Diocese of Sheffield

DAC Guidance Notes

Heating

[April 2015]

Introduction

All churches are different and heating requirements need to be carefully considered to address individual needs. Heating impacts upon the fabric of the building, the congregation and all the activities that take place. Choosing the right heating system(s) for your needs and type of building is vital and requires expert advice. The following sets out general guidelines for consideration and a list of essential information to be provided when submitting applications to the DAC. The DAC heating adviser is available to offer advice for your particular needs.

Each church building needs to be considered as a special case of its own – there is no blue print answer on the best form of heating. Parishes considering heating of their church should consult the DAC at the earliest possible time. The DAC heating adviser can undertake heat/loss calculations and advise on the best systems and boiler for your needs. Unless of a minor nature, at least three tenders for the work should be sought from professional firms familiar with working on large scale projects in historic buildings. It is highly advisable to inform your architect so that they can offer advice about any interventions to the fabric of the building and its response to new levels of heat and humidity.

Fuels

Some churches have opted to install two boilers so that if one breaks down the other can still provide a limited service. Others have chosen to combine traditional and renewable sources to provide an efficient heating scheme. The most widely used system currently remains a traditional 'wet' system of radiators and pipework operated by an efficient gas-fired boiler and controlled by up-to-date timing and thermostatic/humidistat equipment. Oil can be used as an alternative fuel where a gas supply is not available. Electrical heating may be appropriate in small churches and where the building is seldom used during the course of the week. It is not likely to be appropriate for larger churches or for those where there are several Sunday services or frequent services during the week. A summary of current fuels and their installation and running costs is set out below:

Choosing the right Heating system: Sources of Energy						
Energy Source	Renewable Y/N	Carbon Emissions	Capital Cost	Running Cost	Efficiency *	Comments
Oil	No	Med	££	££	*	● Requires on site storage and delivery ● Must be stored in a bunded tank to prevent leaks
Electricity	Some	High (unless renewable source)	£	£££	***	● Requires nearby mains supply and possible 3-phase
Natural Gas	N	Med	£	££	**	● Requires mains supply
LPG	N	Med	£	£££	**	● Requires on site storage and delivery ● Used when natural gas is unavailable ● Must be compliant with the Pressure Systems Safety Regulations
Biomass	Y	Low	££	££-£££	***	● Requires on site storage and delivery ● Needs constant attention: not recommended for weekend only use ● Stoves can be used in small areas
Ground Source Heat Pump	Y	Low	£££	£-££	**	● Requires extensive excavations ● May need to be on for long periods in cold weather ● Performs better in conjunction with underfloor or warm air heating than radiators ● Works best in combination with insulation and draught proofing ● Can provide hot water but heating efficiency is reduced

Air Source Heat Pump	Y	Low	££	£- £££ (in cold weather)	** (less in cold weather)	● Can work with outside temperatures of -5° but efficiency decreases with temperature ● May need to be on for long periods in cold weather ● Can be noisy ● Performs better in conjunction with underfloor or warm air heating than radiators ● Works best in combination with insulation and draught proofing ● Can provide hot water but heating efficiency is reduced ● Vandalism could be a risk
Solar Thermal panels	Y	Zero	£	0- £	*	● Can provide hot water but will need to be supplemented in winter ● May require planning consent
Solar Photovoltaic Panels	Y	Zero	££ panels £££ tiles	0- £	**	● Used to generate cheap electricity but unlikely to produce all you need ● Can be sited on outbuildings ● May require planning consent ● May be eligible for Feed-In Tariff Schemes

Further information on different heating systems can be found here

Installing a new heating system

The following checklist may be helpful.

