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ENVIRONMENT

Everything you need to know about insulating your home

Insulation is your weapon against climate change and high energy bills
— here is what you can do and how much it costs



Jonathan Bentley and Julie Scott, with their children Tristan and Virginia, had a £60,000 budget to make their home more energy efficient

ADRIAN SHERRAT FOR THE SUNDAY TIMES

Britain's homes are the oldest in Europe, with 38 per cent built before 1946. This has left many homeowners struggling to decide how best to insulate their draughty properties to increase energy efficiency, cut bills and help to fight climate change.

This was the dilemma facing Eleanor Watts, 70, and Chris Jacques, 77, in their 1930s end-of-terrace brick house in Oxford. Last year Watts, who writes textbooks, received a £50,000 lump sum from her pension pot. "Money is losing its value, so I decided to invest the whole lot in insulating the house," she says. "It's because of my grandson [Benji, 7]. I'll be dead when climate change really wreaks havoc, but he'll be alive."



Chris Jacques and Eleanor Watts see spending £50,000 on insulating their home as an investment

Watts is no stranger to energy-efficiency measures. Over the past few years she has toured the neighbourhood with a low-carbon community group to take thermal imaging photos — showing exactly where interwar homes similar to her own leak heat. When it came to fixing those leaks Watts turned to Cosy Homes Oxfordshire, a local co-operative of retrofit experts initially funded with a government grant (cosyhomesoxfordshire.org). They assessed her house, drew From April the owners of smaller homes (on council tax band A to D in England, A to E in Scotland and A to C in Wales) with an energy performance certificate of D or below could qualify for the government's new £1 billion ECO+ grants. It is expected to cover significant measures such as external wall insulation.

But who do you ask for help on what to do? The double-glazing salesman? One-stop retrofit shops offering trustworthy, independent advice are still hard to find. Search for a "retrofit coordinator" on the government-backed Trustmark website, try retrofitworks.co.uk or join the nationwide Superhomes network to get access to a retrofit report (superhomes.org.uk). A retrofit co-ordinator will advise you on the most effective measures for your house, the right order to fit them (windows go in before external wall insulation, for example) and ensure work by different contractors dovetails correctly.

Here is our guide to insulating an older home, based on the retrofits for Watts and Bentley.

External wall insulation

Houses built before 1930 typically have solid brick walls. For external insulation, a layer of insulation is fitted on the outside and then rendered over.

You have a choice between two insulation types: Rockwool, which is spun from molten basalt rock and pressed into panels, or expanded polystyrene (EPS) - a

plastic foam made from petroleum by-products, says Mark Saunders, the Cosy Homes retrofit co-ordinator who oversaw Watts and Bentley's respective projects.

"You can have the EPS a bit thinner on your walls, because it has a slightly higher insulating value than Rockwool," Saunders says. "That extra centimetre can be quite critical in terms of whether you need to extend your roof or not." Because you end up with thicker walls, you have to extend window sills as well as move gutters, electric cables, soil and water pipes — but extending the roof overhang gets very expensive.



Watts and Jacques' external wall insulation

EPS is also cheaper. For a U-value of 0.3, the standard for today's building regulations, you need 9cm of EPS (£145 per sq m, including full installation but not scaffolding), compared with 10cm of Rockwool (£175 per sq m). U-values measure how quickly heat passes through: the smaller the number, the better. In a typical Victorian house the U-value of a solid brick wall will be 2 or more, meaning the insulation would improve it almost sevenfold.

"In an average house, there's probably 100 sq m of external wall insulation, so it does add up to a £3,000 difference," Saunders says.

However, EPS on its own is flammable, although the render coat gives the required fire protection — a consideration for many homeowners after the deadly Grenfell Tower fire, which was partly fuelled by other types of flammable insulation. Rockwool does not burn and is also more soundproof where noise is a factor.

Watts and Jacques debated the two options and, in September, wrapped their whole home "in a jacket of Rockwool", she says, costing about £20,000. "Because of the slight risk of fire, and because it's oil-based, we decided to go for Rockwool, which is also breathable. The house now looks as if it's just been painted. But in fact, the walls are 10cm thicker than they were before." When temperatures dropped below zero in December, the couple kept their thermostat at the usual 19C but noticed "that the radiators kicked in much less often because the house retains its heat". Waterproof extruded polystyrene (XPS), a different plastic foam insulation, was fitted at the bottom of walls below the damp-proof course, as Rockwool becomes ineffective if it gets wet.

Internal wall insulation

Last August, Bentley and Scott wrapped their large end-terrace wall and rear extension externally with Rockwool insulation (£20,000), but not the handsome Edwardian street façade. “It would have ruined it to some extent,” Saunders says. Instead, they fitted internal wall insulation (£4,400) around the front bay window that “was always the coldest, dankest part of the house”, Bentley says. “Now it actually feels quite warm sitting there.”



