

Guidance note

Ground source heat pumps

ChurchCare



16,000 buildings. One resource



Ground source heat pumps can be an efficient way of using electricity to heat your church, by capturing and boosting heat drawn from underground.

Benefits of ground source heat pumps

- Lower carbon emissions: an average ground source heat pump could save around 1.8 tonnes of carbon emissions every year, when replacing an oil boiler.
- Lower fuel bills: ground source heat pumps run on electricity, so there's no need to pay for gas, oil or solid fuels. Heat pumps depend on good insulation and can be useful in locations not connected to a gas supply.
- Less electricity use: heating homes with a ground source heat pump is much more energy-efficient than using electric radiators.
- As the grid decarbonises, heat pumps become low carbon.

Also, if a heat pump is powered by a renewable energy source, it is completely renewable.

How does it work?

A ground source heat pump circulates a mixture of water and antifreeze around a loop of pipe either laid a few metres below the surface or in a borehole. Heat from the ground is absorbed into this fluid and is pumped through a heat exchanger, where pipes containing this relatively warm water are coiled around pipes containing the very cold refrigerant. Warming the refrigerant before it enters the compressor. This heat is mainly solar energy that has been absorbed by the ground.

Two metres down, the ground is protected from extremes of heat or cold and stays at about 10°C all year. The heat pump uses electricity to boost this low-grade heat to the temperature needed to heat a church.

Types of GSHP and installation:

Horizontal trenches - should be at least two metres deep for a consistent year-round heat source. You will need 50-80 metres of pipe per kilowatt (kW), or 10 metres of 'slinky' coiled pipe per kW (7-8kW is a typical size) with at least 5 metre distance between trenches with coils. So a typical 8kW heat pump requires around 400m² of ground area



for slinky coils, perfect if you have a un used field or area of land associated with the church.

Veritcal boreholes - need 20-50 metres of pipe per kW, and will usually be 50-150 metres deep. You may need 2-4 pipes per borehole, or more than one borehole. The Pipe diameter should be 20 to 40mm for best performance. This has the advantage of needing to disturb less of the ground (particularly pertinent where graveyards surround the church), but there is the expense of drilling the bore.

Note: Do remember to check with your diocese early in the planning process.

Cost

At current prices, a heat pump should be a cheaper option than oil, LPG (propane & butane), or direct electric heating (e.g. storage heaters). However it is unlikely to be more cost effective than a modern gas boiler. Heat pumps are still a relatively rare option for central heating, so installation prices will vary – the best thing to do is to compare quotes from a few installers.

As a rule of thumb, a ground-source system is likely to cost about £1000 per installed

kilowatt (kW). The heat pump itself will be £400 to £600 per kW, with trenches £300 per kW or boreholes £500 per kW.

Earnings

You may be able to receive payments for the heat you generate from a Ground Source Heat Pump through the government's Renewable Heat Incentive. Small systems of less than 100 kWth are eligible for a generation payment of 4.5 (pence/kWh) and large systems can receive 3.2 (pence/kWh).

Note: You will not be eligible for the RHI if you have received a 'grant from public funds' for the costs of purchasing or installing your renewable heat installation.

For best results

- Ensure your church is insulated as much as possible (e.g. pipes lagged, insulation between roof rafters) prior to a heat pump being installed.
- Install the heat pump with low temperature under-floor heating or properly sized radiators.
- Insist upon understandable, user-friendly controls.
- Ensure you have a qualified installer.

What to expect

- Since heat pumps provide a lower temperature heating compared with boilers, radiators will be warm rather than hot
- A church with radiators may heat up more slowly
- The heat pump will run for longer hours than a conventional boiler but if properly controlled will switch on and off with the heating requirements of the church
- A properly sized and installed heat pump should be able to provide most of a church's heating requirements but most heat pumps are installed with a supplementary electric heater.

Case study

St Stephen's, Lympne, Diocese of Canterbury