
Church Heating

Introduction

This guidance leaflet looks at the need to heat a church building for different usage and the options that are available. It then sets out the issues for the parish to consider in deciding which option is the most appropriate in a particular context and advises on how to ensure that the system is well designed and installed.

European research into church heating, which is recorded in the book "*Church Heating and the Preservation of the Cultural Heritage: Guide to the Analysis of the Pros and Cons of Various Heating Systems*"; ISBN 88-370-5034-8, concluded that there was no universal system of heating appropriate for all churches. This book is the basis for the British Standard BS EN 15759-1:2011 on church heating. The book lists the factors to be taken into account when considering church heating. These include how the church is used, the costs to install, run and maintain the plant, aesthetic impacts and archaeological impacts.

How can the DAC help?

The Diocesan Advisory Committee has published this advice leaflet to help parishes think about church heating and the associated issues. The DAC's volunteer members and technical advisers can also help by discussing options informally on site and by reviewing specific proposals, as part of the more formal process leading to a faculty for a new heating system or List B permission (Archdeacon's Letter) for changes to an existing heating system. However, the DAC is not able to produce a specification for an individual parish – this needs to be done by a heating consultant or contractor commissioned by the PCC. There is more information about this in the section on *Involving Professionals*.

What kind of building?

It is useful to look at what kind of building your church is. It may be a mediaeval church with thick walls, pews, a high roof and floor laid directly on earth or over a void. It may be a Victorian church with grilles in the floor for an early heating system using ducted warm air or hot water in pipes under the floor. It could be a 20th century church with a modern wet heating system with radiators.

How do you use the building?

If you have a busy town-centre church used regularly throughout the week for services, groups and events, then it makes sense to heat the fabric of the building and the regular use of the church may make this affordable. If you have a rural church used for Sunday and midweek worship and occasional events, it may be more appropriate – and more affordable – to aim just to provide instant heat for the people.

If the church is used regularly through the week, it is worth noting that English Heritage (now Historic England) research some years ago found that there is no best system to heat a church, only a best way of running the plant to achieve a constant background temperature. Constant background heating, say about 10- 12°C, keeps the walls, piers and floor warm so that they cease to radiate cold at the congregation. By constantly heating the church the temperature gradient from the floor to the ceiling is reduced to a minimum which reduces the cold down draughts created by the heating to a minimum as well. It also keeps the environment at a better point for the conservation of the fabric, organ and artefacts in the church. It also means that it does not take so much energy to warm up the church for services. Churches are reporting that it costs no more, and even possibly less, to run the heating system in this manner.

What are the constraints?

There may be a choice of fuels available or you may be limited to electricity – in which case, is the electricity supply adequate to cover the increased usage of new heating? The PCC's priority may be to reduce the church's carbon footprint – there are lots of ideas about this on the national *Shrinking the Footprint* website (links below). It may be possible to re-use existing ducts or pipework or to re-site heaters in similar positions. The pews may be fixed into wall panelling, limiting the positions for radiators or other heaters.

Process – first steps

1. Think about your building, the usage of the church and the PCC's priorities in looking at new heating.
 - Monitor the existing temperature and humidity so that you have a baseline to work from.
2. Decide whether you will ideally be heating the fabric or where people are sitting (instant heat) and what constraints there are in terms of choice of fuel, the layout of the building and what you can afford to install and run.
 - See if there are other steps you can take to reduce discomfort, e.g. investigate and deal with damp, broken window panes, draughty doors, etc.
3. Investigate whether existing pipework, boiler, heat emitters or ducts can be re-used.
4. Make initial contact with the DAC and, if appropriate, arrange a site visit with one of the DAC heating advisers and - if changes to the heating are part of wider plans for reordering or development - other DAC members.
5. Draw up a detailed brief of your requirements, as well as Statements of Significance (if your church is a listed building) and Needs.

