

Bats in Traditional Buildings



Is your building project blessed with bats?

The holes, crevices and neglected spaces of traditional buildings offer an attractive shelter to bats, which are themselves 'traditionalists', returning to the same roosts all their lives.

Building professionals and owners or managers of traditional buildings are very likely to encounter bats, which enjoy a high level of protection in law. This manual provides advice on:

- the statutory legislation which protects buildings and bats
- the characteristic habits of bats
- the building works that typically affect bats and their roosts
- the techniques of managing such work and avoiding infringements
- who to turn to for advice and sources of further information

The manual takes in all stages including a summary of the legislation which currently applies to bats, their roosts, and listed buildings and scheduled monuments. It covers planning the work, bat indications and surveys, building work and sharing space with bats.



(front cover)
Pipistrelle at Felbrigg.
(Keith Zealand)
Repair work on a window
at Dudmaston. (©NTPL/
Michael Caldwell)
Restoration work on
masonry at Ightham
Mote. ©NTPL/Ian Shaw)
Mose House Farm
building (prior to repair),
Dudmaston. (©NTPL/
Michael Caldwell)

(back cover)
Brown long-eared bat.
(John Hooson)

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This publication is a partnership project between

English Heritage

- The Government's statutory adviser on the historic environment in England
- Provides advice to owners and managers on the conservation, repair and maintenance of traditional buildings
- Roosts of fourteen of the seventeen British bat species are on its properties

The National Trust

- Database of over 7,500 bat records going back 100 years
- Largest single owner of bat roosts in England, Wales and Northern Ireland
- Roosts of all seventeen British bat species are on its properties

Natural England

- Database of more than 13,000 bat records
- Administers 334 Sites of Special Scientific Interest where bats are found
- Works for people, places and nature to conserve and enhance biodiversity, landscapes and wildlife principally through education and the appropriate legislative framework

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Foreword

It is important to conserve traditional buildings, not only for their architectural or historical interest, but also because they provide vital roosts for most of the seventeen protected species of bat found in England.

Bats are often found in traditional buildings because they provide a large number of potential roosting places, and their design offers many entry points. Bats are long-lived mammals (up to 30 years) and traditionalists, returning annually to the same roosting site for decades. Although buildings, by their nature, give bats permanence and security, this special role is threatened by the demands of today's world. Unsympathetic conversions, obsolescence, traditional skills shortages, and greater regulatory demands necessitate changes to their structure which might prevent further use by bats.

This manual contains advice and techniques to help you if you are involved in building maintenance, adaptation or repairs, or are the owner or manager of a traditional building. It will provide you with:

- an understanding of your statutory responsibilities toward traditional buildings and bats
- a general understanding of bats; their characteristics and habits, and when, where and why they use buildings

- an understanding of the types of use, maintenance and building works that could affect bats and their roosts, and solutions to questions about caring for traditional buildings while minimising disturbance to bats
- encouragement to incorporate measures into buildings that will attract bats where none have roosted before
- information on whom to contact to obtain permission to carry out works on bat roosts

This manual will show you how the protection of bats, their roosts and traditional buildings can be mutually beneficial, and how your building works can be sympathetic to both buildings and bats. It stresses the importance of planning bats into any building operation, including its use, and shows when, why and how they should be incorporated into the project management process.

The legislation and statutory regulations in this manual apply to bats, listed buildings and scheduled monuments in England only. The approaches and examples are, however, widely applicable to other locations. Contact details are given on p 75.

Bats in traditional buildings

A summary

A combination of direct persecution and losses of roosts and feeding sites led to widespread declines in British bat populations. This is why total protection by law is now given to bats and their roost sites, wherever those roost sites are and whether bats are present or not.

Assume bats are present

Most of the UK's bat species use traditional buildings and forage in the surrounding landscape.

Always assume bats are present in such buildings. The only way you can be certain that bats are not present is by asking a specialist to survey the property for bats.

In almost all cases, changes and repairs to buildings can be made in such a way that bats continue to flourish; it is usually just a question of timing, awareness and consideration.

Plan ahead

The continued use and upkeep of traditional buildings and their use by bats should not be mutually exclusive. Realistic timetables, budgets and rigorous planning should enable a sustainable future for both.

Survey for bats at an early stage of any planned works so that you know what you

are dealing with, can avoid expensive hold-ups, and can avoid inadvertent infringement of bat protection laws.

Survey for bats proactively, perhaps as part of a periodic condition survey. Reactive surveys should be part of any initial planning for work on areas where bats are likely to live, such as roofs, walls, cladding, tunnels, basements or outbuildings.

Bear in mind that it may take you some time to obtain advice or any necessary licence.

Check responsibility and knowledge

Ensure that the designated project manager is aware of bat issues and the law.

Close links with experts in the local bat group will be beneficial: they may be able to help you with the surveys and provide advice about roost management. Developing close links now could help in obtaining a good, quick survey when one is needed.

A method statement is obligatory if a licence is required. Although a licence will be unnecessary if the work can be organised in a way that avoids disturbing bats or damaging/destroying their roosts, the work plan should still be written into a method statement. By doing this, you can demonstrate that the

correct procedures have been followed and ensure that all works are complying with the law. See p 9.

Always

- ✓ Seek advice from Natural England at an early stage if any work is to take place on a building where bats are likely to live (which is most traditional buildings).
- ✓ Think 'bat' when any changes are made to a building. This can include any works, ranging from the minor (such as testing smoke alarms) to the major (re-roofing).
- ✓ Place a sign at the entrance to known roosts to warn anyone who may require access.

Try to

- Be proactive towards bats: organise surveys, improve surrounding habitats for bats, and provide extra roosting places.
- Provide bat interpretation or organise bat walks at suitable places.

Caution

- ✗ Never allow works to be carried out in areas used by bats without first making sure that the law is being complied with.
- ✗ Never pick up a bat with bare hands, nor allow other people to do so. If anyone is bitten by a bat, they should seek medical advice immediately. See p 35 for guidance on dealing with stray bats.
- ✗ Never assume that workmen, contractors and other staff have already been told about any bats or their roosts.

Section A

Legal considerations: buildings, bats and the law

This section covers the legal considerations that you must be aware of when working on traditional buildings which may have bat roosts.

Many traditional buildings in England are protected by law, and are designated as 'listed buildings' or 'scheduled monuments'. It is a criminal offence, punishable by a fine or a prison sentence, to carry out unauthorised work to a designated building. As well as legal costs, you may also be required to reverse all unauthorised alterations.

All seventeen species of bat in the United Kingdom are protected by the law. It is a criminal offence to deliberately kill, injure, disturb or capture a bat, or to damage or destroy their roosts. (Note that roosts are still protected even when bats are not physically present.) You should always contact Natural England or seek expert advice before undertaking any work which may affect bats or their roosts; where bats are present, you must either arrange the work in a way that will avoid committing an offence or obtain a licence from Natural England, often referred to as a European Protected Species or EPS licence. See *Bats and the law*, p 7.

If you do not carry out a survey and bats are discovered in the course of the works, the works are likely to be halted until a suitable scheme of work has been agreed. This may need a licence. See *Licenses and advice for work at bat roosts*, p 8.

Obtaining a licence to proceed may take over two months, therefore you should always arrange the bat survey at the start of planning any building works.

Traditional buildings and the law

Traditional buildings make a fundamental contribution to a sense of identity and place. They are records of those who built, worked and lived in them, and the crafts and skills associated with their building materials and techniques. For these reasons, many traditional buildings and monuments considered of special value in England are protected by law from unauthorised alteration, extension, demolition or wanton neglect.

Statutory protection is granted if such buildings are

- **listed** as being of special architectural or historic interest
- **scheduled** as a scheduled monument

Note that if your building is both scheduled and listed, ancient monuments legislation takes precedence, and scheduled monument consent, rather than listed building consent, is required for works.

In addition to obtaining one of these consents, you may also need to obtain planning permission for certain works.

► See *Contacts and Bibliography* for further information on the legislation.

NB At the date of publication (March 2009), the legislation which protects traditional buildings was under review and a new system may be introduced in 2010. Up-to-date information is available from local planning authorities and the websites of

English Heritage (www.english-heritage.org.uk) and the Department for Culture, Media and Sport (www.culture.gov.uk). (See also *Contacts*.)

Listed buildings

Carrying out unauthorised work to a listed building is a criminal offence punishable by a fine or a prison sentence, and the local planning authority can require that all unauthorised alterations are reversed.

The *Planning (Listed Buildings and Conservation Areas) Act 1990* allows the Government to make statutory lists of buildings of 'special architectural or historic interest'. Such **listed** buildings are protected by law, and any changes to them must first receive **listed building consent**.

Listing does not mean that a building must be preserved as it is for all time. It means that the architectural or historic interest of the building must be carefully considered before any alterations are agreed. Listed building consent will be required 'to demolish a listed building or any part of it, or alter it in any way which would affect its character, inside or out'. Although repairs which match the original exactly may not need consent, any proposed works, whether repairs, alterations or demolition, must be determined on an individual basis.

Local planning authorities deal with all listed building consent matters. Before making an application for building work, you must contact the local planning authority's conservation officer. The conservation officer will:

- confirm whether the building is listed
- advise whether proposals do require listed building consent, and if it is likely to be granted

- provide the appropriate form for making a listed building consent application
- formally consider all listed building consent applications, and provide applicants with a decision

After submitting an application, it usually takes at least eight weeks for you to receive the decision. If consent has been refused, you will have six months in which to appeal to Communities and Local Government (www.communities.gov.uk).

Scheduled monuments

Carrying out unauthorised work to a scheduled monument is a criminal offence punishable by a fine or a prison sentence.

The *Ancient Monuments and Archaeological Areas Act 1979* allows the Government to make a schedule of nationally important archaeological sites and built structures. Not all scheduled monuments are 'ancient' nor necessarily a 'monument'; standing buildings or ruins can be given this type of protection. The Act covers sites from the prehistoric era to twentieth-century examples of industrial workings; some World War II and Cold War installations have also been scheduled.

Scheduled monuments are protected by law, and any proposed works must first obtain **scheduled monument consent**. Works are defined as 'demolishing, destroying, damaging, removing, repairing, altering, adding to, flooding or tipping material onto the monument'.

English Heritage deals with all scheduled monument consent matters on behalf of the Department for Culture, Media and Sport. Before making an application for building work, you must contact the appropriate regional office of English Heritage, which will:

- confirm whether the monument is scheduled
- advise whether scheduled monument consent is likely to be granted for the proposed work
- provide the appropriate form for making a scheduled monument consent application
- formally consider all scheduled monument consent applications, and advise you of the provisional decision before your application is formally determined

Once you have submitted your application, it usually takes at least eight weeks before the decision is sent to you. You will be offered the opportunity of a local hearing if you wish to contest the decision or any conditions imposed.

Bats and the law

All bats and their roosting places (whether bats are present or not) are protected by two major pieces of wildlife legislation:

1 *The Wildlife and Countryside Act 1981 (WCA)*

The WCA transposes into UK law the *Convention on the Conservation of European Wildlife and Natural Habitats* (Bern Convention). This Act has been amended several times, with the most recent amendments introduced by the *Conservation (Natural Habitats &c.) (Amendment) Regulations 2007 and 2009*. This removed some of the protection bats enjoyed under this Act where it was duplicated under the *Habitats Regulations*.

All species of bat are listed under Schedule 5 of the 1981 Act, but only in respect of Section 9: 4 (b) and (c) and 5, which, in summary, makes it an offence to:

- intentionally or recklessly disturb a bat while it is occupying a structure or place which it uses for shelter or protection (roost)
- intentionally or recklessly obstruct access to any structure or place which it uses for shelter or protection
- sell, offer for sale or possess for the purpose of sale any bat or part of a bat or advertise sales or purchases of bats

There are defences in the Act which permit what would otherwise be offences in certain circumstances. In the case of bats in buildings, relevant defences to the first two offences listed above are that the action took place in a dwelling-house or that the action was the incidental result of a lawful operation and could not reasonably have been avoided. Unless you had consulted Natural England beforehand, however, you would be unable to rely on either of these defences.

