Heat Pumps

Heat pumps are sometimes described as a fridge in reverse, transferring heat from an outside source into a building. The Guardian have produced a visualisation of how an air source heat pump works. There are air, ground or water source heat pumps, which all use refrigerant to absorb heat from the source, through a compressor.

Air Source Heat Pump

An air to water heat pump heats the building via radiators or underfloor heating. When sized correctly to match the heating demand of a building, they are more efficient than fossil fuel boilers. Efficiency improves at lower flow temperatures, so the pipework and heat emitters may need to be changed to ensure enough heat reaches the rooms. Changes are not always required, so professional advice should be sought to confirm what is needed on a church-by-church basis. Advice (including from a conservation accredited professional if the building is listed) should also be sought on whether works to improve the building fabric and envelope, such as insulation or glazing, are required, to enable the heat pump to work efficiently.

External ASHP unit at Killinghall Methodist Church. Photo by Anais Pedron.

Rather than heating the building via radiators or underfloor heating, air to air systems warm a building through fans. Blowers are used to push warm air into the building, and units can be switched to act as air conditioning in hotter months. As they are not a water-based system, they cannot provide hot water for taps, so point of use water heaters would be required. These systems are not as efficient as air to water ones, but may be suitable for small, infrequently used buildings.

Ground Source Heat Pump

A ground source heat pump requires enough outdoor space to run a loop of underground pipes or to sink boreholes. They are typically more efficient than ASHP, but significantly more expensive to install.

Ground loops are often cheaper than boreholes but slightly less efficient, due to fluctuating ground temperatures near the surface. In contrast, boreholes are between 15 and 120 metres deep, reaching the depth where temperatures are more constant. While boreholes require less space than ground loops, 5-6 metres of spacing is required between boreholes when more than one is needed.

Like an air to water heat pump, a GSHP heats the building via a wet system, such as radiators or underfloor heating.

Water Source Heat Pump

Your church would need to be near a lake, loch, river or large pond. ASHP or GSHP are more suitable.

For our larger sanctuary spaces heat pumps may have to be supplemented by other energy efficiency measures, such as a solar array. The cumulative visual and physical impact will be a consideration, particularly if your building is a listed building or in a Conservation Area. Consents may be required and will be granted if the church can demonstrate that they have avoided any harm to its significance and have minimized the risks of negative or unintended consequences. Heat pump schemes should be specified by a professional with conservation accreditation where the building is listed or in a Conservation Area. Further guidance can be found from Historic England here and on our Historic Places of Worship and Climate Change page.

You can find more guidance from Eco Church on ASHP here & GSHP here.

MCS sets and maintains standards for low carbon technologies, contractors and their installations. You can find MCS certified installers here.