- Write down a list of your needs
    - Prepare a schedule of church services and meetings or events that are held in your church
    - Prepare information on numbers of people who use the building and the areas that need heating.
- Arrange for the DAC heating adviser to visit your church
- Inform your inspecting architect of your requirements and seek his advice.
- Visit other churches that have heating systems similar to the one you are considering and ask for their views on cost, reliability and effectiveness.
- Develop an appropriate heating scheme
- Discuss with your architect and the DAC adviser the names of suitable and good heating design engineers. Meet with them and make a decision to appoint one of them. Depending on the cost of the project and source of funding, you may need to tender for contractors.
- Ask your selected heating engineer to design a detailed scheme and cost it. Ensure he works closely with your architect. Heating systems can have a considerable impact upon a church building and often have important implications for the fabric of the church building and its contents.

- **A summary of features to be considered can be found here**

When you are ready, submit a formal application for approval to the DAC. All applications for new or replacement heating systems should contain the following information:

1. A brief description of what exists at present and the reasons for the proposed new works.
2. Calculate heat loss of building and show in quotation.
3. State manufacturer, model and output of the boiler(s).
4. State manufacturer and model and duty of main circulator pump.
5. State manufacturer, model, location, size and output of each radiator.
6. State the manufacturer and model of any proposed control system.
7. Indicate location and termination of flue(s).
8. Indicate total output of radiation in relation to heat loss.
9. Indicate location of pipe runs and pipe sizes for whole system.
10. If fixing to important fabric, describe method to be employed.
11. For gilled tube in ducts. Where the duct is wide enough show dimension and location of air flow division.
12. Technical literature illustrating the form of radiators or heaters and other proposed equipment.
13. A plan of the church indicating pipe and wiring runs, position of radiators or other heaters, boilers, pumps, thermostats, flues etc.

Boilers

Depending on the historic nature of the fabric, gas boilers of the atmospheric type offer the greatest flexibility for locating within a building. The flexibility of the flueing system allows a boiler to be sited up to 6 metres from an outside wall. Flue gases can discharge at 2.5 metres above the ground and no longer require a dedicated chimney.

Oil fired boilers are not so flexible and most must be located in a dedicated boiler house with a vertical chimney to roof level. Some of the lower output boilers are now available with a low level discharge balanced flue.

Radiators

Radiators can be of the pressed steel type (typical house type) or cast iron column type if required to match older radiators or deemed to be more fitting to the church interior. Cast iron radiators are generally more expensive than the pressed steel type. LTS (low surface temperature) radiators may be required in rooms dedicated to the young. They are radiators with protective casings which limit the surface temperature to 43°C. Because their output is reduced by the casing they are both considerably larger and more expensive that the uncased type. LTS type radiators should be located evenly throughout the church and in all individual rooms.

Fan convectors

Fan convectors are fan assisted heat emitters which pump out a lot of heat in one location. (A typical size is 1200 mm long by 700 mm high by 300 mm deep which is rated at 6KW). The selection of fan convectors should only be considered when there is insufficient wall space for radiators. Although the fans are quiet on their lower speeds, it is desirable to turn off the fan facility prior to a service commencing, to avoid any intrusion due to fan operation.

Trench heating

Many churches have existing underfloor pipe coils (usually down the nave) which do not dissipate enough heat. These ducts usually provide pipe routes to serve radiators but can also be adapted by the installation of 'finned' heating elements to provide a heating output along the nave. The existing patterned cast iron trench covers can generally be reused.

Notes on electric heating

Electric heating is an option where a wet system cannot be installed. It is only suitable for small churches and although it is cheaper to install it is considerably more expensive to run and has less flexibility of use.

Electrical supply

An adequate size electrical supply (usually 3 phase) must be available for heating purposes. In most cases this means a new supply.

'White' meter supply

This is a dedicated meter installed on the electrical supply to the heating system. It means that any electricity consumed between midnight and 6 am is at a cheap rate (approx. 6p/KWhr). It is recommended that any electrical heating system is designed to take advantage of the cheap rate.

Electrical storage heaters

These are heaters which comprise of a core of high density bricks which store heat during the night time charge (usually 12 midnight to 7 am) at cheap rate and slowly discharge the stored heat to the church via a combination of convection and radiation.

