Retrofitting wall insulation

Wall insulation should be fitted in almost every home, but rarely is. ReNew's policy columnist, Alan Pears, walks the talk and shows how he retrofitted his walls to improve his home's thermal performance

Only 15% of existing Australian homes have wall insulation, and most of them have just reflective foil. Foil cuts the heat flow through a wall by about 60%—if it is installed properly without air gaps and assuming it was not damaged by other tradespeople during construction.

In days gone by, builders used to ridicule wall insulation by saying the heat would just leak out through the windows anyway, so why bother. But wall insulation is much more important than most people realise.

First, the area of walls is quite large, so the reduction in heat flow is significant. Second, the temperature of the internal surface of an insulated wall is much closer to room temperature than that of an uninsulated wall, so occupants gain a much higher level of radiant comfort when the walls are insulated. Lastly, if only the ceiling is insulated, the temperature of the air near the walls is increased in winter, so that heat loss through the uninsulated walls also increases—reducing the energy saving benefits of ceiling insulation.

Adding insulation

There are not many options for adding insulation to existing walls in Australia at present. The insulation industry has tried a range of options in the past, such as urea-formaldehyde foam and polystyrene beads. But these have had their problems and have fallen out of favour.

For buildings with uninsulated brick veneer, adding insulation is fairly straightforward. A small diameter pipe can be slid into the cavity from above, and hydrophobically treated rockwool blown in. Under windows, the pipe can be inserted through a small hole drilled through the mortar between bricks. Using this approach, brick veneer walls can be very well insulated, as up to 150mm of rockwool can be pumped in to fill the spaces within the timber frame and the cavity between the frame and the brick outer wall, adding more than R2.5.

Sliding a batt into the wall. The cardboard either side of the batt makes this much easier, and eliminates the risk of coming into contact with exposed wiring.

The situation is not so simple in cavity brick walls. Often builders make the cavity narrower than the normally-specified 50mm. Mortar and other building rubbish can stop the rockwool filling the cavity properly, while the metal ties act as thermal bridges for heat to bypass the insulation. So, while adding rockwool to a cavity brick wall should add up to R1.2, it is often a lot less.

Water penetration issues

Many people are concerned about the risk of water penetration if a cavity is filled with insulation. The rockwool used is 'hydrophobic'—that means it is treated with a water-repellent coating, so it does not absorb water. CSIRO tested this insulation under extreme rain conditions and found that it generally did not increase the risk of water penetration. However, the greatest risk of water penetration occurs when raked mortar joints are used between the bricks instead of flush or ironed mortar.

Raked mortar can be recognised because the mortar surface is recessed back from the surface of the bricks, leaving a shallow flat strip of the brick sides visible. This creates two problems. First, water can pool on top of the exposed bricks, unlike flush or ironed mortar, where the water has nowhere to sit, and runs off. Second, the surface of the mortar is porous and can easily absorb water (unlike ironed joins, where the process of 'ironing' the mortar compresses the surface, reducing its porosity). Cracks in walls also increase the risk of water penetration, and should be repaired.

When the wall cavity is filled with insulation, the installer will normally check to ensure that the electrical wiring cannot overheat. Enclosing an electrical cable in insulation reduces the rate of heat loss from the cable, which can potentially overheat if it is heavily loaded for long periods. Current limiting devices can usually be fitted at the fuse box, but in extreme cases, rewiring may be necessary.

Doing the retrofit

Insulating houses that already have reflective foil in their walls is more of a challenge. And that's what got me interested in this issue. My home, like many built in the past 50 years, is brick veneer with reflective foil wrapped around the timber frame. The only way to add significant amounts of insulation is via the internal plasterboard walls. Filling the cavity between the foil and the brick walls is feasible, but as I pointed out earlier, often the cavity is a lot less than 50mm wide, and there can be a fair amount of debris in there.

Luckily, I was planning to repaint the interior of my house, so I decided to try an experiment. Using a hand plaster cutting saw and a straight piece of timber, I made two cuts above and below the noggings in the wall, 600mm apart. Noggings are the cross pieces in the framing, usually located about halfway up the wall. The 600mm distance was sufficient to leave room to slide insulation batts into the wall above and below the noggings. It so happens that you can buy strips of plasterboard 600mm wide, so if I wasn't able to reuse the plasterboard I removed, I could easily repair the wall with a standard product.

After making the cuts, I carefully levered the middle section off the wall, pulling it off the nails that had been used to fix it in place. I laid this on the floor, removed the loose plaster and repaired the holes. I also added some bracing, as this piece of plasterboard was actually comprised of two separate pieces joined together when originally installed.

Then came the installation of the batts. I used R1.5 fibreglass batts. I tried to buy R2 batts, but to my frustration they were not available from nearby suppliers. They would still have fitted into the 100mm deep framing that I have and provided a bit more insulation. A benefit of using fibreglass over polyester in this situation is that fibreglass gives a higher insulating value per unit thickness, and batts are stiffer. Concerns

After the insulation is installed. Note the small pads to support the plasterboard when it is replaced.

Bracing and patching the plasterboard strip before replacing it.

about health aspects of using fibreglass have been overcome in recent years—although I wore long sleeves, gloves and a face mask while working.

Getting the batts into the cavity

I sandwiched each batt between two pieces of cardboard, then slipped it into place. After this, I removed the pieces of cardboard. This process worked well, and avoided any risk of electrocution as the batts slipped down behind power points. As is usually the case when insulating walls, I had to add some small bits of insulation to fill the gaps between the ends of the batts and the noggings. There were some minor challenges slipping the batts around the diagonal brace in the wall, but using a few scraps of cardboard to 'lubricate' the situation worked quite well.

