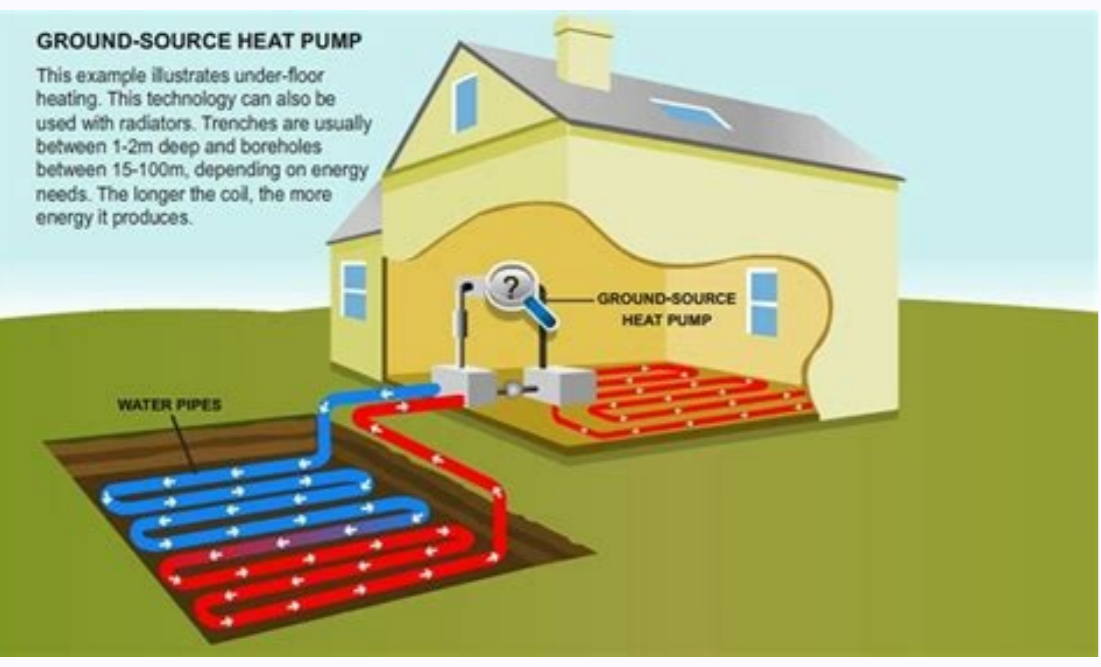
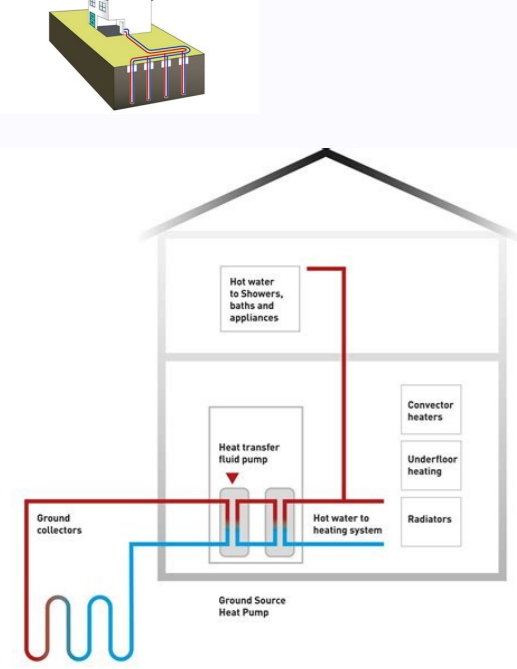


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Closed-Loop/Ground-Source Heat Pump Systems

