

Managing the Frost Protection of Your Church during Closure

Frost protection of heating systems is predominantly there to prevent pipes and tanks from freezing and then bursting, causing water damage. It also prevents freeze-thaw cycles of water within the fabric of the building.

This is achieved in two ways:

- **Passively**, by insulating pipes and tanks on the basis that we rarely have continuous periods at temperatures low enough to freeze pipes/tanks which are suitably protected.
- **Actively**, through use of the heating and pump system to keep water moving and to prevent temperatures falling to a level which can cause damage.

Internal exposed pipework is protected to some extent by the building envelope. Un-insulated pipework, particularly small pipes or elements are at the greatest risk of freezing and bursting. In general, damage to historic fabric is more often caused by rapid temperature and humidity fluctuations than by stable cold conditions, however there are exceptions. There are some circumstances where cold temperatures, frost and the ensuing condensation / damp conditions can cause damage to fabric and historic interiors.

How does frost protection work?

For most churches, the church heating is controlled by two internal sensors; one being the normal thermostat and the other being the frost-stat. When the church is closed, the main heating can be left on a “frost protection mode” controlled by the frost-stat.

- **Action 1:** locate thermostat and frost stat. What are they set on? If there is no thermostat/frost stat consult heating engineer about fitting them.

As soon as the temperature falls below the set point on the frost-stat, the whole system (boiler plus pumps) will fire up. If this happens too often, when it is not needed, you will waste energy and money. You need to try and find the right balance of preventing damage without wasting energy. (Systems exist which pump the water around the system as an early step in frost prevention, to avoid cold spots building up, and because moving water is less likely to freeze, like in a river.)

- **Action 2:** Do you have such a system in place? If yes, is it working properly? If no take advice on if it is appropriate to your situation.

Of course, damage to the system or the church fabric from frost can be very expensive compared to the additional cost of fuel, so you may want to err on the side of caution.

Do you have specific fabric / historic items / fragile items that require frost protection?

Cold air holds less moisture, so has a lower dew point, with the extra moisture dropping out of the air as condensation. This usually happens on cold surfaces, such as windows, metalwork or stonework. Organic materials such as paper, textiles, paintings and woodwork are affected by excess moisture causing distortion or decay. In a closed space with little air flow and damp conditions, moulds may also grow on surfaces. Before closing, the church therefore may wish to consider moving such contents, if they would otherwise be the only reason to keep the heating running. If this is a simple stack of modern bibles, table coverings, or vestments, this should be simple to do; perhaps you can move them to the vicarage, or this might be a good time to have them cleaned? However, if the objectives are fragile or historic (such as paintings, woodwork or historic books and manuscripts), and acclimatised to the conditions in the church, or if they are specifically covered by the church insurance, then this will need careful thought, and in some case faculty.

Will your church organ be affected?

There are many organs in churches with no heating at all; damage is more common to organs from heating, not from lack of heating. Stable conditions are usually good for organs.

In any case, church organs often have their own internal low-power electrical heating tube in them. These are generally installed to prevent excess damp rather than excess cold. Check whether your church organ has a heating tube. If one is fitted is it working effectively when needed?

If the organ does not have an internal heating tube, and you are concerned, then consult your organ specialist to confirm what the requirements are for your instrument.

You can also refer to guidance from the Institute of British Organ Building [Church Heating and the Organ](#) and from Harrison & Harrison [Advice regarding organs being put out of use during COVID-19 lockdown](#).

Electrically heated churches

For most electrically-heated churches, where:

- there are no water-filled pipes and tanks
- the heating is normally only turned on for services, and
- frost-protection is not needed for any of the reasons above such as sensitive artefacts or fabric then the heating can simply be turned off.

Gas/oil heated churches

For churches with a 'wet' radiator or underfloor system, the system should be left on the frost protection mode. Normally, when the system is not timed to be ON the controls operate in frost protection mode.

- **Action 3:** Check whether your system has an automatic frost protection mode.

A lot of modern boilers, mainly gas fired, already have built in frost protection to switch them on under the control of an external and/or boiler water temperature sensor. Details of how these controls operate should be in the maintenance manual or from your boiler installer / maintainer.

It is important to understand how the various thermostats and sensors control your system before making any changes. Thermostats are generally adjusted at the actual temperature measuring device. The setting of sensors is adjusted at the boiler control unit. At a maintenance visit it is useful to make a note of the current settings and compare with the suggestions below.

The settings the system is likely to be set at are noted below:

- If the frost-stat is inside the church, set it to around 5-7°C.
- If the frost-stat is in a boiler room with an externally vented door, or in an outside/undercroft area etc., then set to around 4 to 5°C.
- If the heating system has an outside air temperature sensor used for frost protection, set this to around 2°C.
- If the heating has a pipe-stat then set this to somewhere between 4-10°C. (It needs to be somewhere below the usual temperature of the cold mains water, at around 12°C, and above the freezing point at 0°C.)
- If the heating system does not have a frost-stat, and only has a thermostat, then in the short term set the thermostat to 10°C (likely to be the lowest it goes to) and set it to come on for 2 hours between 01.00 and 03.00. In the longer term, installing a frost-stat is recommended.

Note that the thermal response of the building will vary depending the building construction and its exposure.

During periods of prolonged sub-zero temperatures the building should be visited frequently and particularly where no frost protection controls exist extend the hours of boiler operation.

IMPORTANT EXCEPTION TO THE ABOVE: Does your insurer specify a temperature? Some insurers specify a temperature; at least one specifies 7°C internal air temperature.

- **Action 4:** Check with your insurer whether they require a particular temperature to be maintained. If yes, then set your frost stat to the temperature specified by your insurance.

Preventing freezing water in WCs and kitchens

If there is water in the church in terms of WC's and kitchens, then this should also be considered.

In most electrically heated churches, these areas tend to have a separate electric heater with a frost setting on it – this should be left turned on, or the water turned off at the stop tap and the system drained, by flushing the WC and leaving the tap open. This would be a good idea, in any case, if the church is being left empty, to protect against flooding from pipe leaks.

