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Sanctuary

ISSUE 55

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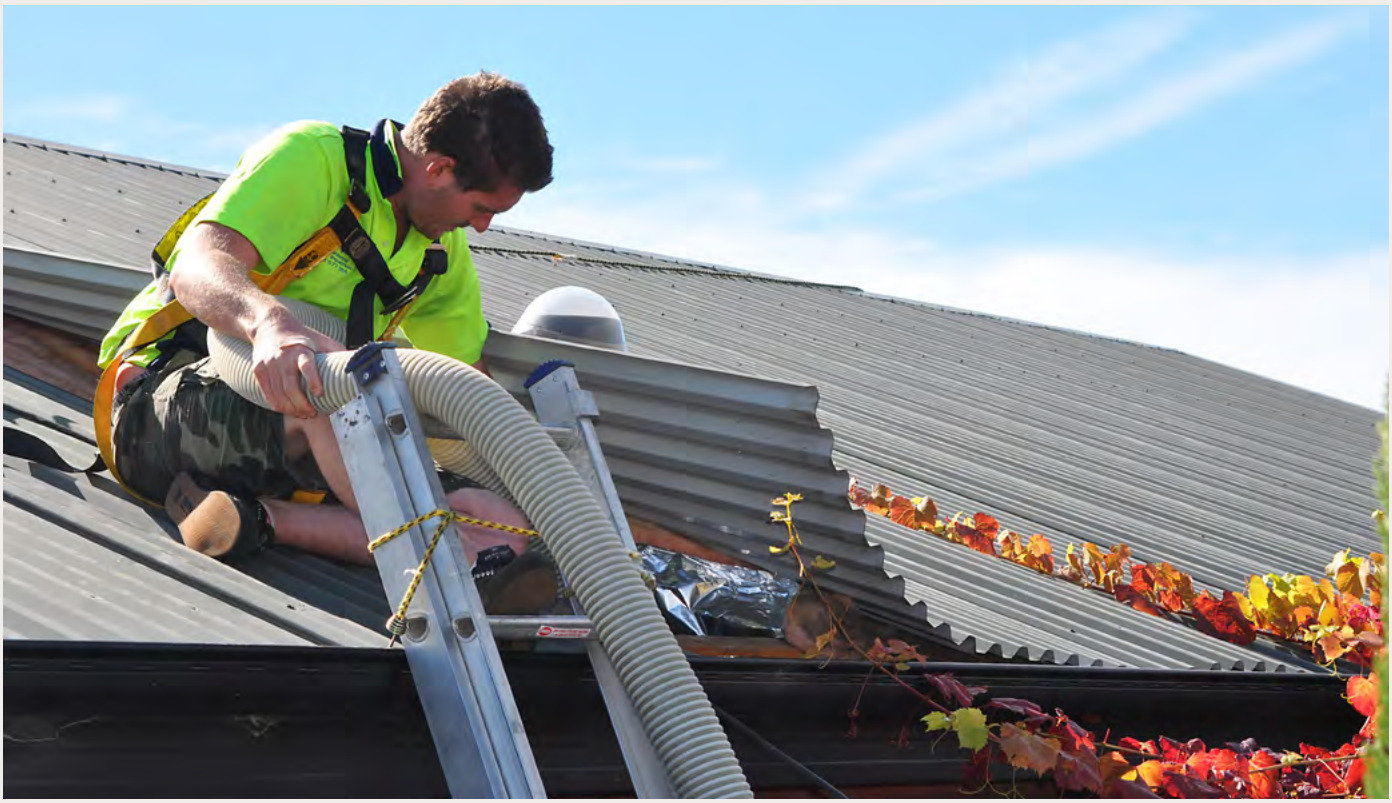
FROM CAVITY TO COSY:
Retrofitting wall insulation

WORDS Richard Keech



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The most common approach to retrofitting insulation into walls is blowing a loose-fill insulation product into the wall cavity, either via holes in the external cladding or internal lining or, where feasible, down from the top of the wall. Here, an installer carefully lifts roof sheeting to pump Insulbloc recycled polystyrene insulation into a wall cavity. Image: 4 Seasons Home Insulation

Retrofitting insulation to existing walls can be a tricky proposition, but the thermal benefits are well worth it. Energy efficiency expert Richard Keech explains how to do it.