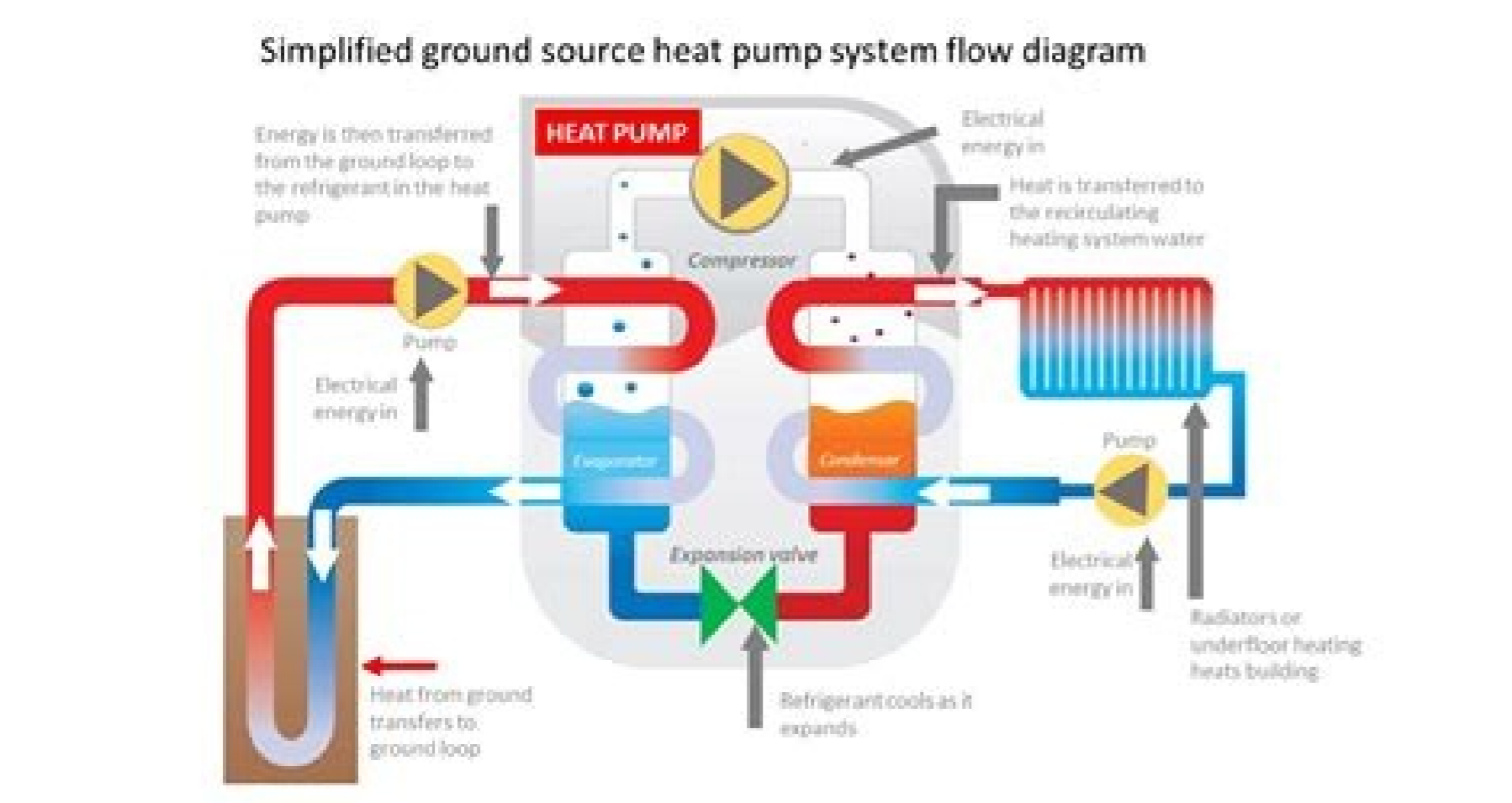
Installation Guide

(A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.)

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Ground source heat pump residential and light commercial design and installation guide. Ground source heat pump sizing guide. Is ground source heat pump worth it. Ground source heat pump installation guide. Ground source heat pump design guide. Ground source heat pump explained. Ground source heat pump requirements. A buyer's guide for residential ground source heat pump systems.

