



## LIGHTNING PROTECTION AND YOUR CHURCH

### Early Lightning Protection Systems

It was in the early 1900s that many churches were fitted with 'tower only' systems of protection which have been moderately successful in carrying out the required task of diverting the electrostatic lightning discharge safely to earth. Today's knowledge is far in advance of those days, and the behaviour of lightning is much better understood. Arising from that knowledge are much more elegant ways of achieving protection from the worst effects of a lightning strike. The old 'tower/spire only' systems are in many cases now known to be really quite inadequate to meet the needs.

### Your Legal Obligations

Although there is no legal requirement for church buildings to be protected from structural damage by lightning, there are obligations on every PCC under health and safety legislation to protect people from various potential hazards, for example those that can result from a lightning strike.

Churches are subject to the Health and Safety at Work Act 1974 from which stems the Electricity at Work Regulations 1989 (EAWR's) and The Management of Health and Safety Regulations 1999 (MHSR, s). The first step toward meeting these obligations is to carry out, or have carried out on your behalf, a formal risk assessment, (Regulation 3 MHSR, s). This will not only provide factual guidance on the steps that you should consider, but will provide a valuable record should a prosecution or related claim ever be made against the PCC. There is a requirement under Regulation 6 of the EAWR's to protect electrical installations from being left in a dangerous condition from the effects of natural hazards. Lightning comes under that heading, and it is necessary for the parish to seek help and advice from their inspecting architect and the DAC specialist adviser, (see Chancellors Directions), for the risk assessment method to be used.

### The position with Ecclesiastical Insurance and English Heritage

From the statistical evidence of strikes to unprotected churches both English Heritage and the Ecclesiastical Insurance Group would in general support the view that most churches would benefit from a lightning protection system. Neither would wish to force PCC's and incumbents to spend money to replace old systems or install new ones just because the standards are now much higher, but both would almost certainly wish to see that existing systems were properly tested and maintained, and if a strike did occur that a budget was prepared for the installation of a new system as part of the repair works. The general strategy which is applied to this matter by them is that:-

- (a) The installation of a protection system is not usually a policy condition where cover is being given by EIG against lightning damage. But, as part of risk assessment strategy, such an installation serves to enhance the protection of the building for future generations to enjoy and should help to reduce claims costs in the longer term;
- (b) When designing suitable installations it is essential to apply the principles of minimum intervention and reversibility wherever and whenever possible. If conductor systems are not thought about carefully, they can be architecturally intrusive. **It was not unknown**

**in the past for systems not to have been installed for this reason. The risk of a strike is increased by 5 to 1 in this instance.**

## **Current Standards**

Quinquennial reports may state that the lightning protection system does not meet the recommendations of BS EN 62305: 2008. This British Standard is the nationally accepted way to deal with the potential for lightning strikes, and is referenced in the legal guidance documentation for safety applied to electrical systems. When such a statement appears it is advisable for PCC's to consult with their inspecting architect and request a review of their present system to see where it is not complying and, if change is necessary, what type of change should be considered. The DAC Adviser will be pleased to help with this assessment and may be contacted via the DAC Secretary.

Modern lightning protection systems may well include for the fitting of surge protection, more especially with the increase in use of sound reinforcement systems and electronic organs etc., most of which are expensive investments and should be adequately protected. Manufacturers of electronic equipment do not automatically fit these devices ex works.

## **Test and Inspection Requirements**

In the same way that any electrically isolated metallic component such as weathervanes, flagpoles, lead work, gutters and drainpipes, copper roofing etc., can lead to an easier path for a lightning leader strike to be attracted to the building, so a lightning protection system, which is not in good working order, can similarly present a danger because the air terminals may attract a lightning strike without providing a low resistance path to earth through which to safely discharge the return path lightning current.

This can result in serious side flashes, which may cause considerable damage to the structure and utility services. Regular visual inspection of the network of tapes should be carried out by the PCC, particularly after any contract works have been carried out on the roof or steeple/tower. Any obvious break in the conductor tapes should be reported immediately.

The system should be tested not less than twice within a quinquennial period, with one of those tests coinciding with the quinquennial inspection. It is definitely inadvisable to leave the period between tests and inspections to greater than 5 years (see Appendix). Contrary to expectations such tests are not particularly expensive. The request for inspection and test should require the work is carried out to British Standard Specification requirements. Your inspecting architect will ensure there is an appropriate test certificate issued by a specialist contractor affiliated to the Association of Technical Lightning and Access Specialists (ATLAS).

## **Action on receipt of a non-compliance statement in the Quinquennial Report**

From the test certificate and report, the DAC adviser and your architect will be able to advise about any statements of non-compliance which may arise. If you receive a non-compliance notice with your quinquennial report please contact the Secretary of the DAC at Church House, Hove and ask to be put in touch with its Lightning Protection Adviser. Usually the adviser will visit the church and prepare a comprehensive report for the architect and the PCC, which should help in the making of decisions about any need for change. Ideally your architect should be in attendance during a visit to help to ascertain and comment upon the possible impact on the aesthetics of the church of any proposals being suggested.