Involving professionals

You should discuss what you want to achieve with your church architect or surveyor, who will be able to advise on the way the heating interacts with the building and your use of it and any opportunities or limitations arising from that interaction.

Some parishes engage a heating consultant, in which case you should ensure the consultant has particular experience of heating systems in the type of church building you have. You should provide the heating consultant with a clear brief about how you use the church, the types of system you are considering and constraints (e.g. budget, condition of existing pipework, timescale, etc). The heating consultant should provide a written assessment of options with outline costings for the PCC to consider and a specification with drawings as a basis for obtaining comparable quotations.

Heating consultants and contractors should be members of a professional body and the following organisations may be useful:

Association of Consulting Engineers (ACE) www.acenet.co.uk

Chartered Institution of Building Services Engineers (CIBSE) www.cibse.org

Building Engineering Services Association (BESA) www.thebesa.com

British Institute of Facilities Management (BIFM) www.bifm.org.uk

For many churches, it will be appropriate for a heating contractor to design and install a system. It is vital that the chosen contractor understands the complexities of designing heating in a church – especially if re-using some existing equipment – and the DAC [and the national Church Buildings Council] therefore advises that:

- all contractors employed to work on wet heating systems in churches must hold a minimum qualification of Level 3 NVQ Diploma in Heating and Ventilating Industrial and Commercial Installations (City & Guilds 6188-30, or equivalent) and non-domestic qualification from Gas Safe or, for oil systems, be an OFTEC Approved Technician. In addition:
- Any work to a gas fitting must be carried out by a person who is registered on the Gas Safe Register (or is a member of another class of persons approved by the Health and Safety Executive for the purposes of Regulation 3(3) of the Gas Safety (Installation and Use) Regulations 1998).
- Any work to an electrical installation or electrical equipment must be carried out by a person whose work is currently subject to an accredited certification scheme (eg NICEIC Approved Contractor).

Types of System

Electrical

The electrical supply should be checked to ensure it is adequate (3-phase for electric heating). Can existing mains cables be used? Some parishes may want to consider generating electricity using photo-voltaic (PV) cells about which separate guidance is available (links are below).

Under-pew heaters – These provide a basic level of comfort where it is needed close to people's feet and bodies and are visually unobtrusive. The appropriate design should be installed to avoid the danger of children touching hot heaters.

Heat mats/cushions – These may be appropriate in some parts of the church, e.g. to provide heating for the celebrant in the sanctuary.

Wall-mounted high-level radiant heaters – these no longer need to have a "red glow". They provide instant warmth to people sitting in the church, but may be uncomfortably hot on the head whilst leaving the feet chilly. The heaters and associated cabling need to be sensitively sited to be visually unobtrusive. One contractor has designed a form of "chandelier" incorporating radiant heaters but other solutions may be visually more appropriate in many churches.

Low-level convector heaters – These can provide constant background heating provided there is wall space to site the heaters.

Indirect Gas Heaters

In some contexts, individual balanced-flue gas wall heaters may be appropriate. The requirement for individual external flues means they sometimes may not be used where historic fabric is involved.

Portable gas heaters should not be used in churches, for safety reasons (the Fire Brigade will not enter a building containing gas canisters if no humans are inside) and because they produce a damaging amount of moisture.

Energy sources

Energy sources such as gas or oil may be appropriate, or the parish may wish to consider sustainable energy sources:

Wood/pellets – require large-capacity storage and volunteers to fill burner.

Ground source heat pump – efficient, but requires deep excavation to avoid disturbance of buried human remains in a churchyard setting; expensive to install; works with boiler capable of operating at lower temperatures, e.g. in conjunction with underfloor heating or selected fan convector units.

Air source heat pump – cheaper and less invasive to install, but less efficient at low external temperatures when heating is particularly needed.

Wet systems

Warm pipes/ducts – Can be re-used if already in place. Effectiveness can be increased by replacing pipes with gilled fin tubes.