Could lower your fuel bills Reduce your household carbon footprint Heat your home as well as your water A ground source heat pump, sometimes referred to as a ground-to-water heat pump, transfers heat from the ground outside your home to heat your radiators or underfloor heating. It can also heat water stored in a hot water cylinder for your hot taps and showers. Thermal transfer fluid (TTF), a mixture of water and antifreeze (sometimes known as 'brine') flows around a loop of pipe, buried in your garden or outdoor space. This loop could either be a long or coiled pipe buried in trenches, or a long loop (called a 'probe') inserted into a borehole with a diameter of around 180mm. Heat from the ground is absorbed into the fluid, which then passes through a heat exchanger into the heat pump. This raises the temperature of the fluid and then transfers that heat to water. For further information on how a heat pump works, including details on typical savings, system design and control, see our in depth guide to heat pumps. There are a few things to consider when deciding whether a ground source heat pump is right for you. You don't necessarily need a large space, but you will need land near your home suitable for digging trenches or drilling boreholes. Ground loop The ground will need to be suitable for digging and accessible to machinery from a road entrance. The area will need to avoid trees, as roots will cause problems when digging trenches. The length of ground loop and trenches depend on the size of your home and the amount of heat you need. Boreholes If space is limited, it may be possible to drill vertical boreholes to gather heat. This is usually more expensive than digging trenches and usually needs a specialist (thermogeological) survey. Larger houses may require more than one borehole. Borehole depth depends on the heat demand of a property and the underlying geology but is likely to be around 75-200 metres deep. Inside the house You will need space inside your home for the indoor heat pump unit, which contains key components. The inside unit often contains the hot water cylinder and is roughly the size of an American style fridge. Most homes in the UK use radiators or underfloor heating to circulate hot water, which is known as a 'wet system'. Ground source heat pumps need a wet system. If you don't currently have a wet system, you will have to decide whether you'd like to install one. This is a great opportunity to make sure the wet system is optimised for a heat pump, resulting in lower running costs. You can find more information about the most effective wet system for your heat pump here. Don't want or can't have a wet heating system? Click here for air-to-air heat pumps. The cost of a ground source heat pump installation varies, influenced by: Access to the ground and whether you choose trenches or a borehole to lay the ground loop. The brand, model and size of heat pump chosen. The size of the property and how much heat it needs. Whether it's a newbuild or an existing property. Whether you're opting to make any improvements to your radiators to improve the efficiency of the heat pump, or if you are installing radiators or underfloor heating for the first time. Typical costs are around £24,000 if your ground loop is buried in trenches, and could be around £49,000 if you need to dig a borehole. We recommend speaking to at least three installers to provide a quote for your heat pump system to give you the best idea of likely costs for your home. Running costs will depend on how your heat pump is designed and how it is operated. Savings on your energy bill will also depend on the system you are replacing. You can see potential annual savings of installing a standard ground source heat pump, including any recommended radiator upgrades, in an average sized, four-bedroom detached home, below. For more information, head to our in-depth guide to find out how to get the most out of your heat pump and maximise your savings. Read more Read more Last updated: 23 June 2022 A garden must be accessible to digging machinery with ground that is suitable for creating trenches or a borehole. Coiled pipes are known as slinkies, and a meander pattern is laid straight and runs back and forth. A typical three-bedroom house using slinky pipes laid in trenches requires about 40x12m of land. Boreholes range from 60-200m deep and are around 150mm wide. If a home has insufficient land area for slinkies or no access for a borehole drilling rig, ground source may not be viable,' says David Billingsley, director of sales at Kensa Heat Pumps. Installation via vertical boreholes is usually more expensive as it requires a specialist drilling rig. Most use the closed loop system, where a pipe loop shaped like a hairpin is dropped into the borehole and sealed in. Multiple boreholes are usually required unless the house is small or very well-insulated. A slinky set up connects a Kensa GSHP unit. The collecting loops are laid horizontally then buried. The timeline 'The pump unit is usually installed once the building is weathertight and the services are in place,' says Phil Hurley, managing director at Nibe. 'The groundworks phase varies, but usually takes around three weeks. GSHP installation is subject to Building Regulations and your local authority will need to be notified upon completion. The heat pump appliance is about the size of a fridge-freezer and most often kept inside the house. 'It's best to put the unit where it can be maintained easily,' says Phil. 'The area must provide an appropriate route for associated pipework, especially the ground collector loops, which need to be well insulated along the entire length.' Can a GSHP be retrofitted? Typically, GSHPs are well suited to self-builds, as the plot will be excavated to put in the foundations, but that doesn't mean they aren't possible for renovations. 'It's a myth that GSHPs can't be successfully retrofitted into older properties,' says David Billingsley. 'But the more thermally efficient a house is, the easier it will be to heat effectively with any type of system. Better insulation will result in higher heat pump efficiency and lower running costs.' The £1255 from Nibe has a heat output of 6kW and is priced from £12,000 How much does a ground source heat pump cost? Typically, costs for a ground source heat pump can range anywhere from £12,000 to £25,000, depending on the output needed to meet your home's heating requirements. The average three-bedroom UK home has a heat demand of 8-10kW. To supply and install a suitable pump using horizontal pipework would cost between £12,000 and £14,000,' says Phil Hurley. 'A borehole installation can cost between £20,000 and £25,000.' Units have a service life of around 20 years, while the collecting pipework can last up to 100. Plus, you may be able to recoup some of the installation cost from the government's Renewable Heat Incentive (RHI) scheme - a financial reward for those who install renewable energy sources in their homes. Average running costs depend on the thermal efficiency of the building and its heat demand. The 9kW Evo GSHP would run at 0.44p/kWh with an estimated running cost of £887.40 per year, based on a 200sqm, four-bed new-build home in the south-west of England with a heat load of 8kW,' says David Billingsley. Maintaining your GSHP unit GSHPs have few moving parts and upkeep is minimal. 'As an electrically powered, non-combustion appliance it requires little maintenance,' says David. 'I advise homeowners to get their system, including radiators and/or underfloor heating, pressurised hot water cylinders, ground collectors and the heat pump, checked by a competent installer before the colder months set in.' Having a good supply of hot water and effective heating are the surest signs your system is operating at its best. Some models, such as the Nibe S-Series and Kensa's Evo heat pump, come with a smart controller or app that allows you to monitor the set-up in real time, so you will receive notifications regarding any problems. Read more: Air source heat pumps: a buyer's guide RELATED ARTICLES The curveball here is the Renewable Heat Incentive (RHI). Funded through general taxation and overseen by Ofgem, this scheme is available to new entrants until 31st March 2021. The RHI provides a payment per kWh of heat generated by a qualifying installation. From April 2019, the tariff for GSHPs is 20.89p per kWh (compared to the cost of gas at around, say, 4p/kWh). They adjust the amount that you're paid to take into account the electricity required to run the pump. So, if your installation had an SPF of four, a quarter of the total heat would be subtracted. Thus your payment would be based on three-quarters of the heat demand declared on the EPC. For domestic projects, the amount of heat generated is usually deemed based on the estimated annual space heating needs stated on your property's EPC (and hot water, too, if the pump provides this). So the amount of heat you actually use will make no difference to the payments you receive. Payments are also capped. The annual limit is 30,000kWh for GSHPs (which is higher than for air source heat pumps or biomass). So at 20.89p/kWh, the maximum subsidy would be £6,267 per annum (before deductions for the electrical input). Tenacious developer Rob Hall and his partner Cecilie Jacobsen had their hearts set on creating a three-storey family home in an idyllic coastal village in West Sussex. They wanted to make it as eco-friendly as possible, so they installed a ground source heat pump. Three 120m deep holes were drilled in the back garden for the system and two sturdy retaining walls were constructed deep inside the earth on either side of the plot, using 7m contiguous reinforced concrete piles. Learn more about the couple's experience here Over seven years, this should offset the initial cost of installing a GSHP. Bear in mind, though, that most new homes will be well insulated, so won't have such a

