



TURRET CLOCKS

Introduction

A turret clock that is in working order makes a positive aural contribution to the area around a church and is an ever-present reminder of the presence of the church that owns it. Although turret clocks may no longer be relied on for the time, an out-of-use clock can have a negative impact that is surprisingly strong, giving an incorrect message about the life of the church that houses it. A clock in good order is usually noticed and appreciated.

These guidelines are intended to assist Diocesan Advisory Committees (DACs), incumbents, churchwardens, architects and others concerned with church maintenance. They explain the importance of correct maintenance, some of which can be done within the parish, and set out what should be undertaken by a qualified and appropriately experienced clockmaker.

These guidelines explain relevant safety considerations for those working on or inspecting clocks. More detailed information on turret clocks can be found in the [Turret Clock Code of Practice](#).

Any parish contemplating work on a church clock is advised to consult its DAC at an early stage. Most DACs have a Clocks Adviser who will be able to assist the DAC in forming its advice to the parish. Early consultation with anyone responsible for any bells in the tower is also helpful, since some work to clocks can have implications for bells, perhaps most especially in a busy ringing tower.

Work on a clock, beyond routine maintenance, will require a faculty, which must be in place before work starts.

Proposals to introduce a new clock or, on rare occasions, dispose of an existing one, will require a faculty, consultation with the DAC, and, for a clock of historic interest, the CBC. Your DAC Secretary or Archdeacon will be able to advise you.

Grant-aid towards the cost of restoration or repair may be available from the CBC or from other grant givers, including the National Lottery Heritage Fund.

These guidelines have been prepared by the Clocks Committee of the Church Buildings Council (CBC).

Clock conservation

Conservation is a way of working that protects the turret clock from being changed in a way that is not acceptable. Almost all turret clock movements are of some historical importance and should be kept in good condition and maintained in use wherever possible. Alterations that significantly affect the original mechanism should be avoided at all costs.

The Church of England follows Historic England's [Conservation Principles](#) for works to all of its historic church buildings and interiors, including turret clocks, including:

- Assessing and repairing of the causes of deterioration
- Using methods that are as reversible as possible
- Documenting all work in a post-conservation report
- Being accountable for decisions and possible outcomes

Conservation-based repair and restoration is the best way to preserve and protect a turret clock now and in the future. Using conservation principles to inform practical decisions should result in work being done in a conservation-friendly way.

Usually, keeping a clock in use will be the most effective way of conserving it. Unused or redundant clocks are almost always safer in the tower in preference to being displayed in the church. There will be exceptions to this when there is both space in the church for the clock and the willingness and interest to display it in a way that will help the wider public to appreciate it.

Looking after a clock

It is appropriate to have one person in a building, the clock keeper or a responsible person, who has overall responsibility for the well-being of the turret clock. When a clock is hand-wound this will usually be the person who winds the clock, or one of a team of winders. Where a clock has been converted to automatic winding it is still good practice to have someone responsible for it and who is willing to visit the clock occasionally on a regular basis at least once a month to see that all is well.

Where possible it is good for the clock keeper to have a deputy for holiday absences and be trained to succeed them. The clock keeper will be able to set the time correctly, manage the twice yearly hour changes, and ensure that the clock case is in good order to protect the clock movement from dust and dirt.

More practical information on looking after a turret clock is available in the [Turret Clock Keeper's Handbook](#), one of a set of guides written by [Chris McKay](#).

Routine maintenance

All practical work on turret clocks should be undertaken by qualified professional turret-clockmakers following conservation principles. However, for some clocks the regulation of the timekeeping will be a matter that can be attended to locally and your clockmaker will be able to advise you about this.

For the better operation and preservation of the clock it is important to have a maintenance contract for the clock with a professional clockmaker sympathetic to historic clocks. Such a contract should include an annual visit to the church. Such maintenance is essential to the clock's well-being and, since it will include safety inspections of such items as weight lines, will enable the parish to be confident that the clock is safe for other users of the tower.

It is likely that the annual maintenance of the clock by the professional conservator will include:

- **Cleaning** - All excess oil, grease and dirt needs to be removed and the inside of the clock case should be cleaned. Once a year, arrange for the clock room and exterior of the clock case to be vacuum cleaned, checking for any small parts that may have fallen off and retaining them for inspection.