## Summary

A lightning strike to our church is something we all hope will not happen. But it does happen, and we know that five churches in the diocese have been struck in the last seven years and our Cathedral church twice since 1999. **Clearly the application of good quality lightning protection is something that should not be ignored.** The possibility of secondary damage to other services inside the church resulting from a side flash or surge on the main electrical system caused by lightning strikes should never be underestimated. These effects can seriously damage the internal electrical system, the water system, church bells, the tower clock, an electronic organ etc., the latter especially so if surge protection equipment is not part of the electrical services.

## Lightning Protection Inspection and Test Requirements

Inspection and Test procedures are given in Clause E.7 of BS EN 62305: 2006: Part 3, and the view taken by the DAC is that the periodicity suggested in the table on the next page is appropriate to most parish churches. It is possible to deal with this by the following procedure, which meets the spirit of the Standard.

When a new system has been installed the contractor should have provided a completion test certificate that will show the earth resistance of each earth rod, the combined system when not connected to the electrical system main earth bar, and with it connected to the main earth bar. That information should be on the As Fitted Drawing that they should have supplied. This information is important for the future and must be filed in the church logbook.

Inspection of the LPS should be carried out annually on a visual basis. The systems are usually mechanically robust requiring little maintenance, but there may be occasions when the components are damaged, e.g. vandal activity or there have been contractors working on the fabric where it has been necessary to displace the connecting tapes etc. Details of the location of tape/rod runs are usually shown on the record drawings. Earth pits are found at the base of or close to the down conductors and usually are a plastic box set flush to the soil level in the ground, the lid of which is removable with the aid of a 6mm Allen key. When opened DO NOT disconnect anything, merely see that the connection is firm and has not loosened up. If it has, then report that to the appropriate person in charge rather than try to tighten up the clamp. It is usually best to have a professional look at that situation to ensure that the connections are not stressed. The actual earth resistances are for professional testers, since specialist instruments are necessary for that work.

The churchwardens or their appointed Clerk of Works/Building Officer should carry out this visual check, the full details of which are given in the table on the next page. The form should be copied and used to record the inspection for entry in the logbook for the purpose of compliance with Regulation 4 of the Electricity at Work (1989) Regulations and Clause E.7 of BS EN 62305: 2006: Part 3. This report, plus the professional test and inspection test certificates, forms a record that the inspecting architect will wish to see during a Quinquennial Inspection procedure.

In this way the PCC will be able to demonstrate that the law has been met in the event of an incident involving electrocution.

When surge protection is first fitted, an electrical certificate should have been issued for that work and should also be filed in the logbook along with existing Periodic Electrical Inspection certificates. Surge protection units are part of the electrical system and will be included in an Electrical Periodic Inspection, which is not carried out by specialist lightning protection system contractors.

## LIGHTNING PROTECTION SYSTEM INSPECTION REPORT

Type of inspection	Visual	Close
Periodicity	Annual	2.5 years*
<p><b>Description of inspection</b></p> <p>From ground level check with binoculars that the ridge tape/s and down conductor/s is/are firmly fixed to the structure.</p> <p>Check where possible that all joints and bonds are firmly tight and not showing signs of corrosion. (See note +)</p> <p>At ground level check that the tape is not corroded away.</p> <p>Check for signs of any other mechanical damage. Report any damage found.</p> <p>If there are earth rod inspection pits, lift the lid and check the condition of the joint between the tape/rod and earth rod. Report any signs of corrosion.</p> <p>Carry out earth rod resistance test. NB: only a competent specialist should carry out this test.</p> <p>Where possible carry out continuity check of above ground system. NB: only a competent specialist should carry out this test.</p>		
Date checked:		Checked by:

- \* One of the *close inspections* should coincide with the quinquennial inspection.
- + Bonds (an extension of the bare copper down tape or insulated copper cable) are likely to be found attached to metal guttering, the tower clock, the bell frame if steel, the electrical circuit at its highest point in the spire/tower, the gas, water and electrical services where they enter the building.

There are three levels of inspection recognised for equipment in the electrical industry, *visual, close and detailed*. Only *visual and close* inspections are necessary for ongoing security of a lightning protection system. However, if electrical surge protection equipment is fitted to the electrical system in the church this should be inspected by the electrical contractor carrying out the Periodic Inspection to BS 7671: 2008, (the 17<sup>th</sup> Edition of the IEE Wiring Regulations) not the lightning protection specialist.

1. *Visual inspections* can be carried out by a churchwarden or suitably appointed building officer. Where there is no apparent problem identified, a tick should be placed in the appropriate box. If there is a problem identified, the church architect should be informed.
2. *Close inspections* must only be carried out by a competent specialist approved by the church architect. They should provide Test Certificates, which must be filed with the visual inspection forms in the church logbook.