2 *The Conservation (Natural Habitats &c.) Regulations 1994*

More commonly known as the *Habitats Regulations*, these transpose into UK law Council Directive 92/43/EEC of 1992 (often referred to as the *Habitats Directive*). All bats are listed under Schedule 2 (European Protected Species) of the *Regulations*, and for some (horseshoe bats, Bechstein's and barbastelle), the UK is obliged to list Special Areas of Conservation (Natura 2000 sites). The *Regulations* have recently been amended by the *Conservation (Natural Habitats &c.) (Amendment) Regulations 2007 and 2009*. These *Regulations* make it an offence to:

- deliberately capture, injure or kill a bat
- deliberately disturb bats in a way that affects their ability to survive, breed, hibernate or migrate, or significantly affects their local distribution or abundance

- damage or destroy a breeding site or resting place of a bat [note that this does not have to be deliberate]
- possess or control, transport, sell or exchange, or offer for sale or exchange a live or dead bat or any part of a bat

The *Habitats Regulations* contain few defences other than those that permit the tending of disabled animals or the mercy-killing of severely disabled ones. Guidance is available on Natural England's website (www.naturalengland.org.uk) which interprets the disturbance offence. The guidance explains that deliberately disturbing individual bats or, at certain times of the year, small groups of bats, is no longer an offence under the *Habitats Regulations*.

Natural England can issue a European Protected Species (EPS) licence to permit otherwise unlawful acts for a range of specific purposes, including 'imperative reasons of overriding public interest', which includes development in the widest sense. A licence cannot be issued unless there is no satisfactory alternative and the action authorised will not adversely affect the maintenance of favourable conservation status for the population of the species concerned.

In practice, the only ways in which work on buildings with bats can be carried out within the law is if the work is organised so as to **avoid committing offences** or if it is carried out **under the terms of a licence** issued by Natural England.

For both pieces of legislation, penalties are fines of up to £5,000 per offence and/or a custodial sentence of not more than six months.

- See the Five-step process to compliance, p 10, which explains the process of obtaining advice and applying for a licence for bat work.

Licences and advice for work at bat roosts

The *Wildlife and Countryside Act 1981* and the *Conservation (Natural Habitats &c.) Regulations 2007* give legal protection to bats, and to their roosting places. There is provision, however, to license people to disturb bats or damage roosts for particular purposes. See *Managing bat contractors*, p 32, for more details.

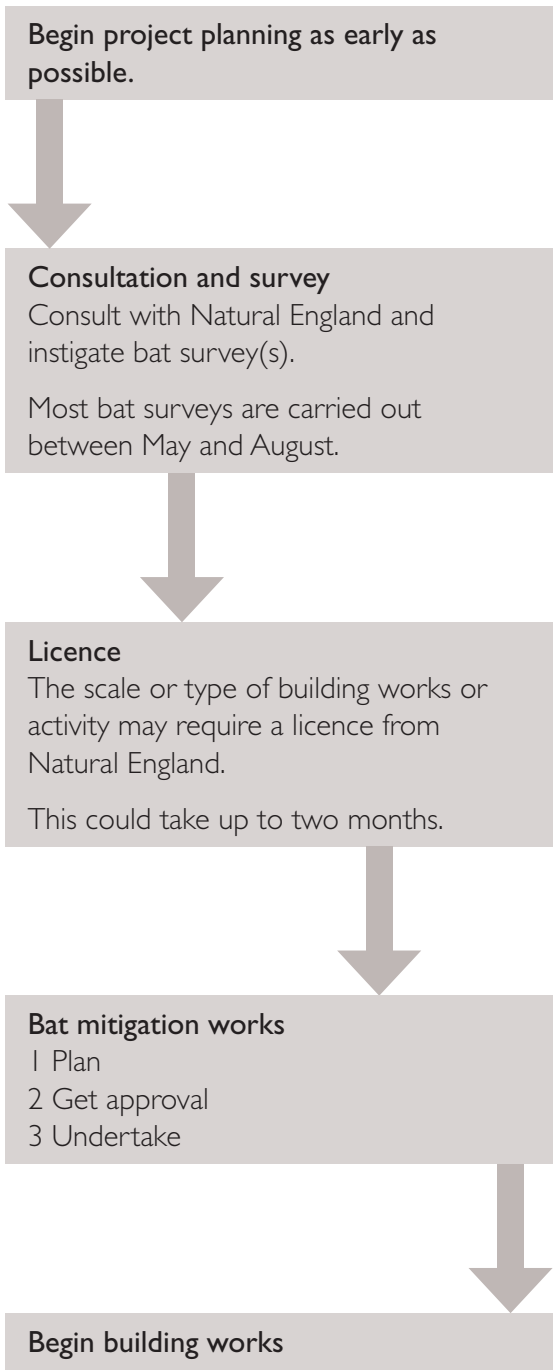
If bats are likely to be present, you should contact Natural England for advice as soon as the proposed works are first mooted. For more minor works, or where the bat interest is limited, it may be able to assist with devising a scheme of work that avoids committing offences. However, more significant operations will require the services of a professional bat consultant to carry out a bat survey, prepare a method statement and, if necessary, submit a licence application – which all takes time.

Timing

A licence or advice from a bat consultant or Natural England on how you should progress legally is likely to cover timing the works to disturb bats as little as possible. Timing issues are detailed further on p 37.

A bat survey will have to be carried out at a suitable time to locate bats or their signs. If no survey is carried out and bats are discovered in the course of the works, all building activity is likely to be halted until a suitable course of action has been decided, which may involve contracting a bat consultant. The hold-up is usually costly. In addition, if a law has been broken then prosecution could result, costing you further time, money and reputation.

Making time for bats



Method statement

Applications for licences require a method statement in a standard format that is described on the application form. This sets out the species of bat present, what the significance of the site is for bats, what works are proposed, and how and when they will be undertaken. If mitigation for the loss or alteration of roosts is required to maintain the bat population, the method statement will give details of how this will be achieved.

Even if the works can be arranged so as to avoid offences, thus removing the need for a licence, a method statement is still recommended, particularly for larger operations. In such cases, the method statement should be used to set out the way in which the works will be organised and timed to avoid committing offences, thus providing clear guidance to all involved. Should an offence ever be inadvertently committed, the method statement can be used to show that all reasonable steps were taken to avoid this.

Reasoned statement

This is simply a covering statement which accompanies a licence application and gives the reasons why the work is being carried out in the way specified.

Obtaining a licence to proceed may take up to two months and therefore you should arrange the bat survey as soon as you start planning your building works.

Five-step process to compliance

Step 1 Contact Natural England

For works which seem unlikely to need a licence, Natural England may send a licensed volunteer bat worker to your building to assess the situation.

For repairs, renovation or alterations, where you can easily agree to a scheme of work which, in Natural England's view, will not contravene bat protection legislation, you will be given advice on how the works might proceed. Although no licence will be needed, it remains your responsibility to comply with the law; **no further steps apply**.

For developments, major renovations or repairs and schemes where it is clear that avoiding wildlife offences would be difficult, Natural England will advise you to employ a professional bat consultant to carry out a bat survey, devise a method statement for the work and, if necessary, oversee your licence application. This will also be the case if you cannot agree to any scheme that would avoid committing offences. **More steps are required; move on to Step 2.**

► See p 34 for a definition of bat worker/consultant roles.

Step 2 Appoint a bat consultant

Identifying a suitable bat consultant is similar to selecting other contractors: personal recommendation is best but selecting members of professional bodies may help. Many are members of the Institute of Ecology and Environmental Management (IEEM) which is a good place to start if no recommendations can be obtained (see Contacts). The consultant may work as part of an environmental consultancy or independently.

Always ask to see the consultant's current bat licence and evidence of an up-to-date rabies vaccination, and also check their insurance cover.

► See pp 33–5 for more on working with a bat consultant.

Step 3 Commission a survey

The bat survey will attempt to determine what species of bat are present, to estimate their numbers, find access points, and say how and when they are using the building.

The licence application requires details of the species and the number using the site. When horseshoe bats are found (mainly south-west England), further information on surrounding roosts and flight lines may be required, since they are endangered species in need of extra protection.

► See Building and bat surveys, p 22.

Step 4 Obtain a report

This should contain not just the background, method statement and raw results from the survey, but also result summaries, interpretations, evaluations on how the bats use the site and the importance of the bat population locally and nationally.

Results should be clear: the maps, photographs and diagrams should make it explicit which building or part of the building the survey concerns. You should ask for plans that you can give to your bat surveyor which are marked with standard and agreed roof void, chimney stack and room numbers or names. See What to expect in a survey report, p 34, for more information.

If the consultant is able to propose an acceptable scheme of work that avoids committing any offences, the report should include details of the agreed scheme of work,

with information about timing of operations, methods of working and acceptable materials. The report should make it clear where the boundaries lie, beyond which further activities may constitute an offence.

If the consultant judges that a licence application will be necessary because avoiding offences is not possible, the report should be set out in the required form for a licence method statement. Mitigation requires a commitment to monitor the success of the measures for a defined period of time. This report will then form the basis for a licence application. See *Bat Mitigation Guidelines* (Mitchell-Jones 2004) in the Bibliography.

Step 5 Apply for the licence

The bat consultant will help you complete the licence application. The method statement submitted with the licence application will cover proposed mitigation works.

The applicant, with the help of the bat consultant, is also required to submit a 'reasoned statement of application' with the licence application: this explains why the work is being done in a particular way and at a particular time.

In deciding whether to issue you with a licence, Natural England will consider:

- (a) whether the licensing purpose is appropriate, which, in most cases, will be 'overriding public interest';
- (b) the 'no satisfactory alternative' test, ie that there is no satisfactory alternative way of carrying out the works that would avoid offences;
- (c) the 'no adverse effect' test, ie that the works will not 'adversely affect the favourable conservation status of the population of the species concerned'.

If your operations require planning permission, Natural England will consult the local planning authority to satisfy itself that the presence of protected species was taken into account when the planning application was determined.

Provided your application passes these tests and all requirements are met, you will be issued with a licence within a couple of months. If, however, there are any points of difficulty, the licence application will be returned to you and must be re-submitted only after the issue has been resolved.

Once you have gone through the five stages above, you will be able to begin the building work. You must, of course, ensure that you do meet the terms of the licence; during the works, keeping to the conditions of the licence is the legal responsibility of the person named on it (usually the developer or owner). If you have employed a bat consultant, it is advisable to retain their services to oversee any specialist works and to carry out any required monitoring.

Note that although the licence itself is free, the consultant will not be; remember to include their costs in your budget, plus the cost of any extra works involving bat mitigation or monitoring. As with any building project, predicting the exact costs can be difficult; you should obtain upper and lower level quotations from consultants and allow for contingencies.

You will be asked for (and must give) permission for access to the site by Natural England staff to monitor the works. They have a target of checking licence compliance for a sample of about ten per cent of licences.

Section B

Why bats use buildings

This section gives you information about bats and their habits, and tells you where you are most likely to come across bats in buildings.

A colony of bats will have several roost sites that they will use according to their needs and the time of year. An absence of bats does not mean that the roost is no longer being used. See Choosing a roost site, p 15.

Identifying whether bats actually use a building, and understanding the patterns of use, requires specialist knowledge. See Finding bats and their roosts, p 19.

Common name	Scientific name	Status
Barbastelle	<i>Barbastella barbastellus</i>	Rare; threatened; UK BAP Priority Species; EU Priority Species
Bechstein's bat	<i>Myotis bechsteinii</i>	Rare; threatened. UK BAP vulnerable species
Brandt's bat	<i>Myotis brandtii</i>	Uncommon; not threatened.
Brown long-eared bat	<i>Plecotus auritus</i>	Threatened; UK BAP Priority Species.
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	Frequent; not threatened
Daubenton's bat	<i>Myotis daubentonii</i>	Frequent; not threatened
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	Rare; threatened; UK BAP Priority Species; EU Priority Species
Greater mouse-eared bat	<i>Myotis myotis</i>	Very rare; at one time considered extinct in Britain
Grey long-eared bat	<i>Plecotus austriacus</i>	Very rare
Leisler's bat	<i>Nyctalus leisleri</i>	Occasionally found in England and Wales; more frequent in Ireland
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Occasional or frequent; threatened; UK BAP Priority Species; EU Priority Species
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	Rare
Natterer's bat	<i>Myotis nattereri</i>	Not threatened
Noctule	<i>Nyctalus noctula</i>	Threatened; UK BAP Priority Species
Serotine	<i>Eptesicus serotinus</i>	Rare
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	Threatened; UK BAP Priority Species
Whiskered bat	<i>Myotis mystacinus</i>	Not threatened

* Includes mines, bridges, caves, tunnels, cellars and ice houses.