I then attached some small pads of scrap MDF to the back of the plasterboard on the walls between the studs, so that if someone leans on the repaired section of plasterboard they won't put too much pressure on my repaired joints. I also used a surform to taper the surfaces of the plasterboard where I was going to join the pieces—this left some space for the filler to go and (I hope) strengthened the join (plasterboard tape can be used to increase the joint strength too—Ed). Then I replaced the strip of plasterboard and filled the join with plasterboard filler.

After sanding off, it looked as good as new. A couple of coats of paint, and no-one could tell what I had done.

Since doing the retrofit, I have been in touch with CSR Bradford, who have contractors who may be prepared to offer another option. If you cut small holes in the plasterboard between the noggings (remember, you need holes in both the upper and lower halves of each space between studs), they will pump in the rockwool product. It is then your responsibility to arrange the patching of the plasterboard—either do it yourself or call a plasterer.

It seems to me that the insulation industry should develop better products to upgrade wall insulation. And maybe they could form partnerships with interior painters and decorators so that walls can be insulated when homes are being remodelled or redecorated.

In the meantime, I can now finish upgrading my house walls. ✶

The wall after the plasterboard has been replaced and filling and sanding is completed, ready for painting.

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Since his article in the last issue, *ReNew's* policy columnist Alan Pears has refined the art of plastering, as he retrofits insulation into his walls

Since my article in the last issue I have had some interesting dialogue about the art of plastering, insulated another room, and recognised that the last article may not have explained some of the subtle details of the technique I used. So here is a bit of an update.

Firstly, when replacing the strips of plasterboard removed to allow insertion of the insulation, I chose not to use paper tape over the joints. Some correspondents have suggested that over time the joints will crack and open up without tape.

I chose not to use paper tape because I was concerned that applying it over the existing plasterboard would mean that the areas of wall around the joins would be noticeably higher than the rest of the walls, making the joins more obvious. I tried to deal with the problems of future cracking and achieving a smooth wall by sanding the cut edges to remove roughness due to the fluffy paper edge (caused by the saw) and open up the size of the gap.

I temporarily put in spacers (I used nails) to create a gap between the plasterboard on the wall and the section I replaced, and forced plaster jointing compound between them. I also used a reasonable number of plaster screws to hold both the replaced section and the existing plasterboard in place, as well as installing the small stabilising blocks behind the join. As I mentioned in the previous article, my home is on a very stable concrete slab, with very little evidence of past movement.

However, I have to admit I'm not a plastering expert, and my approach may prove unsatisfactory in the longer term. I may also have overestimated the visual impact of using the paper tape. Maybe others can advise on the best approach here.

The plasterboard is cut into two sections to make them easier to handle. Small blocks of MDF are used to stabilise the new joints and screws fixed to keep the existing plaster in place.

Thicker batts

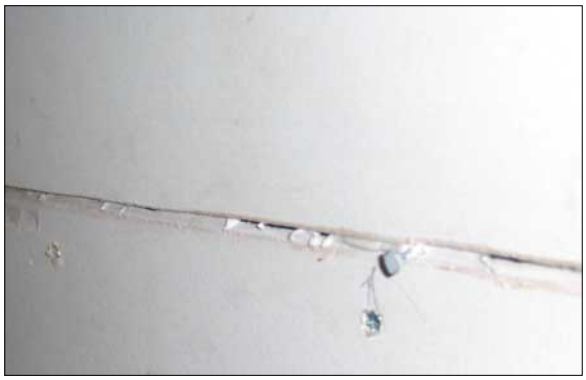
My experience in insulating another room also taught me some lessons. This time I found some fibreglass acoustic batts that were 75mm thick but, because of their very high density, had an R value of around 2.3, which is 50% higher than the R1.5 batts I previously used. Unfortunately, I found that these batts were very stiff, which made them extremely difficult to slide into the walls using my previous method.

In the end, I had to trim up to a centimetre off the edges of the batts to slide them in. I also found it difficult to slide them past the diagonal braces in the wall because they would not compress much. I found that covering them with plastic (from the bags they came in) instead of my cardboard strips made it a bit easier, and in some cases I cut the batts into smaller pieces and slid these in separately. It was much harder work than last time!

I suspect that R2 fibreglass batts of normal density might be the final compromise, but I haven't tried them. And I've run out of walls to insulate.

In general, sliding batts past diagonal braces requires putting a strip of cardboard in place in the wall over the brace, so that the batt can be slid in without catching on the timber brace. Of course, many modern houses use steel strips for braces, so this would be less of a problem.

I also found it easier to cut out sections of plasterboard half the length of the room instead of the full length. This just meant that the pieces I was removing were a more manageable size. If you



The photo shows the old nails used to create a gap, with some jointing plaster in place before the board was fixed into place. Note the extra screws used to fix the existing plasterboard firmly to the studs to minimise forces on the joint over time.

A number of chisels and strips of metal were used to gently lever the plasterboard off the wall without breaking it.

plan to replace them with new plasterboard this is probably not an issue. I used a number of chisels and strips of metal to gently lever the existing plasterboard off the existing nails and glue without breaking it at its original join. You need to be quite careful if you want to re-use the plasterboard. And before replacing it, this time I plastered paper joining tape over the back of the existing join, along the middle of the plasterboard strip I removed to strengthen it. I did this instead of putting on occasional braces as I did last time, which you have to position carefully so they don't interfere with the plasterboard sitting flat on the noggings.

Lastly, it helps a lot to make sure you have all the tools and screws that you may need close enough to reach as you balance a large sheet of plasterboard against the wall.