- **Lubrication** - The pivots of all parts that rotate should be oiled, and sliding parts and springs greased. Only appropriate lubricants should be used that are specifically designed for use with a turret clock. Excessive lubrication and the use of inappropriate grades of oil will encourage wear of the movement, which is why this is a job for a professional.
- **Additions** - Automatic winders, night-silencers and pendulum correctors should be serviced in accordance with the manufacturer's guidelines.
- **Dials** - Dials should be inspected with binoculars to visually assess the condition of the dial, its fixings, hands and surrounding stonework.
- **Inspection** - The whole installation should be inspected and any issues reported to the Clock Keeper and noted on the Service Report card hung inside the clock case.
- **Recording** - After work has been completed, the Service Report card must be completed and all maintenance and service visits must be recorded in the Church Log book.

Clock cases

The clock mechanism should be kept as clean as possible. Gritty dust, pigeon droppings and similar harmful substances can be excluded by a dust-proof case, ventilated to avoid condensation, with hinged or removable sections to give free access for maintenance purposes. A suitable case can also give protection to other gears associated with the clock, most commonly motionwork immediately behind the dials. If possible, electric lighting should be installed in the clock case.

Timekeeping

We have become accustomed to domestic clocks and watches that keep accurate time. The same expectations of timekeeping are sometimes made of turret clocks. Although the best turret clocks, with gravity escapements and temperature-compensated pendulums, fulfil such expectations if properly maintained, it must be recognised that simpler and earlier clocks will not be so accurate. The clock can usually be kept accurate to an acceptable degree by regular and minor resetting of the time. For clocks that are found problematic to adjust for good timekeeping, there are various electronic control systems available commercially. These are usually considered for use on clocks with auto-winding and difficult access. When such a system is used it should be applied to a clock so that it can be removed and the clock left entirely as it was before the device was fitted. It is not necessary to make physical alterations to the clock itself to install assistance with timekeeping. However, it should always be remembered that such devices are no substitute for regular professional maintenance and should only be considered when the clock is in overall good order.

Additional technical information is available in the [Turret Clock Keeper's Handbook](#) and the [Turret Clock Code of Practice](#).

Weights, pulleys and lines

Weights, pulleys, and the lines which support them must always be maintained in good condition as their failure can cause a serious accident. They should always be inspected as part of the annual maintenance contract. There are, however, some matters that can be attended to by the parish to ensure the safe operation of the clock, most particularly in relation to the weights.

Weights should almost always be enclosed in chutes, with boxes of broken bricks, sand, or rubble to absorb the impact if they should fall. It must never be possible for anyone to pass beneath them.

Chutes must not be used as a run for electric cables and switches or to store rubbish or cleaning materials. It should not be necessary for anyone to have regular access to the weight chute. Extra weights must never be added to an existing one to force a neglected clock to work.

Dials and hands

Dials should be inspected regularly, both for their appearance and their condition. They can give rise to safety hazards if their fixings become insecure. Dials that require attention, whether internally or externally, should be conserved, using traditional materials as far as possible. Dial fixings should be made of a suitable material noting that different metals used for the dial and its fixings may react with each other in damp conditions. Stainless-steel fixings are generally used.

Historic dials made of wood must be conserved if at all possible. Since dials are exposed to the full impact of the weather, some dials will reach a condition of being beyond repair and replacement is then necessary. Replacement dials should be accurate replicas of the old dial and made of a suitable hardwood and painted in the same colours as the original. In exceptional circumstances a glass-fibre replacement dial may be an option but this must be fully justified and permission obtained before any work is done, as the resin compounds in the glass-fibre dial may not stand the test of time. The original wood dial should be retained in the tower for future reference. It is rare for a cast-iron skeleton dial to be beyond repair.

Due to the external conditions that the dial and hands on a clock tower are exposed to, restoration may be necessary, but this should be done using conservation principles. Re-painting and re-gilding will generally require stripping the dial to its base material as the existing paint may not be adhering well and the dial surface may be corroded underneath. Before work begins, paint samples should be taken as a reference. When removing paint from a dial, the least aggressive method should be chosen.