The UK Biodiversity Action Plan (UK BAP) is part of an international framework to conserve and enhance biodiversity. Seven species of bat are on the UK BAP's priority list (of species and habitats) meaning that they are rare and/or in decline.

Distribution	Roost size	Summer roosts	Winter roosts	Foraging habitat
Southern half of England and Wales	1–50	Tree cavities and occasionally old buildings such as barns	Tree cavities and underground sites*	Ancient woodlands and pasture, parkland, hedgerows
Southern England	1–100	Tree cavities, especially old woodpecker holes	Tree cavities and underground sites*	Ancient woodlands
England, Wales and Ireland	30–200	Mainly roof voids in buildings	Underground sites*	Woodland and tree-lined water bodies
Throughout the UK and Republic of Ireland (RoI)	10–20 (can be up to 100)	Roof voids in older buildings, barns, churches and tree cavities; bat boxes	Tree cavities and underground sites*	Woodland, gardens and orchards
Throughout the UK and RoI	50–200	Outer parts of buildings (confined spaces such as soffits and under hanging tiles rather than roof voids)	In confined spaces in buildings	Woodland, gardens, parkland, hedgerows; around water bodies
Throughout the UK and RoI	20–50 (can be up to 200)	Tree cavities; also tunnels and bridges	Tree cavities and underground sites*	Over water
South-west England and south-west Wales	50–200 (can be up to 600)	Mainly large roof voids of old buildings	Underground sites*	Parkland and woodland, steep-sided valleys
South coast of England; only one hibernation site known		Mainly large roof voids of old buildings	Underground sites*	Pasture and woodland
Southern England	10–20 (can be up to 50)	Buildings	Caves and tunnels; also probably uses trees and buildings	Parkland and woodland
England, Wales and Ireland	20–100	Buildings, bat boxes	Buildings	Woodland and parkland
South-west England, Wales and RoI, spreading north and east	30–70 (can be up to 400)	Mainly large roof voids of old buildings	Underground sites*	Woodland and parkland
Throughout the UK during migration; resident in Northern Ireland	1–100	Buildings	Buildings	Woodland, especially near water bodies
Widespread in UK and RoI	20–100+	Old stone buildings and large, timbered barns; tree holes; bat boxes	Tree cavities, bat boxes and underground sites*	Woodland and parkland
England and Wales; absent from Ireland	15–50 (can be up to 100)	Tree cavities, occasionally buildings	Tree cavities	Woodland, pasture and lakes
Largely confined to counties south of Lincolnshire and Ceredigion but may be spreading north and west	15–30	Buildings	Buildings; rarely underground sites*	Woodland, pasture and lakes
Throughout the UK and RoI	50–1,000 (2,000 exceptional)	Buildings, bat boxes and trees	Buildings, bat boxes, and tree cavities	Widespread, especially near water bodies
Throughout the UK and RoI	30–200	Mainly roof voids of older houses	Underground sites*	Woodland, gardens, parkland, hedgerows; around water bodies

Bat facts

What are bats?

- Bats account for nearly a quarter of all mammal species.
- Worldwide, there is more than 1,000 species of bat.
- As mammals, bats give birth to live young and suckle them with milk. Females rarely have more than one baby a year.
- Bats are the only mammals that can fly. Their wings are modified hands, with very long fingers and skin membrane stretched between.
- Bats are not blind but they hunt and find their way around using echolocation, building a 'picture' of the world through sound waves, as well as with eyesight.
- Bats are nocturnal. When at rest during the day, most species are tucked deep into crevices or in other dark spaces, such as roof voids, where they can be hard to locate.



A hibernating brown long-eared bat in a mortar crevice. (Keith Zealand)

Bats in the UK

- There are seventeen species of bat in Britain and Ireland (see pp 12–13). All are found in the south of England but the number of species declines further north, with only five in northern Scotland.
- The bats found in Britain and Ireland are small: the largest species (the serotine and noctule) have a body length of no more than 100mm; the smallest (common pipistrelle) is about half their size.
- All species eat only insects, usually caught in flight in favoured feeding habitats such as woodland, gardens and hedgerows, often near water. Some species pick prey off leaves or the ground (known as gleaning).
- In the UK and the rest of Europe, most bat species are uncommon or rare; as a result, all bats and their roosts are totally protected by law.
- The most endangered species in the UK are the greater and lesser horseshoe bats, barbastelle and Bechstein's bat. The horseshoe bats are largely confined to south-west England and to Wales. The other two are found in the southern half of England and in Wales.

A year in the life of bats

Spring

March and April are the period of 'arousal', when bats spend increasing time out of hibernation. Although they will return to a torpid state if the weather is cold, they must now forage for food.

Some species of bat, such as lesser horseshoe bats, may have their summer and winter roosts in the same (big) building.

Warm roof voids or boiler rooms are used for breeding in the summer; cool cellars are used for hibernation in the winter. However, some bats can be found in either roost type at any time of year.

Early summer

Females gather in maternity roosts ready to give birth in June or July. Males usually roost in small numbers away from the females.

Bats live in warmer sites such as roof voids during the summer but will select sites with the right conditions for what they are doing: females prefer hot sites when they have babies; males prefer cooler sites. The biggest maternity roosts can hold over 1,000 bats but, for most species, these roosts usually hold fewer than 100 adult bats.

Late summer

By August, females start to leave the maternity roost sites and juveniles are flying and feeding on insects.

This is the time of year when juvenile bats are most likely to stray into living spaces when they try to return to their roost.

Autumn

Males 'display' to attract females. Bats mate from September to early winter.

Bats are now feeding well to put on body fat ready for the winter. Bats aggregate at 'swarming sites'. These sites are often at the entrance to underground sites, such as mines, but similar behaviour can also be seen in roof voids and other roost sites. Reasons for this behaviour are largely unknown, although it may be linked to mating.

Winter

Bats hibernate between September and April. They may move between sites during that time.

Bats choose cool and stable hibernation roost sites, which have a high humidity. Horseshoe bats generally choose sites with higher temperatures and better air flow than other species. Within buildings, bats hibernate in wall cavities, roof voids, cellars, ice houses and other dark, cool places. During mild periods in winter, it is not unusual for bats to become active and emerge to feed and/or drink.

Choosing a roost site

Why buildings?

Modern agriculture, forestry and urban growth has reduced the number of natural bat roost sites (tree crevices and holes surrounded by good feeding grounds) or made them less suitable. As such roosts become rarer, bats are increasingly choosing those traditional buildings which have their preferred habitats all around them – parkland, gardens, farms, lakes and woodlands. Bats may also prefer buildings because they are cleaner, warmer and more stable than trees and other natural sites, with less competition from birds and other mammals.

The choice of building is complex and its suitability from a bat perspective depends on such things as structure, location, microclimate and human use. Habit also plays a part; bats are long-lived with excellent memories and may use the same house each year in a row of seemingly identical houses.

Because they are long-lived, bats become well-acquainted with a large number of suitable roosting structures over many square kilometres. They may visit them occasionally or frequently and use those that they find suitable for their requirements. Some buildings have records of continuous use by bats for decades, even when the ideal conditions for bat roosts would seem to have been lost.

Bats will tend to choose certain places in a building, particularly the:

- roof eaves, verges, gables, ridges and chimney/roof joints which have gaps that bats can utilise or through which they can gain entry to other parts of the building
- roof voids, wall cavities, tunnels and cellars that have the desired dark, stable, protected conditions, and, in the case of tunnels and cellars, are usually humid
- mortar gaps in stone or brick-work or around windows or doors which provide small crevices

Different species of bat at different times of their annual cycle will also make use of a variety of building materials – roof-timber joints, boxed-in eaves (soffits), under ridge tiles, between roofing-felt/boards and slates/tiles, cavities in stonework and gaps between bricks. In particular, bats use spaces that have opened up between two different materials, such as where wood meets brick or stone

(eg under barge boards, soffits, roof beams), lead next to tile, slate or wood (eg on roofs) and iron in contact with stone or brick (eg pipes in walls, girders in roofs). Bats also exploit gaps caused by surface coverings falling away from walls; for instance, between a wall and plaster or render. The materials all have characteristics that provide bats with roosting places or entry points into a building: wood shrinks or rots leaving hollows and open joints; tiles and slates slip or warp, allowing access points into a roof; metal expands and contracts, breaking any seal with a neighbouring material; stone erodes and crumbles, providing more crevices.

Roost requirements

Bats at rest require certain conditions from their roosting places. Depending on the number of microclimates and size of internal spaces, a building may accommodate just one or a number of different types of roost or activity, including foraging.



*Bats seek roosts which are clean, warm and stable (Natterer's bats *Myotis nattereri*).
(© NTPL/NaturePL/
Dietmar Nill)*

A colony of bats may have many day-roosting sites which they use at different times of the year. How often bats move between roosts depends on the species, as some move more frequently than others. When bats move, they rarely all do so together and the colony may split itself between roost sites. The reasons for this are unknown but appear complex and social, not simply due to changes in environmental conditions. Females of most species segregate in summer to produce their single babies and generally tend to move less frequently at this time.

The roost requirements vary with the bats' activity and seasonally between species, ages and sexes, but will invariably include dark, stable conditions and will generally be high up. Bats look for particular roost conditions and these are listed below.

Conditions which suit a bat's physical requirements

Bats have adapted to being active at night and generally seek out low light levels. Some bats, like pipistrelles, may occasionally be found roosting in quite light conditions, such as around door frames and behind down-pipes, but these cases are unusual.

Because the front limbs and fingers of bats are part of their wings, they are not particularly agile on the ground. Several species are predominantly found in the highest points – the ridge beam or higher purlins in a roof, the apex of a gable end, or at the topmost part of a bridge or tunnel. Although it is very unusual to find bats roosting less than one metre off the ground, it is not unknown for some species to hibernate in rock piles.

Bats prefer a surface on which they can get a good grip with their toes and thumb claws,

and will avoid dusty, flaking surfaces. They may select a material like wood when they want good insulation, but when they need to cool down and stay at a steady, low temperature, as they would during hibernation, bats will prefer to be in contact with brick or stone. Bats also select particular stone or brick types that drip with condensation as this improves the hibernation humidity.

Protection from predators and the weather

Dark conditions and high places give bats protection from disturbance by predators and humans.

Roosting places are sought where no rain, frost, direct sunlight or wind can penetrate. This is particularly important because although bats are able to regulate their body temperature, direct exposure to the weather can disrupt this rapidly, leaving them vulnerable (see next point).

Confined, stable environment

Many bat species often squeeze tightly into small gaps. They have the ability to form their own microclimate within the crevice, enabling them to regulate their temperature and save energy. Horseshoe bats (which wrap their wings around themselves) are unusual in that they hang from exposed positions but they also select places away from draughts.

Draughts can dehydrate a bat and quickly change the conditions in a roost, consequently most roosts are in draught-free places. Bats are sensitive to change: even when hibernating, they can be aroused by noise, light and slight rises in temperature, such as that caused by human body heat. Arousal in cold winter weather burns up their fat stores and could be fatal.

Suitable temperature and humidity

Bats choose different conditions depending on what they are doing, although they always seem to prefer high humidity.

Pregnant females may select very warm (25–35°C) sites, such as a slated roof void, as this will reduce the period of pregnancy and also enable the newly-born youngsters to develop more quickly. If cool, wet weather conditions result in few insects being available for food, females may choose to roost more in cooler sites. This slows down pregnancy so that birth coincides with better insect availability.

Males may roost in cooler sites all summer as they are not involved in the rearing process and can conserve their energy by becoming torpid.

In winter, when most of their insect food is unavailable, bats choose cold (3–7°C for most bat species and 7–12°C for horseshoe bats) and humid sites for hibernation.

Rather than wait for the conditions in a roost to change, the bats move between roosting places that offer different conditions. For example, in summer, if the weather is cold, there will be less insect prey for the bats at night. They may select colder sites to roost in, where they will become torpid during the cold spell, thus conserving their energy. After a feeding bout during summer nights, bats may choose a fairly cool night-roosting site and become torpid for a few hours. This conserves the energy that they have gained through foraging flights.

Fly-around areas

Many species will enter large structures at night solely to fly around for reasons as yet unknown. The fly-around area may be beneath where they roost, in a neighbouring building or even some distance away.