Radiators – cast iron radiators may be re-used. New radiators should be carefully selected to be visually appropriate in their setting. Radiator covers and shelves should preferably not be used, as they reduce the effectiveness of heat distribution by convection. Where more heat output is required, radiators may be better replaced by fan convector units.

Fan convector units – these have much greater heat output than radiators for a similar-sized unit and can be used where wall-space for radiators is limited. The appropriate type should be selected to operate at the optimum temperatures for the boiler. Fan convectors can create intrusive noise, so to overcome this problem make sure that they can give the required heat output at no more than medium fan speed and are from a reputable manufacturer.

Under-floor heating – may be a good solution where major work is needed to the existing church floor. It must be run as consistent background heating which may need to be supplemented with another type of heating. Potential for future problems to remain undetected under solid floor until damage has been caused. In traditionally-built church (mid-19th century or older) any system must be permeable, e.g. using lime-based materials or keeping the vented floor void e.g. by using a concrete block and beam floor to house the underfloor heating pipes. Archaeological assessment will be required at an early stage to identify any issues that might affect the viability and costs of a project.

Boiler types

Many existing church boilers are robust cast iron sectional boilers. Recent changes in EU legislation mean that most cast iron boilers are no longer manufactured, hence condensing boilers are becoming more common. Whilst condensing boilers may be appropriate in a church context, their narrow waterways and sensitive mechanism mean they generally have a shorter life and may be damaged by debris entering an existing open heating system (with a header tank). Cast iron *pressure-jet* sectional boilers continue to be available on a “like for like” replacement basis and may provide a better solution for churches using existing older pipework. Any new boiler should be selected as being appropriate to be run at the temperatures appropriate for the rest of the proposed heating system. This will ensure the boiler runs at maximum efficiency and may enable the parish to save energy and money for example by using a condensing boiler in condensing mode.

Process – next steps

6. If you are thinking about a new heating system, ask the DAC for informal advice and perhaps a DAC site visit to look at the options, in the light of the current heating system, issues and use of the church.

7. Then either: **Commission a heating consultant** to produce an assessment of heating options and outline costings as a basis for obtaining comparable quotations or **Obtain costings and proposals** from a heating contractor for the type of heating system you plan to have – make sure the contractors have the right experience and qualifications. If obtaining competitive quotations, ensure a comprehensive scope of work is provided so that all contractors quote on the same basis.

8. Send the details to the DAC for formal advice leading to a faculty or Archdeacon’s Letter

9. Follow the DAC practical checklist below:

- Consider Construction Design and Management (CDM) Regulations on safe design and installation
- Has an asbestos Research & Design survey been done?

- Follow DAC approval systems
- When setting a budget always consider having a contingency
- Is the project large enough to obtain professional advice?
- Has a concise brief been written?
- Always include record manuals and operating instructions in the contractors' works
- Select competent contractors with membership of recognised trade bodies*
- Define a form of contract if possible. Trade bodies often have standard terms (often biased to the contractor) but at least a basis of contract
- Make sure there is a defect period of at least 12 months included and if possible a retention
- Obtain competitive prices
- Analyse the prices and don't be afraid to ask for clarification
- Always place an order in writing
- Always confirm any variations in writing
- Make sure the contractor demonstrates the system operation and shows that the system works
- Record the completion date for warranty purposes

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For further guidance, please contact the DAC Team:

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Tel: 01727 818138

AND

Heating engineers and consultants organisations:

Association of Consulting Engineers (ACE) www.acenet.co.uk

Chartered Institution of Building Services Engineers CIBSE www.cibse.org

Building Engineering Services Association BESA www.thebesa.com

British Institute of Facilities Management BIFM www.bifm.org.uk

Website Links

<http://www.churchcare.co.uk/shrinking-the-footprint>

<http://www.churchcare.co.uk/churches/guidance-advice/looking-after-your-church/heating>

<http://www.stalbans.anglican.org/finance/dac-advice-leaflets/>