Gilding should be carried out using 23.5 or 24-carat double-thickness English gold leaf to the original, or previous, design for the particular dial. Gold paint must not be used as it loses its colour very quickly. For dials near to the sea, 24 carat is a more durable option. Dials close to trees can suffer damage from wind-blown debris. A tree surgeon would be able to advise the best treatment.

Opal glass, used in 19th-century cast-iron skeleton dials illuminated from the back, is best replaced with the same material as it maintains the same appearance and lasts a long time. An acrylic substitute can only be considered if a case can be made for using it — for example, if the opal glasses in the dial are regularly broken from stones being thrown at it — but the local conservation officer or, if in a church, the church architect, should be consulted first and permission obtained before work starts.

Damaged or corroded hands should be repaired wherever possible, or as a last resort, replacements made to exactly the same design as the original using the same materials. Internal counter-balances for the hands should not be removed and changed for ones with external counter-balances as this will alter the traditional appearance of the dial and is not an acceptable practice. Hands should always be carefully counter-balanced and it is worth checking that they still are. As with all other types of conservation, work to clock dials should be documented with a written description of the work done, including details of all materials used, illustrated with clear photographs.

Bells and bell hammers

Bell hammers and their associated bell cranks and cables can easily be neglected, but must receive regular inspection and lubrication of all moving parts as part of the annual maintenance of the clock. Any work that affects the ringing of the bells should be discussed with the Tower Captain and advice sought from the DAC.

Bell hammers must not rest on their bells as this creates a serious risk of cracking the bell and spoils its sound. Bell hammers should be checked regularly, and hammer check springs re-adjusted as necessary. A hammer should always strike its bell at right angles, on its thickest part and in such a position that it does not cause the bell to swing. If a bell has been quarter-turned because of clapper wear on the inside, the clock hammer must not strike on the outside immediately over the worn area.

When bells are hung for ringing, any clock bell hammers must be able to be lifted clear, otherwise there is a risk of damage to the bells, bell hammers or their mountings during ringing. The pull-off wires must be operated from the ringing chamber and there should be some clear indication that this has been done. If there are electro-hammers for the clock they can be isolated by an isolating switch. This switch should be prominent in the ringing room with a clear indication to the ringers that it is safe to ring.

Night-silencing

Night-silencing is used to prevent a clock from striking the hours and quarters during the night-time hours. There may be a need for such a device in certain situations.

Before night-silencing is installed it would be wise to discuss the situation with bell ringers and your local community and environmental health officers. The Central Council for Church Bell Ringers ([CCCCBR](#)) website has information on noise nuisance from bell ringing.

Automatic winders and electric drives

It sometimes becomes impractical to find someone in a building to wind the clock on a regular basis, particularly when a clock has to be wound every few days because of an insufficient weight drop or very heavy weights. In some cases access is difficult or hazardous, but providing safer access to a clock, for example, by installing a spiral staircase, can be an option. Relocating the movement within the tower is another possibility, but a less satisfactory solution from a historical point of view.

An automatic winder will remove the task of manually winding a clock. The automatic winder usually comprises a small weight that is wound up at regular intervals by an electric motor. Generally the automatic winder drives the clock by a length of roller chain.

When installing automatic winders it is vital that the integrity of the turret clock is preserved. No holes should be drilled into the clock frame, no slots cut out and no parts removed. The automatic winder should be attached to an external frame made of hardwood or steel. Utilising parts of the clock to attach an automatic winder, for example, securing bolts of bearing blocks and frames, is not acceptable. The clock must always remain completely intact so that it is possible to reverse the process and put the clock back to its original state simply by removing the added parts without leaving any signs that automatic winding has ever been fitted. The clock case should not be drilled or cut to fit automatic winders or their electric cables.

If the clock has had automatic winders fitted many years ago and they are now being replaced it is recommended that the whole automatic winder installation is looked at again in a re-assessment to see if it can be improved and brought up to modern-day standards. The following show some things that may be found during a re-assessment which should be corrected if possible:

- If the drive sprocket is on the second arbor of a train it is a good time to move to main barrel automatic winding.
- When the going train has the drive sprocket on the second arbor but the minute arbor is separately meshed with the great wheel, the great wheel should not idle between the two.
- When the strike or quarter great wheels undertake the action of lifting the bell hammers and the automatic winder drive sprocket has been fitted on the second arbors.
- When automatic winders are fitted very closely on top of the movement by rails bolted to the top of the clock frame affecting normal operation, free access for time-setting, and servicing of the clock.