Building aspect and design

The aspect, situation and construction of a building will create different temperatures and roosting opportunities that can make a site attractive for bats. The more complex and varied the building, the greater chance that it will provide suitable roosting opportunities because of offering more voids and roost entrances.

Roofs or walls facing south or west will provide hotter roof voids or wall cavities.

The roofing material will also affect roof void temperature; for instance, a dark slate roof will have a void of a different temperature than one of corrugated iron. Lining on the underside of the roof covering will also affect conditions inside, as will insulation at floor level in the roof void.

High roofs which do not receive any shading from nearby trees are likely to be warmer. High ridges usually mean a larger roof void which can be attractive to some bat species.

An underground room will be more buffered from outside conditions than one above the surface.

A prominent building (large size, on a ridge or mount) is more likely to be investigated by passing bats and used, if opportunity allows, even if only to navigate by.

This activity is often seen in churches soon after sunset, but also occurs in other large roof voids, such as barns and halls. Horseshoe bats will gather in such a space after emerging at dusk from their day-roost and, from there, will set off to feeding areas.

Entry points into bat roosts

The required size of the entrance slot depends on the species. Horseshoe bats require larger openings – as large as a partially-open door, broken window or ventilator slot – as they prefer to fly into the roosting area. The other species can crawl if they need to and will often make use of gaps as narrow as 15mm to reach a roost. Bats do not modify the entrance by gnawing.

The bats' entrance point may be close to the roosting place, such as gaps in joints of old roof timbers or in the soffit box of the eaves or verge. In some cases, the roosting place may be a little removed from the access point, such as a mortar gap in a wall which may lead into cavities between the inner and outer walls. The gap under the eaves or fascia boards may lead into the roof void, or the split or peg holes in a roof beam may lead deep inside where it has been hollowed out by wood-boring beetles.

There may also be a first access point some distance away, such as where the bats enter over the top of a poorly-fitting door or through a broken window before finding their way to their roost in the roof.

Finding bats and their roosts

Finding bats is a skilled operation and should only be undertaken by appropriately licensed specialists to avoid prosecution should bats

be disturbed; see Managing bat contractors, p 32. Some of this skill involves locating signs of bats which remain even when the bats are absent: the droppings, urine spots or greasy marks on roosting places.

Droppings, food remains and where they are located can indicate the species of bat, when and how it was using the roost, and the exact position of the roosting place or entry.

Even for experts, bats are often hard to find when roosting. As well as tending to choose dark, inaccessible places:

- bats are small and usually quiet and inactive when roosting – a single bat squeezed and motionless in a mortar gap is likely to remain unnoticed. This is a particular problem when looking for bats during hibernation; even in summer, a cluster of sleeping bats tucked into a corner of a roof is easy to overlook in the dark.
- some bat species regularly move between roosting places, so even a known roosting place may often have no bats using it.
- in summer, females gather to produce their babies, and although they may be heard chittering during the heat of the day or just before emergence, they may not be seen if roosting in an inaccessible location.

Endoscopes are sometimes used in bat surveys but, in many situations, it is still difficult to see if bats are present or not; absence of signs does not necessarily mean that no bats use the site. Watching for bats emerging at dusk is one method that can be used in summer; plan all works ahead, so as not to miss this monitoring opportunity.

Bats and their signs

In the first instance, bat workers will look into past records of bats or previous surveys and speak to people familiar with the building, such as an owner or occupant. They will also look for the following signs that bats are present:

Droppings* Bat droppings are typically found below the places where bats roost. They have a characteristic appearance, with fragments of insects visible under a lens, and may accumulate in sizeable piles in well-used roosts. It is sometimes possible to identify the bat species from the appearance of the droppings. Bat droppings can be distinguished from rodent droppings as they are usually found in accumulations and crumble to a fine powder when crushed; by contrast, rodent droppings usually harden with age.

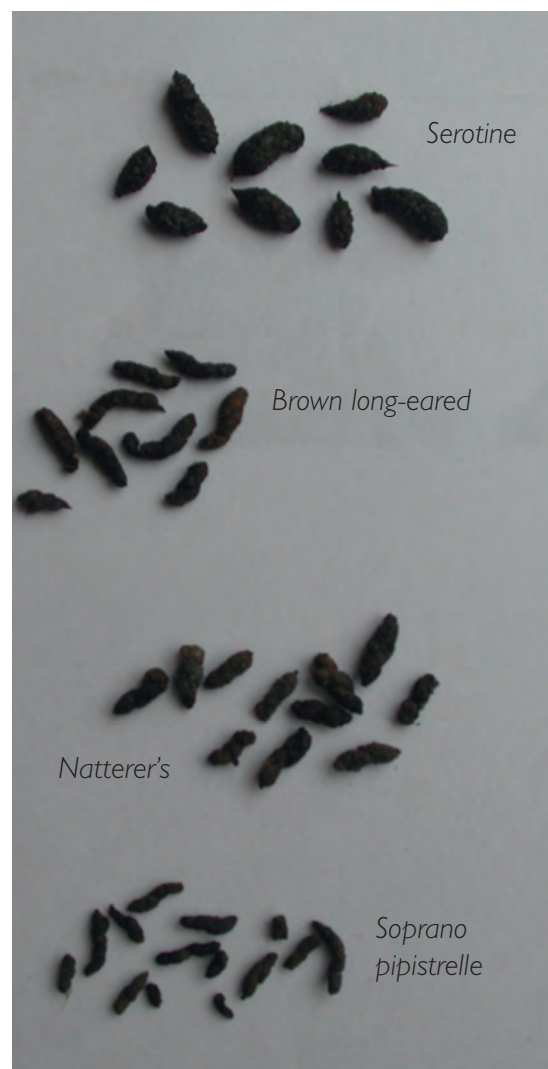
Dead bats* Bat corpses or skeletons, often associated with piles of droppings, can be used to identify a species.

Insect remains* Some species of bat capture moths, butterflies, cockchafer or other large insects on the wing and return to a feeding perch to consume them. The wings or wing-covers are discarded and may accumulate below the perch.

Smell* Well-used roosts may have a distinct 'batty' smell. Occasionally this can be very strong, particularly where there is inadequate ventilation or dampness.

Urine Shiny surfaces, such as polished wood, plastic or stone, may show urine spotting or staining.

Grease marks/staining Bats' fur contains essential oils to keep it in good condition.



Bat droppings (to scale). (© Jude Smith)

A characteristic dark stain might be seen on wood or stone near a roost entrance or favoured roosting spot.

Sound If bats are present in a roost, their chittering can often be heard, most commonly just before the bats emerge in the evening or when the weather is very warm.

(* These signs are the easiest for non-specialists to spot.)



Scattered remains of butterflies indicate a bat roost overhead. (© Jalna Donaldson)



Urine spotting is most obvious on a shiny surface, as here on marble. (Keith Zealand)

Section C

Planning and preliminary work

This section is the starting point for any building work that may affect bats or their roosts: what you should consider at the planning stage, the legal considerations that you need to be aware of, and getting the specialists involved.

Always start with the assumption that bats are present in a traditional building or the surrounding site, until a bat survey categorically records that no bat or roost signs are present. See Building and bat surveys below.

Plan all works well in advance so that the survey can occur when most bats are present and the works progress when bats are absent or when least disturbance will be caused to them.

Once bat roosting sites have been located, label them so that anyone who enters them in the future is made aware that the sites are protected (see below).

Bat roost alert sign (© NTPL/David Levenson)



A building or work site must be safe for a bat worker to enter and survey. Risk assessments must be carried out and the bat worker notified of any unsafe areas and hazards to avoid. See Risk assessments, p 32.

Bat surveys must be carried out by trained bat specialists; only those who hold a bat licence may disturb or handle bats. See Contracting a bat specialist, p 33.

If you come across a bat or bats during the course of work, **stop working in that area** and seek advice from Natural England or your contracted bat consultant. See p 35.

Only licensed bat workers are normally permitted to disturb or handle bats; if you need to move a bat, it is important to avoid being bitten and avoid harming the bat. See Coming into contact with bats, p 35.

Project planning

Building and bat surveys

You'll know that thorough planning and setting realistic timescales are essential when undertaking building works, but this is never more so than when they involve traditional buildings and bats. Discovering bats when works have started could cause expensive delays to your work and may lead to prosecution.

Be proactive rather than reactive. Locate bat roosts by programmed surveys at your property, or properties, so that when works are required, some information is known

in advance. For instance, when carrying out periodic condition surveys to record a building's condition or to inform maintenance programmes and future repair works, include a regular bat survey, too. This knowledge of how bats use the building will help you considerably when planning work.

► See Contracting a bat specialist, p 33.

Even minor maintenance works could affect bats or their roosts. If there have been no regular surveys of bats at the property, you should commission a survey before carrying out works on:

- **roofs or roof voids** (including repairs and re-roofing, painting or replacing barge boards/soffits/guttering, insulation or boarding, fire compartmentalisation, chimney repairs/capping/lining, re-wiring and plumbing)
- **walls** (including re-pointing and grouting, removing loose render or plaster, wall cavities, replacement or repair of shingles or weatherboarding)
- **doors and windows** (including repairing, reglazing, painting, timber treatment, replacing frames, doors or windows)
- **cellars** and other underground sites (including repairs, wiring and plumbing, safety works, lining and compartmentalising)
- **conversion or restoration** of any traditional building

► See Building activities likely to affect suitable environments for bats, p 29.

You may find the trigger list for bat surveys (overleaf) useful, even though it is not solely related to building work on traditional buildings.

Timing of bat surveys

Timing is paramount and the bat consultant will know the best times of year to find signs,

to see bats and to judge the number of bats present. Because bats typically use more than one roosting site a year, a one-off survey may find few or no signs of use. Although it is sometimes possible for a consultant to conduct a single survey, or even determine the species and type of roost solely from bat signs, you should be prepared for more than one survey visit.

Most roost surveys are carried out from May to August. This is across the UK so demand on professional consultants during this time is high – book early. Weather conditions on the days of the survey are an important factor as they can influence results. The survey should not be undertaken during extreme conditions.

Bat roosts and their exits may be found by internal or external inspection and dusk or dawn activity. The numbers of bats present will be determined either by internal inspection or dusk emergence; the presence of droppings will sometimes give sufficient clues.

When horseshoe bats are found (mainly south-west England and Wales), additional information on surrounding roosts and flight lines may be required by Natural England since they are endangered species needing extra protection. Although this also applies to barbastelle and Bechstein's bats, they more usually roost in trees.

Looking more widely than the roost being surveyed, it is important, although not always possible, to determine either the species or the number of bats around the roosting site area, and also the flight lines of the bats leaving the site; these will be assessed using electronic bat detectors. Further information about bats of the area may be obtained from local record centres, which the consultant will do.

Trigger list of where bats are likely to be present and where developers can reasonably be expected to submit a bat survey

- (i) Proposed development which includes the modification, conversion, demolition or removal of buildings and structures (especially roof voids) involving the following:
 - all agricultural buildings (eg farmhouses and barns) particularly of traditional brick or stone
 - construction and/or with exposed wooden beams greater than 200mm thick;
 - all buildings with weather boarding and/or hanging tiles that are within 200m of woodland and/or water;
 - pre-1960 detached buildings and structures within 200m of woodland and/or water;
 - pre-1914 buildings within 400m of woodland and/or water;
 - pre-1914 buildings with gable ends or slate roofs, regardless of location;
 - all tunnels, mines, kilns, ice houses, adits, military fortifications, air raid shelters, cellars and similar underground ducts and structures;
 - all bridge structures, aqueducts and viaducts (especially over water and wet ground); and
 - all developments affecting buildings, structures, trees or other features where bats are known to be present.
- (ii) Proposals involving lighting of churches and listed buildings or floodlighting of green space within 50m of woodland, water, field hedgerows or lines of trees with obvious connectivity to woodland or water.
- (iii) Proposals affecting quarries with cliff faces with crevices, caves or swallets.
- (iv) Proposals affecting or within 400m of rivers, streams, canals, lakes, or within 200m of ponds and other aquatic habitats.
- (v) Proposals affecting woodland or field hedgerows and/or lines of trees with obvious connectivity to woodland or water bodies.
- (vi) Proposed tree work (felling or lopping) and/or development affecting:
 - old and veteran trees that are older than 100 years;
 - trees with obvious holes, cracks or cavities; and
 - trees with a girth greater than 1m at chest height.
- (vii) Proposed development affecting any feature or locations where bats are confirmed as being present, revealed by either a data trawl (for instance of the local biological records centre) or as notified to the developer by any competent authority (eg planning authority, statutory nature conservation organisation or other environmental or conservation organisation).