Everyone knows that insulation is a good thing to have. Most Australian homes now have at least some insulation in the ceiling, but if your home is more than around 25 years old, it's likely that the walls will be uninsulated. So just how big a problem is this? And how do we fix it?

Before diving into how to retrofit wall insulation, it's worth taking a step back to consider the importance of insulating the different parts of the home. According to *Your Home*, for an uninsulated house, the percentage of winter heat loss that can be expected through the ceiling is 25 to 35 per cent, through walls 15 to 25 per cent, through windows and floors 10 to 20 per cent each, and via air leakage 15 to 25 per cent.

The easiest, cheapest and, happily, the most effective places to start improving your home's thermal performance are ceiling insulation and gap sealing. However, that's not the end of the story. What you do next – walls, floors or windows – is going to depend on your particular building and budget. In fact, wall insulation may be more significant than the numbers quoted above would suggest – particularly in older buildings that already have some insulation in the ceiling or

via window coverings, so the proportion of heat flow through the walls is higher. In addition, many older houses have higher ceilings and smaller windows, so the wall area is relatively greater and therefore a larger source of heat loss and gain. The net result is that, in many older homes with ceiling insulation in place, the uncontrolled heat flow through walls is likely to represent the dominant pathway.

HOW CAN WALL INSULATION BE RETROFITTED?

Retrofitting walls with insulation is more of a challenge than insulating your ceiling – and due to the special expertise and equipment needed, it's not generally a DIY option (see 'Preliminary steps' below) – but several products and installation techniques are commercially available. A popular approach is to blow loose-fill insulation into the wall space. Less common, but a good option if your cladding or plasterboard needs replacing anyway, is to remove the external cladding (for example, on a weatherboard home) or the internal plasterboard and install wall insulation batts. A couple of other techniques are also possible, such as adding an insulated lining over the interior face of the existing wall. [*Ed note:* Another option, which is a significantly larger intervention and beyond the scope of this article, is to add a layer of insulation plus new cladding to the outside of the existing walls; see p35 for a renovation project that employed this technique.]

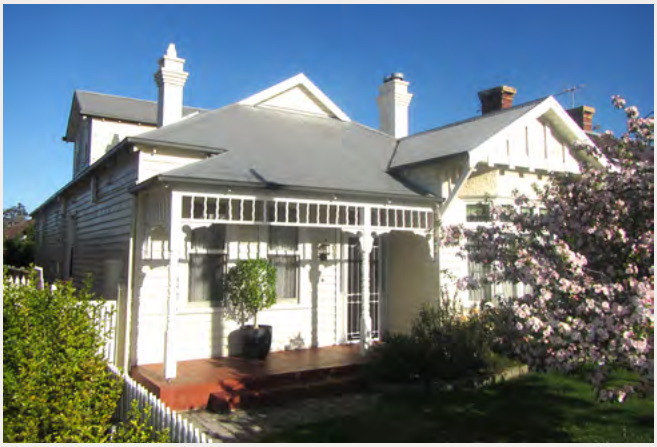
The main game: loose-fill insulation

The most common approach to retrofitting insulation into walls in Australia is to blow in a loose-fill insulation product such as Knauf SupaFil CarbonPlus or Insulbloc by 4 Seasons Home Insulation. Specifically made for this purpose, the loose-fill insulation is blown in through a hose. It doesn't generally lend itself to DIY because of the need for special expertise and a pneumatic blowing machine (though in some circumstances Insulboc can be poured in from the top of the wall rather than blown in, a job that could be tackled by experienced DIYers).