The following requirements should be observed:

- The drive to the clock must be to the great wheel or barrel assembly (main barrel automatic winding). This is because clock gearing is designed for a large wheel to drive a smaller pinion. To drive a large wheel by a small pinion can result in abnormal wear on pinion leaves and wheel teeth or broken great wheel teeth if a jam occurs.
- Winding jacks or built-in reduction gears must never be used as part of an automatic winding installation.
- The original weights and pulleys should be retained in the building, ideally at the bottom of the weight chute and clearly labelled to prevent accidental disposal. There is no need to retain old wire or rope weight-lines. Weight chutes, although no longer in use, should ideally be preserved and protected so it would be possible to return the clock to manual winding to fulfil the aim of reversibility.

Some automatic winders comprise a weighted arm that is fastened to the winding square which is raised periodically by an electric motor, known as remontoire winders. Where a remontoire winder is employed, no modification should be made to a clock case to accommodate it, rather it should be mounted off the clock with a chain drive to a sprocket on the great wheel or barrel assembly.

It is advisable to have the movement cleaned and overhauled when automatic winding is fitted, unless this has been done very recently. All automatic winders must incorporate an emergency over-wind switch in case the normal switches or sensors fail to stop the winding motors. Suitable power supplies must be provided by a qualified electrician in accordance with the relevant electrical regulations. Wiring to existing automatic winders should be checked to ensure it is still safe.

Electric direct-drives have been used in the past, where an electric motor drives a striking or quarter train directly by the fly arbor with the fly vanes removed. For the going train, a direct-drive involves removing the escapement and installing a synchronous motor usually connected to the minute arbor by a chain. The fitting of a direct-drive is now totally unacceptable for new installations, even on a temporary basis. If electric direct-drives are found they should be re-assessed and a plan made to reverse the situation to main barrel automatic winding as soon as possible, if the parts to do this are still present.

Automatic winders will normally be included in an annual maintenance contract. The presence of automatic winding does not remove the need for a regular visual inspection of the clock and to regulate the timekeeping. Pendulum correctors are available to regulate the timekeeping of clocks but they are not a substitute for inspection.

The addition of an automatic winder does not mean that annual servicing is not required. A monthly visit to check the clock is strongly recommended.

Further sources of information

In addition to your DAC and the Church Buildings Council, the following will be of use to you in the maintenance of your clock. Details of grants offered by the CBC can be found on our [website](#).

The Turret Clocks Advisers Forum offers advice and guidance, including the [Code of Practice for Turret Clock Work](#) which sets out best practice for those caring for and repairing a turret clock.

Historical information and guidance on technical matters can be provided by the [Turret Clock Group](#) of the [Antiquarian Horological Society](#).

The [Turret Clock Keeper's Handbook](#) is one of a set of guides written by [Chris McKay](#) and is available for download from the Central Council of church Bell Ringers ([CCBR](#)) website. These guides explain many technical matters in detail, but the information given in them is no substitute for employing a professional clockmaker to maintain your clock.

Accreditation is now available for clockmakers, and details of clockmakers accredited in conservation can be found at the [Conservation Register](#) of the Institute of Conservation (Icon). Accreditation for clockmakers through this scheme is a fairly new development and the Register should become more comprehensive in the coming years. If the Register does not provide any useful contacts for you there is an additional source of information from the [British Horological Institute](#). It is essential to ensure that the clockmaker is experienced with turret clocks and that they are sympathetic to conservation principles.

This guidance is issued by the Church Buildings Council pursuant to its powers under section 55(1)(d) of the Dioceses, Mission and Pastoral Measure 2007. As it is statutory guidance, it must be considered with great care. The standards of good practice set out in the guidance should not be departed from unless the departure is justified by reasons that are spelled out clearly, logically and convincingly. Issued by the Cathedral and Church Buildings Division, September 2021. © Archbishops' Council.