Source: *Bat Surveys: Good Practice Guidelines* (Parsons *et al* 2007). Reproduced by kind permission of the Bat Conservation Trust.

► See What to expect in a survey report, p 34, for more information.

Planning for change of use and redundancy

Bats may have roosted in an unmodified or neglected building for decades. When a new use is found for the building, the renovation must take account of the needs of the bats.

Changes to the outside environment – security lights, car parks and paved areas sited in bat feeding grounds – could cause bats to desert an otherwise good roosting site. The law and planning guidelines protect both bats and their roosting sites, and therefore what happens to the surroundings must also be carefully considered. See The outdoor environment, p 53.

When old farm and industrial buildings are no longer 'fit for purpose' and are superseded by modern buildings, they can, of course, still be fit for the bats and other wildlife that use them. When drawing up a feasibility study and planning a new building, you should also plan for the future of the redundant building, possibly as a wildlife habitat.

Your options, in order of priority, are as follows:

- 1 Ideally, avoid the loss of current roosts wherever possible. This minimises the licensable work and has the greatest chance of successfully retaining the bat interest.
- 2 As an alternative, if the loss of current roosts is unavoidable, plan to accommodate bats within the converted building. This strategy has a good chance of being successful.
- 3 The least favoured option, if it is impossible to retain the bat roost within the original building, would be to replace

the old roost with a new or converted building close to it. This new roost should have, as far as possible, the same or better conditions of temperature, humidity and roosting opportunities as the old roost. A new building is likely to need planning permission and obtaining this would be a prerequisite of a licence application.

Be aware that change of use of a building used by bats is likely to require a European Protected Species (EPS) licence; you must seek advice from Natural England. The licence will only be issued when satisfactory mitigation has been agreed. Briefly, this means minimising any impact on bats or their roosts and mitigating for the unavoidable loss of any roosts, usually by providing suitable alternatives.

You must ensure that there is no disturbance to bats or damage to their roosts (unless an EPS licence is in place relevant to the area being disturbed). Roosting areas should be avoided or made inaccessible during building work when bats are present. Temporary barriers may suffice when the bats are only in an area for a short time, otherwise it may be necessary to build bat access into security or safety barriers, for instance, through the horizontal bars of a vandal-proof grille or over the top of a security door etc; such detail should be in the EPS licence.

There should be no lighting in areas with bats. If it is necessary, then install lighting that is low-level or on a timer in areas where bats may be roosting nearby. Because underground sites are often used by bats in winter, consider restricting the use of lights to the summer months; this detail should be in the EPS licence covering the works. See *also* Site lighting, p 38, and Lighting, p 59, for more information.

Case study on the conversion of a barn to a museum and visitor centre (Avebury Barn, Wiltshire, listed Grade I)

Context	<p>This thatched, timber-framed, timber-boarded manor barn had been little used for many years, apart from occasional storage.</p> <p>The high, timber roof had a summer roost of Natterer's bats in gaps in the mortise-and-tenon joints on the ends of the beams. The barn was also being used by serotines, pipistrelles and brown long-eared bats.</p> <p>The barn was required as a museum, interpretation and visitor centre for the Avebury stone circle, necessitating repairs to the thatched roof as well as interior work at ground level.</p>
Advice	<p>Natural England advised the building owner to:</p> <ul style="list-style-type: none"> • carry out the work in autumn or early spring • check for bats before starting work. (It recommended placing sheets on the ground to collect droppings which would indicate the presence of bats.) • incorporate entry holes for bats in the structure during building work • ensure that the microclimate was not significantly altered
Mitigation	<p>Temperature and humidity readings in the roof area close to the bat roosting places were automatically monitored during the summer preceding the works.</p> <p>Noisy operations involving power tools were carried out during winter; less noisy operations continued into the summer. Re-thatching (patches) was carried out in winter and the work was kept away from probable entry points of the bats. Minor repairs to the aisle posts were carried out in a way that avoided blocking any cracks or crevices.</p> <p>A bat interpretation panel was displayed during (and after) the works. All museum exhibits, the service desk and displays were illuminated with low-level lighting and no attempt made to illuminate the roof timbers. Exhibits were protected from bat urine and droppings with a covering of plastic film. A 3m-high canopy was built over the service desk to shield it from droppings from above and to help illumination and heating.</p> <p>The heating installed was mostly under-floor plus some low-level heating, designed to be no more than 5°C above the ambient (external) temperature.</p>
Post-operation monitoring	<p>The temperature and humidity were monitored during and after the works, and were found to be similar to those before the works began.</p> <p>Droppings were monitored in quantity after the works, and it showed that the Natterer's bats continued to use the site, probably in similar numbers. Breeding has since been proved.</p>
Postscript	<p>Some of the works over-shot their programmed time, such as thatching. Negotiations with Natural England remedied this situation. Since 2002, this sort of conversion would involve an EPS licence, operated by a bat consultant. It is highly likely that the same mitigation for bats would have taken place.</p>

Building in bat space

Reducing the size of a space already used by bats can risk the future of the roost. In high buildings (such as tithe barns and churches), it is possible to have bats roosting in the roof timbers and people using the area below as long as the conditions for the bats remain stable (eg lighting is directed down and the public use of the building is not excessive). A study (Briggs 2002) on the conversion of barns that were being used by bats showed that when the space available to them was reduced to 25 per cent or less of the original, the likelihood that they would continue to use the roost was drastically decreased. In every case where the licensing body had consented to change of use with agreed mitigation, such as retaining some roof void and installing bat boxes, the bats left.

Plan carefully if you intend to reduce the size of a roost or segregate bats to accommodate a new use for the building. Ideally, a void for bats should be a minimum of 150cu m* in volume, with a length of at least 5m with 2m clearance beneath the ridge. It should be insulated at floor level to keep it hot in summer and should preferably retain the roost entrances which were used before the conversion.

(* 150cu m: this space need not be kept dark and exclusively for bat use during the day, but should be dark and fully accessible to them at night.)

Other than space, you should also replicate or consider:

- **Eaves and soffit boxes**

Re-create these on the finished roof to replicate any similar lost roost site.

- **Internal crevices and voids**

Any lost during the conversion should be replicated. No light should leak from rooms below and noise should be limited with extra insulation.

- **External mortar gaps and crevices**

Any used by bats should be left or similar gaps re-created in the same location in the renovated building.

- **Underground sites**

If these are used by bats then the same conditions of temperature, darkness, air flow and humidity should be replicated in the repaired building.

- **Night-roosts and activity areas**

Many open buildings, such as stables, barns and garages are used by bats at night. They will fly around inside, and also rest, groom, and eat large food items such as beetles and moths. Allow as many ground floor areas to have open bat access at night as possible, for example, by providing gaps over closed doors or retaining open frontage.

If you are contemplating a change of use for a group of, say, farm buildings used by bats, consider retaining one building which is currently used as a roost in its present role and form. This building could be repaired first at an appropriate time of the year, and could then assist with bat mitigation during the development of the other buildings. This would preserve a traditional building and bat roost(s) in their entirety.

See Contacts: Bat Conservation Trust (www.bats.org.uk) for information on buying or constructing a bat box.



(left) Bat box inside a roof. (Keith Zealand)

(right) Bat box under eaves. (Keith Zealand)



Recreate mortar gaps for bats. (Keith Zealand)

Protecting the surrounding historic and natural environment

The area around a building and the wider landscape it is set in are used by bats for feeding and other roosting sites. Walls, buildings, hedges and trees are used by bats to navigate sometimes very complex routes (flight lines) between feeding areas and roost sites. The loss of a mature tree or one of its branches, the demolition or construction of a wall or a new opening in a hedge can all disorientate bats, disrupting feeding or roosting activities.

A bat survey will help to ensure that these relationships with the surrounding historic and natural environment are understood.

- See The outdoor environment, p 53, for guidance on maintaining the wider environment for bats.

Checklists for building works

Building activities likely to affect suitable environments for bats

This list is by no means exhaustive but you may find it useful as a guide to the types of work which affect bats and their roosts, and why.

Does your building activity include:	Why this might affect bats
<ul style="list-style-type: none"> partial or complete demolition of building; stripping roof; re-roofing? 	Bats typically choose high, airy, sheltered locations for their roost.
<ul style="list-style-type: none"> change of use of building; public events; servicing and up-grading of artificial lighting; installing roof-lights to increase natural light levels; illuminating the exterior of a building? 	Dark or low light levels are required by bats.
<ul style="list-style-type: none"> raising ceiling levels of floor below into roof space; putting in false ceilings converting roof void into a habitable room? 	Roosts are commonly well above ground or floor level.
<ul style="list-style-type: none"> re-pointing stone work or filling shakes or spaces around joints in timberwork; filling wall cavities with grout or insulation; treating timber for wood-boring insects, rot or fungi; applying insulation to wall surfaces? 	Deep crevices are often used by bats seeking insulation and protection.
<ul style="list-style-type: none"> events in or around the building; installation of services, their operation and subsequent maintenance programmes; previously disused and closed-up buildings opened up for daily visitor access; change of use of buildings from low to high usage (eg from storage to visitor facilities or dwelling); putting displays and services into space immediately below roost or using it for storage? 	Bats seek places which are rarely disturbed by people, noise (especially ultrasonic), lights, sudden temperature change, or draughts.
<ul style="list-style-type: none"> installation of building management systems to regulate the environmental conditions found throughout a building; change of use of part or all of the building; installation of insulation; alteration to the building or surrounding structures or trees which could alter the effect of solar gain and therefore the internal temperatures in the roosts? 	Altering the temperature will affect the suitability of a roost. Because different temperatures are required at certain times of the year (eg maternity roost, male roost etc.), bats will roost in more than one area to suit their need.
<ul style="list-style-type: none"> lining a roof or walls or installing insulation; painting or treating wood, brick or stonework? 	Bats require close contact with materials which are clean, easy for them to grip and give them insulation; wood is ideal but they will also choose brick and stone.
<ul style="list-style-type: none"> partitioning roof voids or large spaces; changing the use of, redecorating or re-furnishing a room or space which greatly reduces the space available for bats to fly; hanging banners or panels from the ceiling and away from the walls; using an empty space for storage? 	Some species of bat require room to fly around the roost or close by.
<ul style="list-style-type: none"> building extensions; felling trees, demolishing neighbouring buildings, walls or removing other linear features, including hedgerows? 	Bats use 'landmarks' to navigate along flight lines from roosts to feeding areas.

Project management

Throughout any building maintenance or building project, you have important responsibilities. You must evaluate the effect of any design, temporary works or building works on bats and their roost(s).

You should also consult the local planning authority and Natural England at the earliest possible stage in the planning process, and continue to do so throughout the design (or subsequent alteration to the design), construction and handover phases of the works. In some cases, professional advice on bat management may be needed. See Five-step process to compliance, p 10.

Each person who works on site or who is involved in managing the work is responsible for safeguarding bats and their roosts. You may wish to specify responsibility for ensuring checks are carried out in the job description of an on-site project manager.

Note: Only project checks which relate to bats are covered in the checklist which follows; it does not include other building project checks.

1 Assessment

Do you know if bats are present or are using the building?

If this is **not** known, you should:

- assume that bats are present in the building
- search for anecdotal evidence and physical signs of bat presence. See Bats and their signs, p 20.
- consult Natural England or the local bat group. See Contacts.
- commission a bat survey from an appropriate specialist to find out if they are there. See Contracting a bat specialist, p 33.

If bats **are** present, you should:

- identify relevant stakeholders, eg Natural England, local bat group(s), owner/occupier
- find out whether the proposed works will require licences
- arrange for a bat survey (if not already carried out) to find out types of bats and their use of the building
- incorporate mitigation work into your initial planning and costs, including the need for further bat monitoring and surveys, based on results and advice from the bat consultant
- plan the timing and work schedule
- identify bats in the risk management plan
- consider bats when preparing planning applications/listed building/scheduled monument consent applications

Team formation

As part of team planning, identify how the bat surveys and, if necessary, how bat licences will be worked into the project programme.

