



Centre for
Alternative
Technology

UNDERFLOOR HEATING

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Introduction

If you are replacing your heating system, undertaking renovation work on your house, or building from scratch, then underfloor heating is definitely something to consider. There are several advantages:

It gives a very even temperature over the floor area, with very few cold spots. Because the floor temperature is much lower than a conventional radiator, convection currents are minimised and there are less draughts. Efficiently installed, it should run at 35 degrees Celsius, compared to radiators which run at 75 degrees.

The radiant heat given off by the floor results in very high comfort levels. In our experience this means that, in practice, you can run it at lower temperatures – so saving energy. There will be no radiators taking up wall space. Underfloor heating works well with a condensing boiler because the boiler runs more efficiently with low return temperatures.

The main disadvantage of underfloor heating is that it is slow to respond and can take a long time to heat up. So it is best used in homes or buildings that will be in use for fairly long periods.

Although electric underfloor heating systems are available, heating systems running off electricity are not environmentally friendly because of the pollution involved in electricity production. A wet system, running off a biomass boiler or stove, or a gas fired condensing boiler, is a better option.

Where can you use underfloor heating?

It's ideal in solid floors, where it can run through something with a high thermal mass which will release heat slowly, but you can also install it in suspended or timber floors as long as the timber is really dry. If it isn't, it may shrink and crack with the heat. The surface temperature shouldn't go above about 30° or the timber may distort, and you should leave a gap around the edge of the timber floor to allow for expansion.

There are commercial companies that install underfloor heating systems, but it's also feasible to do it yourself. The advantage of a professional installation is that the company will be able to pressure test it, checking for any leaks and ensuring it is stable before covering it over. If you want to install it yourself, you'll need some building and plumbing know-how.

Gusto Homes are now fitting underfloor heating as standard in their developments. They use polystyrene insulation under a concrete floor. The Underfloor Heating Association say that 90% of homes in Scandinavia have underfloor heating.

Installation

There is more than one way of putting underfloor heating in a solid floor, but this is one of the methods we have used at CAT. Floors should comply with building regs, so do check your plans with your building control officer.

First, lay a concrete or limecrete subfloor over your damp-proof membrane, and on this lay a layer of

insulation - it needs to be something solid like expanded polystyrene or cork, and should also run up the edge of the floor to stop the heat from escaping into the walls. The underfloor heating pipes (cross linked polyethylene or barrier pipe) will lie top of the insulation, running back and forth along the length of the floor.

Underfloor heating pipe is fairly easily available from plumbing suppliers. 15mm bore pipe is better than 10mm, as it will be easier to pump the water round. You can buy fixing plates with the pipe to enable you to fix it down onto the insulation. Over this you then lay another layer of concrete / limecrete screed which needs to cover the pipes by at least 50mm.

A manifold connects the pipes to the heating system and heating controls just as in a normal heating system. You can then lay a floor finish such as tiles, slates or stone over the concrete. If you are putting down a wooden floor, you should lay battens (making sure that you don't puncture the pipes when fixing them) and fill the gaps between them with concrete so that there aren't any air gaps between the underfloor heating pipes and the floor finish.

You can also use underfloor heating in suspended floors and there are several ways of going about this. One option is to insulate between the joists to prevent heat loss, and then lay a subfloor over the joists. The underfloor heating pipes lie on top of this, between battens. To ensure that the heat is evenly distributed, you can either fill the gaps with a weak sand / cement mix, or fit aluminium plates to the pipes to dissipate the heat evenly through the floor. The floorboards would then sit on top of this, held by the battens.

The final floor finish could be concrete, tiles, slates, stone or wooden floorboards. Laying carpet over any of

these is a bad idea with underfloor heating, as it would mean you have to run the system at higher temperatures. However, a few rugs should be okay!

The moisture content of timber used in a wooden floor with underfloor heating should be about 8% for retrofitting and 10% for a new build. Alternatively, lay it loose for the first year, so that adjustments can be made for any movement.

The cost of installation will vary, particularly if you are fitting it to an existing building. As a general guide for new installations, the price should be £30 per square metre of floor. Total cost may be £2,000 to £4,000 for a 3/4 bedroom house.

Further Information

For detailed information about choosing building materials and designing a healthy, efficient, and low-impact home, see our publication ***The Whole House Book*** (by Cindy Harris and Pat Borer). CAT publications and many other books are available from **CAT mail order:** 01654 705959; <http://store.cat.org.uk>

CAT runs several **residential courses** on designing and building low-impact homes, eco-renovation, and heating with renewable energy.

Tel: 01654 704952

Web: www.cat.org.uk/shortcourses

You can contact the **CAT Information Service** with further questions you have about underfloor heating, or for details of specialist suppliers and installers.

Tel: 01654 705989

Web: www.cat.org.uk/information

For more in-depth technical advice, you may find it useful to book a **consultancy** with one of our renewable energy experts.

Web: www.cat.org.uk/consultancy

Tel: 01654 705991