It is recommended that when selecting electrical storage heaters the heaters have the fan boost facility with optional daytime heating elements. This enables the storage units to dissipate more heat (via the fan) and also to switch on the optional heaters (via a timer) for an evening service. Although the fans are quiet, it is

common to turn off the fan facility prior to a service commencing to avoid any intrusion due to the fan operation.

Fan heaters

These heaters come in many sizes but are only suitable for individual rooms and provide instantaneous heat. They do not use cheap electricity. The heaters can be wall or floor mounted.

Panel Heaters

These heaters are wall mounted and operate via the ordinary electrical supply to supply heat at any time. They are again only suitable for small individual rooms but can operate automatically over 24 hours via built in thermostatic controls.

Under pew tubular heaters

These heaters are only suitable for providing a minimal background heating for frost protection. Although many churches have this type of tubular heater fitted beneath the pew they have not proven to be satisfactory due to their limited output and long heat-up period before any effect is apparent.

Air curtains

The greatest heat loss is due to the ingress of cold air from open doorways. An electric over door heater will help to combat the cold ingress of air but are expensive to run as an output of 9/12KW is required to make them effective.

Running costs

If there is no alternative to electrical heating it is essential to ensure that the main heating output is obtained at ‘cheap rate’ with any daytime supply being used for ‘top up’ purposes. The fabric of the church can only be protected by the installation of the storage type of heaters which dissipate heat over 24 hours.

Notes on electrical radiant heating

This form of heating is considered to be the most unsatisfactory and obtrusive form for most churches. Its use is very limited as it is not acceptable visually, uses ordinary electricity, and does not provide any background heating to protect the fabric.

The heating supplied by these infra-red heaters is instantaneous which beams radiant heating to the congregation. Although the effect of the heating is immediate many people suffer from 'hot heads' and 'cold feet'.

Heaters of this type would generally be mounted on the walls at 3 – 4 metres high. Ceiling mounted models, hung from chains, are also available.

As with any other electrical work, the DAC will need to have a full copy of a recent electrical test certificate as part of the application.

Notes on gas fired convector heating

Where gas is available, direct gas fired fan assisted fan convectors may be considered. Most manufacturers offer a range to suit varying sizes of rooms. The modern gas convector has electrical ignition and can be time clock controlled but it is generally used as a manual heat emitter. It offers quick heat up periods.

The location of gas fired convectors is critical as they must be located on an exterior wall to allow for the combustion air and flue gases to be emitted. Under **no circumstances** must the flue gases be allowed to dissipate into the occupied space.

The downside of gas fired convectors is their size as they are usually 300 mm deep. Many gas convector front plates get very hot which means that a front guard must also be fitted for protection purposes. Therefore, they must be located in open areas and not adjacent to furniture or fabrics.

The installation of gas piping to serve the convectors must also be considered. Under Gas Safety regulations any concealed gas pipework must always be run in a ventilated duct. It is therefore recommended that gas pipework is run in an exposed position to meet current regulations in this respect.

Oil tank legislation

All Non-Domestic oil tanks must now be bunded (double-skinned) to prevent pollution by spillage of the contents. A bunded oil tank can be:

1. An integral bunded prefabricated tank (usually plastic)
2. A masonry or concrete bund around an existing tank to a height able to contain 110% of the oil tank capacity
3. The legislation applies to all public sector buildings, including churches.

If it is necessary to relocate the oil tank and it is adjacent to any part of a building, your architect must ensure current building regulations with regard to fire protection are met. For tanks up to 3500 litres capacity no precautions are necessary if the oil tank is located at least 2 metres from the building or a boundary line. If this distance cannot be met a fire barrier rated at least 60 minutes should be provided extending 900 mm higher & wider than both ends of the tank. Requirements for tanks larger than 3500 litres can be found on the government website.

Planning permission may be necessary for relocating an oil tank and parishes should check this with their local planning authority.