Procure relevant bat consultants for the feasibility stage of the project and ensure they have the appropriate licence/insurance cover.

Find out if other team members have had experience of working on bat-related building projects.

2 Feasibility appraisal

Have all bat-related project costs been identified and budgeted for?

- Bat surveys
- Bat monitoring beyond the extension of the building project
- Consequential costs (eg loss of income)
- Fitting out/operating/future maintenance

Other considerations

Bat survey(s) must be undertaken at an appropriate time of the year to ensure sufficient understanding of:

- the species of bat which uses the building
- how bats are accessing the building
- how it is used by them (roosting areas and flight paths)
- when the building is used (season)
- what other alternative mitigating roosts might be available

Ensure that you have allowed enough time in the project schedule for a bat licence to be applied for and obtained.

Consider whether interpretation relating to bat works and the roosts would be useful to your project.

Some building works that aid bat roosts may be eligible for grants; you should check with Natural England in the first instance.

Detailed design

- Ideally, you should identify all design elements which could impact on bats and their roosts at this stage to allow for avoidance or mitigation. Doing so may save you from costly alterations and delays during the construction phase and possible disturbance of bats or destruction of their roosts.
- Works designed to accommodate bats and their roosts will also be subject to the client's brief, intended purpose and budget. Both the client and Natural England must be fully consulted before designs are finalised.

Have you:

- ensured that bat-related works comply with building regulations and are incorporated into the consent submission for listed building/scheduled monuments;
- checked that relevant information about bats and their roosts have been incorporated into the tender documents (standard preliminary document);
- developed, if required, a health and safety plan for tendering that incorporates information about bats;
- ensured that the design and specification of temporary works (eg scaffolding, temporary roof) does not affect bats or their roosts?

3 Design and specification

Within your scheme design, have you:

- confirmed core project objectives;
- produced critical path project programme which incorporates bat works/mitigation?

Have you obtained the required consents/licences/permissions?

- Natural England EPS Licence
- Listed building/scheduled monument consent
- Planning permission

4 Construction (Build)

When work begins, have you:

- ensured that the pre-contract meeting and contractors' induction cover general and site-specific information regarding bats and their roosts;
- identified and maintained site supervisory roles, eg bat monitor;
- closely monitored the schedule of works and how it relates to conditions imposed by the bat licence or specialist advice given? This particularly applies to advice on the approved timeframe for works affecting bats and their roosts;
- ensured that any public information, if planned and required, is in place for the beginning of the construction phase?

Falling behind schedule

If the construction programme begins to slip and risks falling behind the approved timeframe, contact Natural England immediately. Remember that failure to comply with the conditions of a licence is a criminal offence.

5 Closure

Towards the end of the work, you should:

- ensure maintenance contracts and regimes are in place before hand-over
- undertake post-project evaluation and monitoring
- ensure the end users (eg facilities managers and other staff) receive bat awareness training
- ensure any interpretation relating to bat works is in place

Managing bat contractors

You must inform the bat worker of the health and safety implications of the site, and also of any building conservation aspects to avoid any inadvertent damage.

If the work is on an historic or listed building, you must ensure that bat workers (and other contractors) are aware of the location of significant collections and artefacts. Protective measures may have to be installed prior to their visit to ensure the historic fabric and collections are safe.

It is usual for a bat worker to give simple training to contractors on what to do should they find a bat during their work. Ask if it is not offered.

Risk assessments

Both bat workers and building contractors face hazards on building sites. It is up to you to ensure that appropriate risk assessments are carried out and that suitable insurance cover is in operation. Both the risk assessments and any risks identified must be resolved before any work starts.

The assessments do not have to take the form of a written list, although this format is usually the most helpful. You can contact the Health and Safety Executive (HSE) or visit their website (www.hse.gov.uk) to find information relating to managing contractors, particular hazards, or creating risk assessments.

Assessing the risks directly related to bat work should not be undertaken in isolation from other risks, including an assessment of

building use, its condition, what is stored in it, its occupation at the time work is to be carried out, access to it, and the weather conditions.

Some organisations, such as the National Trust, have formal risk assessments for bat work and others, particularly the Bat Conservation Trust, proffer advice. If you are carrying out work for a professional organisation, they may have their own generic and specific risk assessments.

Some examples of bat work where risk assessments are used:

- Bat roost/hibernaculum visits (in roof voids, on ladders, underground)
- Handling bats
- Lone working
- Working in enclosed spaces
- Working at night (near roads, water, uneven ground, farm animals, landowners)
- Working at height

► See *Bat Workers' Manual* (Mitchell-Jones, A J and McLeish, A P (eds) 2004) which contains the National Trust's risk assessments

Contracting a bat specialist

Bat surveys require specialist knowledge and equipment, and only those with the appropriate bat licence may disturb bats by entering a bat roost.

If the works do not require a licence from Natural England, or if you are having only a routine or early survey done, then a licensed **bat worker** can carry out the survey for you. If Natural England has advised you to have a survey carried out, you should contract a **bat consultant**.

As with other professionals, the best way to find a good bat consultant is through a recommendation. Many will work through an

environmental consultancy so if you cannot find one through a recommendation, contact the Institute of Ecology and Environmental Management (IEEM) for a list of environmental consultancies with expertise in this area.

Your local bat group will know of licensed bat workers in your area (contact the Bat Conservation Trust for groups) and you could also try Natural England.

► See Contacts for details of these organisations.

Always ask to see the consultant's (current) bat licence which allows them to disturb, handle and otherwise work with bats. Any bat specialist who conducts surveys on behalf of Natural England or one of the other statutory nature conservation organisations (SNCOs) is required to have evidence of an up-to-date rabies vaccination so you may also expect your consultant to provide confirmation of this.



Example of a bat warden's card

Insurance

As a minimum, bat workers, whether voluntary or paid consultants, will have public liability insurance (typically at £5m); all bat consultants will also hold professional indemnity insurance. Professional indemnity cover depends on the scale of the work that the bat worker typically takes on and may vary from, say, around £250,000 offered by an individual to £5m plus offered by

Explanation of bat specialist titles

The remit of bat specialists varies according to the time commitment and the contract rather than their expertise. Typically, volunteer bat wardens may do a bat roost visit on behalf of Natural England at domestic dwellings. Detailed or lengthy surveys and licence applications are dealt with by paid bat consultants. It is common for a paid consultant to be a member of a local bat group and so, as well as their paid bat work, they may also take on voluntary bat work through their local group.

For simplicity, we have mostly used the term 'bat worker' in this manual to describe the bat expert with whom you will work. Other terms you may come across are 'bat consultant' (a subset of environmental consultants), 'bat warden', 'bat monitor', 'bat surveyor' or 'bat specialist'.

consultancy firms. You will need to ask the person you contract what their insurance cover is and decide whether it is appropriate for the job you are asking them to do.

Volunteers with bat groups affiliated to the Bat Conservation Trust are covered by public liability insurance up to £5m for some of their activities (eg bat walks). Natural England accepts liability for its volunteer bat wardens.

What to expect in a survey report

The minimum that you should expect from a survey is a completed bat roost visit report form, supported by photos or sketches illustrating access points and buildings plans showing roost sites/droppings etc.

For complex sites, where a survey is conducted by a contracted bat consultant, you should expect the raw results of the survey and:

- result summaries
- interpretations
- evaluation of bat use
- the importance of the bat population locally and nationally
- the area surrounding the roost site
- method statement of work

The maps, photographs and/or diagrams provided will show the building or part of the building which has been surveyed, and also the roosts and access holes. There must be no confusion as to the exact location of a tiny exit hole or a roosting place in a large roof void.

You should ask your building surveyor for plans that you can give to your bat consultant which are marked with standard and agreed roof void, chimney stack and room numbers or names.

Depending on the species, a bat consultant may also report on flight lines, additional roosts and foraging areas.

The report should make reference to the surrounding habitat and how the bats use it. In some situations, particularly where planning permission is required, details about flight lines taken by bats and foraging areas will be an essential part of the survey.

If possible, the bat consultant may propose an acceptable scheme of work which will avoid committing any offences, and the report will then be more detailed on building works and timing. A report of this kind should make it clear where the limits of its advice lie.

If the bat consultant judges that a licence application will be necessary, he/she will set out the report in the required form for a method statement, ie with details of a proposed scheme of works and proposals for mitigation to avoid adverse impacts on the numbers of bats present (as described in *Bat Mitigation Guidelines* (Mitchell-Jones, A J 2004)).

Coming into contact with bats

If, during the course of the building work, you or your contractors come across a bat or bats, **stop working in that area** and seek advice from Natural England or your contracted bat consultant (if working under an EPS licence).

Only trained and licensed bat workers are normally permitted to handle bats. In exceptional circumstances, such as when a single stray bat is found indoors at night (not in a roost), the bat can be handled with gloves or protective material by a non-licensed person and safely put outside.

Contractors may encounter bats and should be briefed beforehand on what to do. You must stress to them the importance of avoiding being bitten and avoiding causing harm to the bat.

Some bats may be infected with a virus (European Bat Lyssavirus type-2 or EBLV2) which is closely related to rabies and can infect humans. The risk of coming across a bat which has rabies is actually very low. To put it in perspective, in the UK, over 6,000 bats that died of natural causes have been tested for rabies since 1987; to date, only eight of those bats had the live rabies virus, the first being found in 1996. All eight were Daubenton's bats that had been taken in by bat rehabilitators when they had become grounded.

What to do if you find a bat and need to move it

The two most important things to avoid are being bitten or harming the bat.

Do not touch the bat unless absolutely necessary and never with your bare hands.

Put on bite-proof gloves, not kitchen or stretch gloves. Move the bat by covering it with a small box, such as a margarine tub, and sliding a sheet of card under this to trap it. You could alternatively cover the bat in a small towel or cloth and use this to pick it up.

If the bat is found during the day, place it in a non-airtight box. Leave the bat in the box in a quiet, safe place, and provide it with water on soaked cotton wool (or from a pipette if available). At dusk, release the bat close to where it was found.

If found at or after dusk, take the bat away from the immediate building site but close to the roost, and release it by hanging it on to a wall, a tree trunk or window sill.

When releasing the bat, make sure it is active and not torpid, otherwise it cannot fly. **Never** drop it or throw it upwards and expect it to fly.

If you are bitten or scratched by a bat, you should immediately wash the wound with soap and water. This alone is very effective in reducing the risk of any type of infection, but you must also seek medical advice on whether additional treatment is required.

Active field research from 2003 to 2006 detected a small percentage (between one and five per cent) of Daubenton's bats and a single serotine bat which were carrying antibodies. The presence of antibodies indicates exposure to the virus and an immune response, rather than the live Lyssavirus infection which might lead to rabies.

There is no evidence that bat droppings or urine have caused disease or harm in the UK. Some people may be allergic to bites from bat parasites, however. If you are one of them, the best and only advice is to cover up when working in areas where bats have roosted in case there are parasites in the droppings or elsewhere around the roost.

Section D

Maintenance, repairs and alterations

This section provides more detailed advice about carrying out building work near to bat roosts and particular considerations to be aware of when working on specific areas of a building.

There are general good practices which apply widely to building works on sites where bats may be present. See General good practice below.

It is important to employ a specialist consultant when treating timber in a traditional building. See Timber treatments, p 40.

Because bats particularly favour the roofs of traditional buildings to roost beneath, you should expect to encounter bats on any roofing works. See Roof repairs, p 42.

Take care if you are planning to alter the landscape and environment surrounding a bat roost. If its value for bats is reduced, this can be as damaging as disturbing the roost. See The outdoor environment, p 53.

General good practice

Timing of building work

At roosts where the habits of the resident bats have been surveyed and are known about, it should be possible to arrange for work to be carried out when they are absent. Each location will be different but, in general, summer roosts are used from May to September (eg roof voids and warm cellars), and winter roosts are used from

Please note, the detailed advice in this section assumes that you are aware of your responsibilities with regard to bats, as explained in previous sections:

- Bats are protected from disturbance, as is their roosting place, irrespective of whether bats are in residence at the time. See Bats and the law, p 7.
- Even the most minor works can affect bats and their roosts; you should seek advice from Natural England on the required permissions, consents and licences at an early stage. See Licences and advice for work at bat roosts, p 8.
- You should assume that bats are present in any traditional building or the surrounding site; arrange for a bat survey to be carried out. See Building and bat surveys, p 22.
- Keep records of roosts, and label the roost site near to the human entry point to warn contractors. See example on p 22.
- In general, it is an offence for anyone other than a licensed bat worker to handle bats. If you do need to move a stray bat, ensure you follow recommended practice. See Coming into contact with bats, p 35, for what to do if you encounter a bat during work and how to move it.

