard or other finish.

A thick insulation layer can bring the dew point of the wall too far inwards. This leads to the risk of interstitial condensation where moisture condenses somewhere within the wall. It is possible to make a technical case under building regulations to justify an insulation layer slightly below standards. For example to propose the use of a breathable material that will not cause damp problems in an old building. As part of a well-planned retrofit, this can still perform well. It may also be worthwhile to put in some monitoring to keep track of damp levels.

Air-tightness
When using boards you should fix them over a continuous plaster coat for a good air-tight finish. This is much better than the standard 'dot and dab' method of attaching boards. The dot and dab approach leaves lots of air movement in the air gap, which leads to heat loss. If the existing internal finish is a breathable lime plaster then this could be left as the continuous layer. However, you'd really want to remove gypsum plaster and add a new breathable layer before adding internal insulation. To get to really good levels or air-tightness you'll need some good quality tape to use at edges and joints. Although this tape is expensive, it's useful where strength is needed – at window reveals, corners, and so on. At some flat junctions you could perhaps use a cheaper foil tape (the type for sealing insulation to pipes).
Adding a continuous insulation layer internally will involve cutting away the perimeter of any intermediate floors. Otherwise you'll get air leaks and heat loss from the 'thermal bypass' due to the uninsulated strip left between floors.
You need to pay careful attention to where floor joists run through the insulation layer and into the cold wall. Seal with tape where the joists go into a wall, then add the insulation layer cut to shape around the joist, and then tape the insulation layer to the joist.

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