SupaFil is made of glass fibre and is silicone-treated to be reasonably hydrophobic, so it doesn't absorb water out of the air, doesn't support microbial growth and is non-scratchy. However, if large amounts of water get in and wet the material through, then it will clump and lose much of its insulation effectiveness. Insulbloc is made of 12-millimetre cubes of recycled polystyrene foam, treated to be fire-resistant; its effectiveness is not significantly affected by moisture.

The insulation can be blown in through small holes drilled in the wall or, in some cases, from the top of the wall cavity. Which method is used depends on your house construction type (weatherboard, brick veneer or double brick), your roof type, the location (for example, the part of the wall under a window will always need holes drilled) and the manufacturer's recommended installation procedures.

Where holes are being drilled, these can be through internal plasterboard or, more commonly, the external wall surface. From the installer's point of view it is usually easier to do the job from the inside, and in some cases it's the only viable option, such as for double-storey homes, those where access to the outside wall is difficult, and especially where cladding may contain asbestos. This method is also preferable if the wall contains building wrap in good condition. However, many homeowners are not keen on the disruption of installers working inside. The need to patch and repaint the holes is a significant factor in the difficulty of the overall process, and the choice may come down to how the timing works with respect to painting and decorating. If you've just painted the outside of the house and redecorating the inside is on the radar, then drilling holes through the internal walls may be the better option.



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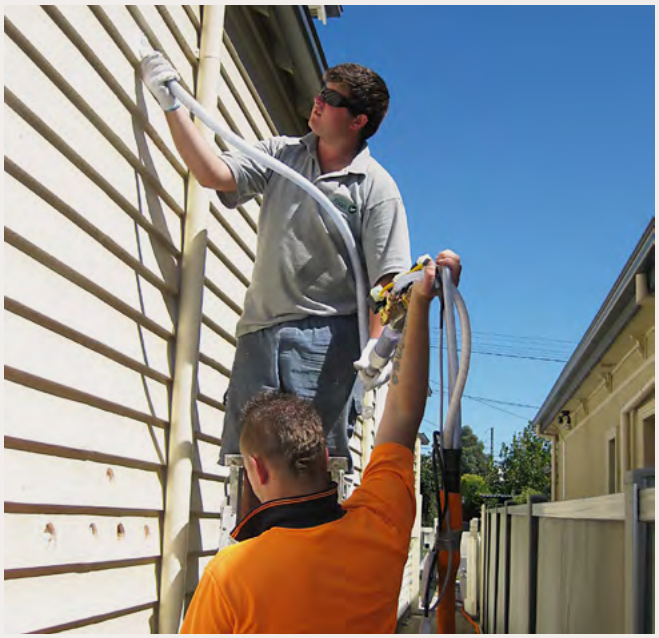
Through the walls can be the dominant pathway for heat loss in older houses like Richard's, as high ceilings and small windows mean that the wall area is relatively greater, and there is often ceiling insulation already in place.

In weatherboard walls, the holes can be patched with either timber plugs or with a durable filling compound. In brick walls, the holes are drilled through the mortar and corners of the bricks, and patched with a suitable grouting compound. Repairing the holes in interior plaster would use standard plaster patching techniques; the main concern is achieving a high-quality finish, so that when it's painted no obvious evidence of the hole remains. So, this might not be a job for a DIY beginner.

Brick veneer: Homes with brick veneer walls are well suited to blow-in wall insulation, because the gap between the bricks and the stud frame is normally continuous. This means that, if the loose-fill material is introduced at the top, then it can fall down the cavity and fill up the wall entirely – except underneath windows. However, if the existing stud frame already has sarking fitted, then only the gap (typically about 50 millimetres) between the sarking and the bricks can be filled. A brick veneer home with a tiled roof is the ideal case, because access to the wall cavity can often be gained by simply pushing some tiles out of the way. For such houses, the number of holes to be drilled will be very few.



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Blow-in wall insulation is frequently installed through holes drilled in external weatherboards, which are then patched and painted.

Double brick: These walls are usually constructed with an air gap between the two layers of brick which can be filled with insulation in the same way as a brick veneer wall. However, some older double brick walls have no cavity. Identifying whether a double brick wall has a viable cavity isn't always easy.