October to March. (NB Individual or small numbers of bats may still use the winter roost during the summer.)

Bats have their young in June and July. It is unlikely that any consent for building work during this time would be given to you as they should not be disturbed for any reason.

► See Timing of timber treatment, p 42 and Timing for roof work, p 45.

Painting and minor repairs

Bats roosting in wall crevices or using them for access may be affected by exterior painting or nearby timber treatment. Be aware that even the smallest job, such as repairing the joinery to a sash window, could block an access point or entrap a bat. You must ensure that you know, before you start work, whether bats are present and where their access points are.

The continuing use of the roost could depend upon a small detail, such as putting back a warped piece of weather boarding in the same place if this is used for bat access. Lack of awareness of their importance could result in 'substandard' items being replaced and bat access lost.

► See Timber treatments, p 40.

Scaffolding

The main risks are to access points which may easily be blocked by poles, plastic sheeting or mesh. Be informed by the bat survey when designing and erecting scaffolding and ensure that bat access points are clear of obstacles. This also applies to the plastic sheeting often used to protect a building or for containing spray from cleaning works.

Where plastic sheeting or mesh is required (eg for safety reasons) and would be near access points, you should seek further advice. It may be necessary to put it up and remove it daily for the duration of works in that area.

Site lighting

Bats emerge when natural light levels have reduced significantly. In summer, most species begin to be active by late afternoon and start to emerge from sunset onwards.

Artificial lights in the roost or around the entrance influence bats and may cause them to desert the roost site, delay emergence or not emerge at all. The siting of security or other lighting is particularly important; whether they are on light and/or movement sensors, they can dissuade bats from leaving or entering a roost if they are positioned badly.

Disturbing bats is an offence so ensure that lights do not do so.

Keep all lighting to a minimum. Temporary lighting must be directed only to where necessary and turned off when work or access is not required.

You should ensure that roof void or cellar/ basement lights are always switched off after maintenance visits (a timed switch or a warning light on the external switch may help).

You should also make sure that site security lights do not point toward the roost exit nor are fitted close to it. There is a danger that bats may trigger their operation as they emerge; if this keeps them switched on, this will interfere with the bats' emergence and feeding time.



Position scaffolding around a bat route/exit and create gaps for them. (© Phil Richardson)

Case study on scaffolding set around a building (Killerton House, Devon, listed Grade II*)

Context

Scaffolding was required around the whole house for roof repairs.

Lesser horseshoe bats have roosts in different parts of the house; they breed in the roof void and hibernate in a cellar.

When the bats emerge, they follow the wall of the house at a height of a metre, then fly into ornamental gardens. Individuals in this flight line are well-separated, with a bat or two every few minutes. Their flight line is precise and traditional – they even fly through the broken slat on the back of a park bench on their way to feeding grounds.

Mitigation

The scaffold was designed to form an arch over the bats' flight line around the house.

Each evening, after the building work had finished, the scaffold and plastic sheeting was simply modified to create the arch above the flight line.

Also ensure that lighting erected outside the building does not disrupt the bats' flight lines. Plot the flight lines before fitting any lights so that you can avoid crossing them.

The effect of lighting can be reduced by:

- using low-level lighting (both height above ground and intensity)
- ensuring that the lights are shielded to point downwards
- adjusting the direction or masking off part of the beam
- positioning to minimise disturbance to bats and interfering with their access to their roost
- using yellow sodium lights instead of white mercury vapour lights (which attract insects and therefore bats)

► See Lighting, p 59, for lighting in public rooms and Events, concerts and fireworks, pp 72–3, for lighting at events.

Timber treatments

Always employ a specialist consultant who has the experience and skills necessary to diagnose and treat traditional buildings.

Assume bats are present when considering the form of treatment necessary.

Timber is not generally susceptible to attack from fungi if its moisture content is below about 20 per cent and from most wood-boring insects if its moisture content is below about 12 per cent. Generally, the more saturated timber becomes, the more rapid the spread of fungal and insect damage will be. If part of a building is found to suffer

from fungal decay or insect attack, it is essential that the source of the moisture is identified and its cause remedied to prevent recurrence. This will avoid inappropriate, costly and damaging treatment from being undertaken and needless disruption caused to bats and to the building.

Regular maintenance can prevent most causes of moisture ingress. Some buildings, owing to their original design, construction and siting – or the importance of their collection – may require a building management system to control the relative humidity or moisture levels. Seek specialist advice before introducing such systems as they may reduce the suitability of a roost for bats.

Remedial wood treatment

Some remedial wood treatments use pesticides that are harmful to bats if they are exposed directly to them. This is a particular problem on roof timbers as bats often roost on the wood itself. Vapours from treatments used on lower floors and joists, however, may also affect bats roosting at roof level. Treatments which use petroleum products to spread the pesticide and aid its penetration are especially likely to release vapours that could harm or disturb bats.

The first question to consider is whether the timber needs treating at all:

Is the problem current or historic?

If historic, then treatment is not generally necessary; the existence of insects' flight holes in structural timber or furniture does not necessarily mean the infestation is still live.

What is the extent of the damage?

Usually only the soft outer part of the timber (sapwood) is attacked by wood-

boring insects, unless the heartwood has been modified by fungal attack or has little natural durability. In many roof structures, the strength lies in the heartwood so minor outer damage may not require treatment.

Do you need to solve an underlying problem?

The dry rot and wet rot fungi that destroy wood need a narrow range of conditions of moisture, temperature and humidity. Whichever type of rot you have, first stop the water ingress which has caused the damp conditions which the fungus needs to survive. Allow the environment to dry out and the moisture levels in the affected timber to reduce before assessing whether further work is required. Replacing the timber or applying a chemical without solving the source of damp would treat the symptom but not the cause, and the problem would be likely to recur.

If the timber does require treatment, have a survey done to see if bats are present; contact Natural England about this. If bats are present, then advice or a licence will be needed to carry out the work. See Building and bat surveys, p 22.

You may find that you need to make repairs or modifications to the roof and walls of the building to prevent water ingress. Contact Natural England and if their advice to you is that the work will not disturb bats, a temporary repair may be possible during the summer breeding season.

Consider alternative methods to chemicals to control wood-boring beetles, such as light traps and sticky traps. Care should be taken to ensure bats are undisturbed (by the light) and not caught (by the sticky trap) by preventing them reaching the sticky part (see picture, right).

If you have to treat any unfixed furniture or movable fittings, move and treat them outside so that no fumes reach the bats.

Pesticides for remedial wood treatments and their application

When considering the use of **pesticides**, contact Natural England who will provide a list of suitable chemicals that can be used and advise on the time of year for their application. Pesticides containing the synthetic pyrethroids (permethrin, cypermethrin etc) and boron compounds (Borester 7, disodium octoborate etc) are relatively harmless to bats.

If there is a possibility of bats being present, the pesticide should be applied carefully to minimise their chances of coming into contact with it. Applying by brush rather than spray controls the chemicals more efficiently. Apply sparingly to areas known to be used by bats for roosting – usually roof timber joints or junctions.

Insecticidal **smoke 'bombs'** and **fogging systems** are imprecise and indiscriminate.

To prevent bats from entering, these traps are made flatter by folding and sticking, and further narrowed with paper clips. (Lisa Newis)



These should rarely be used as there is a good chance that the smoke will reach and harm bats tucked away in deep crevices. Such systems have limited random effect on insects and would also kill the natural predators of insects.

Remedial fluids often come in a choice of a water emulsion or petroleum-base for the active ingredient. The water emulsion option will be safer for humans and bats, however, water-based preservatives do not penetrate well in dry timber. The addition of further water into a damp situation is highly undesirable, especially in enclosed spaces with limited potential for evaporation.

Pastes can achieve deeper penetration into timber and may be specified where death-watch beetle is present. After application, a paste should be covered with a plastic membrane to prevent bats coming into contact with it.

Insecticide injections (used for death-watch beetles): Be aware that the hollows deep inside wood created by death-watch beetle larvae may be utilised by bats as a roosting place. Check whether there is a 15mm or more entry gap somewhere along the length of the timber (the bat survey should have located such places).

Timing of timber treatment

If the exact roost sites are known then it should be possible for you to carry out treatments at any time as long as the bats are not disturbed. You may be able to do this by 'zoning' areas for treatment, perhaps using plastic sheeting to break up large areas into sections that are treated in turn, but ensuring that bat exit holes are not obstructed.

Autumn and spring are usually the best times* to treat timber affected by fungal decay, as the few bats present are likely to be active and able to move away. In winter it is likely that some bats will be hibernating deep inside timbers or nearby crevices. Summer is not a good time as bats are breeding and so no disturbance should take place. (* Some methods of insecticidal treatment only affect insects as they emerge from timber and will only be effective at that particular time in the insect's life cycle. This usually means timing timber treatment for early summer.)

► See Insect pest control and bats for guidance on clearing household pests, p 61.

Special conditions for key areas

Roof repairs

Almost all UK species have been found roosting in roofs. Any work that you carry out on roofs or in roof voids may affect bats or a bat roost.

To avoid disturbance, works should only be carried out when bats are absent: in most re-roofing situations, this would be the autumn, winter or early spring months. Seek advice from Natural England.

Contractors and their sub-contractors must be told if bats are known to use the roof as a roost. You should also ensure that everyone working on site knows who to tell and what to do if a bat is found. See p 35.

A weather-tight roof is, of course, essential to both buildings and their interiors. Regular inspection and maintenance of the roof covering, structure and rainwater goods will increase their lifespan, reduce the loss of historic fabric and the frequency of more costly and major works. Not surprisingly, such working practices also benefit bats.

Many bat roosts in buildings are in roofs, and almost all UK species have been found in them. Horseshoe bats hang in exposed positions from beams inside the void, but other species may tuck deep into crevices and may not be visible. In almost all cases, the bats will be in dark areas.

Points and places used by bats

Common roosting places in roofs are:

- between the outer roof covering and any lining (especially wooden boards/sarking, but also tarred felt)
- under lead flashing such as around chimney stacks
- around any heated flue/chimney stack that exits through the roof
- under ridge tiles, but above ridge beam and any roofing felt
- under roofing tiles, stone slates and pantiles
- along (on top of and hanging from) the ridge beam
- inside the 'box' formed by the soffit and barge board
- inside the box structure of flat roofs
- behind fascia boards
- under eaves or verge/on top of wall
- behind hanging tiles such as on dormer windows and gable ends
- inside the opened joints of roof timbers

To access a roof void, horseshoe bats fly in through relatively large openings (large as in open hay-loft doors, broken windows, and bell-tower louvres, for example), but other species squeeze in through narrow gaps (as little as 15mm). Such points of entry are hard to locate, but are often to be found:

- between the soffit/fascia board and building wall (especially at gable ends)
- under lead flashing
- under ridge tiles
- under lifted/warped/broken slates or tiles
- around dormer windows
- gaps where two roofs join
- through mortar gaps or cracks in the top of the wall



Brown long-eared bats in typical roof roost. (Keith Zealand)

Case study on a major reroofing project (Polesden Lacey, Surrey, listed Grade II*)

Context	<p>Part of the roof over the north wing of the mansion needed attention as rain was getting in. The leak required replacement of lead flashing on one part of the roof.</p> <p>Bats were known to be present in all of the mansion's roof.</p>
Advice	<p>The local bat group had records of the Polesden Lacey roof roost going back over the last decade and were asked to survey for bats by Natural England. A small summer roost of serotines was located in the affected roof void, roosting on the ridge beam. The entry point was also found – under eaves on the south face.</p> <p>Natural England gave the following advice on timing and retaining the roost:</p> <ul style="list-style-type: none"> • Carry out the works after September and before May. • Ensure the scaffolding does not block the roost exit. • Ensure that the entry hole remains unblocked at the end of the works. • If any bat is discovered during the course of the works, contact Natural England.
Mitigation	<p>The work was carried out in November.</p> <p>The scaffolding was designed to fit around the entry point, and no plastic shielding was used at this point.</p> <p>The lead flashing around the chimney was carefully stripped, but no bats were found underneath. New lead flashing was installed.</p> <p>The problem was located and cured without having to remove more of the roof and the entry point for the bats remained unchanged.</p>
Post-operation monitoring	<p>Serotine bats returned to use the site in summer in similar numbers to before the works.</p>
Postscript	<p>This operation occurred in 2002 at a period of change when 'new' Defra licensing was just coming in. (Defra is the government department responsible for animal welfare.) Were this situation to occur now, a special EPS licence may have been required with the professional advice supplied by a bat consultant.</p> <p>The actual amount of work involved was not known until the workmen were on the roof – it resulted in a very minor operation. Knowing this, then the operation could have been carried out using the professional opinions and help of the bat consultant and no licence, as no bats were disturbed and the roost site not damaged.</p>

Timing for roof work

In the first instance, seek advice from Natural England and commission a bat survey.