high heat demand. So if running costs are critical to you, be sure understand the figures before making your decision. Learn More: Ground Source Heat Pump FAQ Heat pump installation costs Fitting a GSHP requires substantial groundworks for the collector loop (with vertical boreholes more expensive than horizontal types). Costs can range from £15,000 to £30,000 or more for a typical domestic installation. Prices depend on the size, the property's heat demand, the type of collector, and how much of the distribution system is included. But as we've seen, in the right circumstances this can be offset over several years of RHI payments. If your heat pump is replacing a non-electrical heating fuel (like gas or oil) in a large building, the extra electricity demand to run the GSHP may require an upgrade of the local power distribution system. This will add to the cost and overall environmental impact of the installation. That said, low upkeep can help to reduce ongoing impact. Renewable Heat Incentive (RHI) Payback on GSHP Installations Direct Electric Heating 6-8 years 12-18 years £2,610-3,940 New Oil Boilers 12 years 29 years £2,610-3,940 New Gas Boilers 14 years 47 years £2,610-3,940 Source: Local Government Association (2016) Would a GSHP suit my project? Ground source heat pumps are appropriate for new homes or existing homes with significant garden space. That's because they require either a substantial area of unshaded ground (approximately 10m of trench per kW of heat energy produced) or access for a drilling rig for vertical boreholes. Ground conditions can also make a big difference to both cost and viability.

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