Weatherboard: Timber cladding on a stud frame wall requires a larger number of holes, as one must be drilled in each frame section: the horizontal noggins prevent the insulation from being able to fill the entire wall cavity from the top. Usually one row of holes is required about halfway up the wall and another one at the top. Be careful: the cladding on older homes may contain asbestos; get it checked by a professional before you start.

What level of insulation will you get?

Fitted properly, each 39 millimetres of thickness of SupaFil will add R1 of insulation value to a wall. So, in a typical 50-millimetre gap within, say, a double brick wall, this will add R1.3. In a 90-millimetre stud frame wall it will add R2.3, which compares well with standard wall insulation batts. This assumes that complete coverage is achieved and settling is minimal, which in reality can be tricky to do. Insulbloc can achieve up to R2 in a 50-millimetre cavity and R3.6 in a 90-millimetre one.

The gold standard: external recladding or internal relining

This 'gold standard' approach for retrofitting insulation applies to homes with timber or other easily removed cladding. For these homes, it is possible to remove the external cladding and install batts and sarking, bringing the home up to the standard of a well-built new house. Similarly, there will be cases where the most appropriate approach is to remove the internal plaster and fit insulation from inside the house.

Clearly this approach involves the largest amount of work and isn't usually necessary. However, it may be appropriate in certain situations, such as where the existing weatherboards or internal plaster are damaged. If the cladding or lining is being removed in any case, then don't use loose-fill. Instead, take the opportunity to insulate in the manner of a new build. This will give better insulation results, fewer issues with visible vestiges from patching holes and often the ability to fit a good vapour-permeable wall wrap (older weatherboard homes usually don't have a wall wrap to start with).

Here's how it would be done for a weatherboard home, if access from the outside suits best:

- Remove all the weatherboards to expose the open stud frame;
- Install insulation batts (polyester, ideally with a high recycled content, or glass fibre). You can expect to fit batts with an R-value of 2.5 to 2.7 in a typical older home wall. Don't use ceiling batts, as batts made for walls are stiffer and hold themselves in place better;
- Fit vapour-permeable sarking (wall wrap) over the outside of the stud frame; and
- Refit cladding and repaint.

Another way: insulated plasterboard

Some situations may not suit either loose-fill or recladding. In such cases, another possible approach is relining the internal walls using an insulated plasterboard fitted over the top of the existing wall lining. A couple of products are available to do this, including Kingspan Kooltherm, which consists of rigid foam sheet bonded to plasterboard and comes in a range of thicknesses from 35 millimetres (R2.1) to 90 millimetres (R4.8). This is a quality product, but is expensive.

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The gold standard for retrofitting insulation to existing walls involves removing the external cladding or internal lining and installing batts. In this way, thermal performance equivalent to a well-built new home can be achieved.

Retrofitting internal walls with insulated plasterboard has the advantage that it can be done by a single trade fairly quickly. It avoids issues related to electrical wiring and patching holes. However, the downsides are the material cost, and the need to reinstall power points and retrim around windows, doors, cornices and skirting boards. There are also the considerations of repainting and of the small reduction in useful room volume that comes with thickening the walls.

PRELIMINARY STEPS

Ready to take the plunge? Prior to retrofitting insulation, you'll need to do a couple of things.

First up, you'll need to determine whether there is any insulation in the walls already (thermal imaging can help with this) and the installation approach that will work best for you. This might be done as part of a thorough independent home assessment or as part of a quoting process for installing wall insulation. Either way, this should include an inspection of the internals of the wall.

In the course of a professional assessment, the assessor might look inside the walls via power points, the top plate of the wall from within the roof cavity or by careful shifting of a roof tile, the bottom plate of the wall from underneath the home, a photographic record taken during construction, and/or thermal imaging. *Note:* don't go sneaking a look behind power points if you're not qualified.