Bentley and Scott insulated their rear extension externally with Rockwool
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They used 8cm wood-fibre insulation on the front wall and 2.5cm cork on the window reveals, covered in lime plaster. Crucially, all these products are breathable. “These buildings were designed with lime mortar and built to be breathable,” Saunders says. Adding non-breathable products can cause dampness. Even gypsum plaster, once polished, is “nowhere near as breathable as a lime would be”.

Saunders adds: "Working from the inside is a lot more disruptive [than external wall insulation], because you've got to redecorate the rooms." The family also lost 10cm of floor space on the affected walls.

Fitting their heat pump caused further disruption, because they had to swap eight radiators with larger ones and replace narrow microbore pipework — popular in the 1970s — with wider central heating pipes. This work cost them £22,700, for which they got a £5,000 grant from the government's boiler upgrade scheme.

Cavity wall insulation

Many homes built after 1930 have cavity walls, with a gap between two layers of brick that can be filled with insulation. At Watts's home, which resembles a typical interwar semi, thermal photographs revealed that the cavity wall insulation — injected years earlier — had "slipped down", she says.

This is common, according to Saunders, who had bought his own home with a certificate claiming it had cavity wall insulation fitted in the 1990s. But investigations with a borescope camera showed many of his walls had "absolutely no insulation whatsoever". Nationwide, he believes a large number of older cavity wall installations "were never installed properly in the first place". If it sags, "you can't just get it topped up. You can't mix insulation products inside a wall - you have to extract and then refill it from scratch. It's not a cheap exercise, probably around £6,000 for the average house."

Some of Watts's walls, like the bay windows, were solid brick with no cavity and leaked heat "like nobody's business", she says. Her radiators, which sat in the bays, "were heating Oxfordshire". Hence they wrapped the whole house in external insulation and did not have to refill the cavities.

Loft insulation

Watts's loft had "not nearly enough" insulation, she says. It was topped up with mineral wool to the recommended 30cm, with a new draughtproof hatch and an extra floor on stilts ("loft legs") where they can store belongings without compressing the insulation (under £2,000).

"People just throw whatever they've got directly on top of the insulation. But squashed insulation is useless," Saunders says.

The installers initially "missed out a whole layer of loft insulation", Watts says. Cosy Homes spotted the mistake and got the contractor to redo the work. "I was very pleased to have professionals checking it over," she adds.

Windows

Today's double and triple-glazing are more efficient than those installed years ago. But in terms of heat loss new windows will give you the least bang for your buck compared to other measures, Saunders says. Triple-glazing for a whole semi could cost £25,000 to £30,000 in timber frames, or £15,000 to £20,000 in UPVC. If you want to replace windows on a limited budget, his advice is to focus on the rooms where you spend the most time and on your home's worst cold spots.

"We didn't want to replace all the windows, partly because we couldn't afford it, but partly because they're working fairly well," Watts says. She and Jacques fitted triple-glazing only in their open-plan living space to make it "very, very cosy". Six new windows and three doors, including a second front door to create

an air lock 45cm away from their draughty existing front door, added up to £26,000.

Bentley, meanwhile, chose triple-glazing for his family's formerly dank front bay window and a new patio door (£10,100). Saunders adds: "Make sure that when you get a window, it's properly installed and draught-proofed. There's no point spending thousands of pounds on poorly fitted triple-glazing, because heat will just sneak around the window rather than through it." Where double-glazing has failed, it might be cheaper to replace just the pane, rather than the whole window – try sealedunitsonline.co.uk.

Ventilation

What surprised Bentley was how important ventilation is to prevent damp and mould in his family's newly sealed home. "You can't just block all the draughts and expect it to be fine. You've got to make sure there's some active ventilation going on all the time," he says.

They fitted decentralised mechanical extract ventilation (DMEV), with fans that constantly run in the kitchen and all bathrooms (£1,800). "If the room gets really humid, like after a shower, it ramps up and you can hear it as it takes out all the damp. Then it settles back down to a background noise. It is really quiet – half the time we don't notice when it's on," Bentley says. "It has made a huge difference to the air quality in the house. and we no longer get condensation or bits of mould on the windows." Watts fitted a smaller version of the same system (£1,500).



Bentley and Scott's ventilation system
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The alternative is centralised mechanical extract ventilation (CMEV), with one fan in the loft that extracts moist air via ducts from all the wet rooms and pumps it outside. "A lot of clients like that because it means you don't hear the noise," Saunders says. This costs about £5,000, compared with £1,500 to £2,000 for decentralised fans.

For both system types fresh air comes in through trickle vents in windows or – where those cannot be fitted, for example in conservation areas – 10cm-wide "core holes" with humidity-controlled openings drilled in the external walls of living rooms and bedrooms.

New building regulations require you to fit controlled ventilation if you install more than one "major" measure, such as internal or external wall insulation. (Loft and cavity wall insulation count as "minor" measures.) As Saunders puts it: "No insulation without ventilation."