Second, you'll need to ensure the wiring in your walls is safe if you're installing insulation inside the walls (especially if you're planning to use a polystyrene product like Insulbloc, as polystyrene can react with the PVC coating on electrical wiring in some older houses). The capacity of the wiring depends, among other things, upon whether the wire is loose within the void of the wall cavity or enclosed in insulation. All other things being equal, adding insulation will lower the power an electrical circuit can safely carry. This may or may not be a problem. In any case, it will need to be professionally assessed prior to fitting insulation, and is yet another reason why retrofit wall insulation isn't really a DIY activity.

THE BENEFITS ARE WORTH THE WORK

While wall insulation is more challenging to install than ceiling insulation, it's well worth the effort. In my own home in suburban Melbourne, I sealed gaps and retrofitted insulation to ceilings, floors and walls between 2007 and 2013. The result was transformational, reducing the home's underlying energy consumption by 75 per cent while increasing thermal comfort. The wall insulation was done towards the end of the process, and the winter after we did it, my teenage daughter told me how happy she was that she no longer needed to get dressed for school under the doona! For me, this brought home the importance of addressing all the heat flow pathways in our homes. Ⓢ

FURTHER READING

'The key to thermal performance: Insulation buyers guide' in *Renew 140*

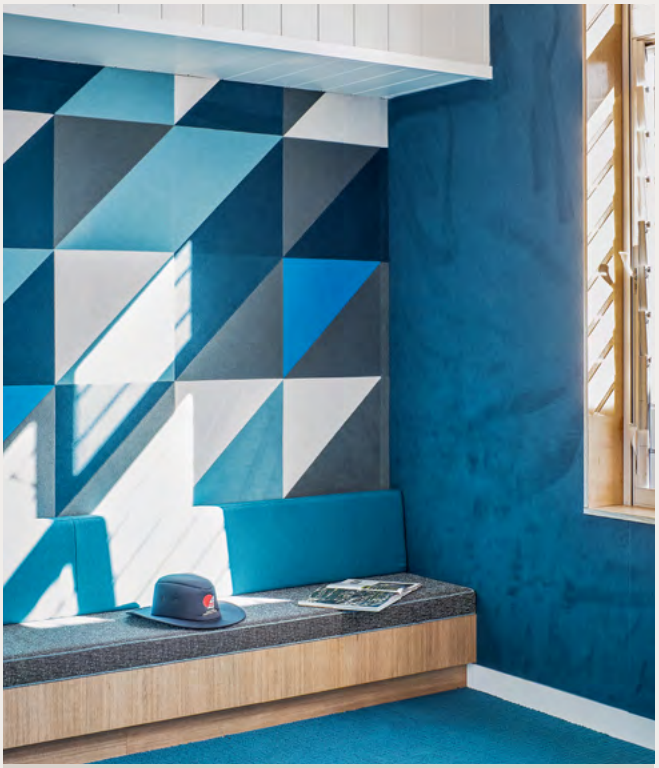

Image: Autex Australia and Angus Martin

DIY SOLUTIONS

These solutions don't involve changing anything inside the walls, so they're safe for DIY.

Wall hangings

If retrofitting bulk insulation is out of the question, then some benefit can be gained from large wall hangings with an air gap and/or a thermal lining behind the hanging. The use of this approach goes way back in history; for example, medieval tapestries gave some reduction in the unwanted cooling effect of otherwise uninsulated masonry castle walls. Wall hangings could be a feasible, removable, lower-cost approach when a short- to medium-term solution is called for, and might even suit some rentals. In additional to offering thermal benefits, they are a literal blank canvas for visual creativity and can improve a room's acoustics.

Acoustic tiles

A small amount of insulation benefit would come with using acoustic wall panels or tiles, such as the Autex Composition Peel'n'Stick tiles pictured above. These tiles are 10 to 12 millimetres thick, have a simple adhesive backing, and provide an insulative value of R0.22. As with wall hangings, they can also be used for visual and acoustic benefit. Such products are similar to using insulated plasterboard, but can be done DIY, and are thin enough to avoid the need to redo architraves, cornices and skirting.