For roofing works, there is a window of opportunity during autumn to early spring as roofs are typically used by bats as summer roosts. This period can have a major effect on a building schedule and the scale of works. Depending on the scale, a temporary scaffold roof may be necessary that can withstand gales and protect the fabric and contents of the building. It is essential that this is identified as early as possible – preferably at the feasibility stage of the project – to ensure that deadlines are met and costs included.

Do be aware that some bats (especially long-eared bats, but also pipistrelles and probably serotines) may stay after summer and hibernate in roofs, although in fewer number. Therefore, if you have a choice, opt for late autumn or early spring because any bat present is more likely to be active and able to move itself to a safer site.

If the work is likely to be prolonged, such that the roof would be unavailable when the bats return, you may be required to provide an alternative roosting site for them. This will have to be made ready for them **before** the work starts and, in some cases, be demonstrated that the bats are using it. NB Specially constructed roosts are rarely successful; this is a specialist job and would be part of the bat licence covering the works. See Planning for change of use and redundancy, p 25.

General good practice

Whether you are considering repairs or a major re-roofing, there are some recommended actions:

Carry out a risk assessment

You must make sure that contractors – and their sub-contractors – are aware when bats are known to use the roof as a roost.

Consider ‘zoning’ the work

On very large roofs, it might be feasible for you to work on one section at a time, with the bats roosting safely in other areas separated from the building work by plastic sheeting. Once one section is finished, then it may be possible to encourage the bats to move whilst the next section is worked on. Separation into zones is permitted under licence provided that entry points for the bats are available. To prevent disturbance, however, draughts, light and noise must be controlled in the roosting areas. Seek advice from Natural England.

Think ‘bat’ when stripping roofs

Great care must be exercised when removing old roofing materials especially near the ridge, gable ends, around chimney-stacks and anywhere where two materials meet as there is potential for finding bats; check under ridge tiles on removal, in folds of roofing felt, in timber joints, behind mortar fillets and under lead sheeting.

► See p 35 on what to do if you find a bat.

Lining beneath new/replaced tiles or slates

Breathable membranes are now being widely used instead of tarred roofing felt. They provide far fewer roosting opportunities for bats in voids as only the overlap gives a purchase. They also produce a brighter roof void, because the material is often white and translucent. If you are fitting a breathable membrane:

- use the darkest colour membrane available
- provide extra hanging points for the bats by using supplementary horizontal

Roofing felt has been laid at the apex of this roof to provide a more bat-friendly surface than the bright white membrane used below it.



strips of rough wood on the underside of the membrane between rafters near the ridge

- try to partially box in some sections to re-create dark conditions

A compromise could be to line the roof with a strip of roofing felt on either side of the ridge and use the breathable membrane for the rest of the roof space.

If torching is used, ensure that access points are left so the bats can continue to enter the void from outside. This also applies to any membrane used.

Building in bat access

Entry points for the bats should be created in the new roof as close as possible to where the old entry points were. These can be handmade on site from lead sheeting, mortar, or by the shaping of soffits, depending on the location. Commonly re-created entry points are narrow gaps between the soffit and wall, shaped lead tunnels under chimney flashing, and missing mortar from ridge tiles. The membrane, felt or sarking/boarding may also

need to be modified to enable bats to access the roof void from the outer entry point.

Monitor

Before the roofing contractors leave the site, ensure that the bat modifications and new entrances have been installed as planned.

In the next active season after the works, arrange for checks to be made to see that the roost site is being re-used and that the mitigation works were completed as agreed. These may need modifications if they are not working. This will be stipulated under an EPS licence and you must ensure that your budget will cover a consultant to carry out these checks.

Walls, shingles and weatherboards

Mortar gaps and cracks often indicate that repair work is necessary to prevent further deterioration. Although the priority must be to safeguard the structural integrity of the building, many bat species roost or hibernate in cracks and gaps, or use them to gain entry

into spaces behind, so you will need to schedule the building works around any bats that are present.

Grouting cracks and pressure-filling cavities, re-pointing the stone or brick work, or rendering an external wall could entomb and kill any bats present. Not only will you need to take special care when repairing cracks or gaps (or larger holes in walls), you must also take care when putting scaffolding around these possible roost sites or entrances.

General good practice

The gaps or cracks used by bats may be as little as 15mm wide (usually the size of a mortar joint). Existing ventilation slots, putlog holes or arrow slits may also be exploited by bats as entry points and roosts.

Gaps around pipes or where two materials meet are common places for bats to roost in or to use as an entry point. Bats will also use gaps between loose plaster or render and walls, behind weatherboarding and vertical tiling, and at intersections between two walls.

Bats prefer high rather than low roosting sites, so are more likely to be found in gaps on the upper walls, lintels and around window frames. There are always exceptions, however, and the height at which bats roost depends on the season and climate.

If the crack or gap is shallow, single bats may be seen roosting or hibernating, squeezed into the space. If the crack leads through to a larger cavity or room space, many more may be using the site even though no bats can be seen.

Bats may also inhabit cracks and gaps in the walls and ceilings of underground sites (including tunnels) where the temperature is buffered from the outside. Roosts in tunnels

over water are particularly attractive to bats. See Tunnels, mines, bridges and cellars, p 52.

Points to consider when planning or working on walls

You should bear in mind when planning work to walls that although in summer, bats leave signs of their use around the entrance (droppings, stains, no cobwebs), in winter, hibernating bats will leave few or no signs.



You are likely to come across these mitigating procedures in the licence conditions for work on walls:

- Leave areas around the roost entrance untreated until the bats have left.
- Check shallow crevices before filling.
- No work on, or blocking of, roost exit holes.
- Ensure scaffolding does not block bat exit holes.

When you are working on wood-clad walls, hanging tiles or weatherboarding:

- take care to remove boards or tiles at a time of year when bats are unlikely to be present behind them

Bats are entering this building through a gap under the third board from the top.
(Keith Zealand)

- ensure that warps and entry gaps are retained when refitting and that the roosting area behind remains unchanged
- any wood treatments must be applied with care; seek advice from Natural England. See Remedial wood treatment, p 40.

An EPS licence will give details on timing and ways of doing the work while leaving roosting opportunities. It may suggest that you install 'bat bricks' into the structure which will maintain its strength but also provide a roosting opportunity, or it may suggest filling in some gaps and leaving others open but strengthened.

If there is uncertainty about the presence of bats after a survey has been carried out, you

may be advised to insert a one-way exit for them. This could be a simple, downward-sloping, plastic tube, 50mm in diameter, which protrudes from the wall. Bats are able to escape through the tube but cannot re-enter. Within a week of being fitted, any bat should have emerged; you may then remove the tube and seal the hole.

A tube may be fitted in May and September only, to avoid both the breeding and winter hibernation seasons. They must **never** be fitted from June to August when bats have young as the mothers leave their babies behind to forage. You should always seek advice from Natural England before fitting this or any such device; it is likely that these would only be fitted by a licensed bat consultant.



A new bat brick.
(Keith Zealand)



Bat brick in situ in tunnel roof. (Keith Zealand)

Refer to the Bat Conservation Trust (www.bats.org.uk) for information on sources.

Case study on the repointing and consolidation of stone walls (Wingfield Manor, Derbyshire, a scheduled monument)

Context	<p>This castle consists mainly of ruined walls, a few turrets, a few roofs and an undercroft.</p> <p>There is a regular need to remove plants growing on the walls (buddleia, rosebay willowherb, bramble, ash). These grow mainly on top of broken walls, where their roots damage mortar and stones.</p> <p>Occasional repointing of the stonework is required, where necessary, to prevent water ingress.</p>
Survey works	<p>A bat consultant was contracted to carry out a survey well in advance of any works to see if bats used the site, and, if they did, to apply for licensing.</p> <p>Detailed photo drawings had been drawn up showing each wall face with major stone positions. All crevices were marked on the plans and graded as having:</p> <ul style="list-style-type: none">• no potential for bats (such as blind crevices, exposed cracks)• potential as roosts (deep, sheltered crevice, but no signs of bats found)• roosts (where either droppings or the bats were located)
Results	<p>The majority of the hundreds of crevices in the exposed walls seemed devoid of bats, however, bats were discovered:</p> <ul style="list-style-type: none">• in crevices above two sheltered window openings (long-eared bats)• by wooden beams of the main roof covering one part of the castle (pipistrelles)• in the undercroft, using crevices in the stones above ground floor windows and in the vaulted roof. These were discovered by the droppings beneath the crevices, and this was followed up by night-time emergence surveys when the bats were identified (Daubenton's bats)
Future approach to the remedial works	<p>Crevices with no roost potential: after visually confirming no bats are present these will be mortared up.</p> <p>Potential roost crevices: if no structural importance, a sloping layer of mortar will be laid on the bottom of the crevice so that any water entering runs out and not into the stone structure. If structural, it can be sealed after fitting a one-way flap or tube for a week in autumn or spring, so that, in the unlikely event of a bat being present, it may escape.</p> <p>Roosts: if no structural importance then a sloping layer of mortar will be laid on the bottom of exposed crevices to cause any rain water to run out. If structural (and it is hoped none are) then an EPS licence would be required, a one-way flap fitted in spring and autumn, and the crevice sealed. Mitigation will be the provision of the large number of other potential roost crevices on the building which will be left open, and carrying out the work away from the sensitive times of summer breeding and winter hibernation. The ceiling crevices of the undercroft are to be kept, and, if structural, will be strengthened and a crevice built in, the work being carried out at a time when the bats are absent.</p> <p><i>cont.</i></p>

Postscript

Initial discussions with the local Natural England staff suggested that the whole castle was a roost and so all walls were included, and no crevices could be filled without a licence. A site visit with Natural England staff solved this problem and it was agreed that just the areas with roosts were to be classed as roosts. This approach would be similar to any large house with bats in the roof void when only the area in use would be considered the roost.

Since it is unlikely that any bat roost will be blocked, the need for a licence is dubious, although it does prove that the custodians of the building were following the correct route.

There is no urgency to carry out the work, and it is likely that it will occur in phases over a number of years. The disadvantage of this is the possibility of bats moving into unused crevices in the future. The advantage is that bats can adjust as mortar work progresses.

Case study on repairs and consolidation of a stone bridge (Terrace Walk, Little Gaddesden, Hertfordshire)

Context

This old stone bridge carries a path across a sunken way.

Surface water draining through from above was causing damage to the structure and some stones required repointing, others replacing.

Two Natterer's bats had been recorded hibernating in stone crevices in the underside of the structure.

Mitigation

An EPS licence was obtained to do the work, which was carried out in summer.

The contractors were aware of the possibility of bats using the site. The crevices regularly used by the bats were reinforced, but left intact.

A membrane was buried just below the surface to limit the water percolating down: this was strategically holed to allow some water through as bats require high humidity in hibernation, not dry conditions.

The bat consultant visited at critical stages during the work to check crevices. The site was also monitored after the works.

Post-operation monitoring

One Natterer's bat was seen using the site the following winter.

Windows, doors and other entry points

Bats may enter a building or their roost through gaps around windows, doors, ventilators, pipes or any similar feature penetrating the outer wall. The gaps used are often small, as little as 15mm wide. Such entry points are not obvious to the untrained eye and are likely to be blocked during routine maintenance.

To avoid such occurrences, and potential prosecution, it is important that you check for bats at the most likely locations when planning such work. In summer, you should find signs of bats around the entry point – droppings, scratch marks, discoloration. It may be possible to see a bat roosting in a small crevice in summer or hibernating there in winter, but you must get an expert to check.

Warped or rotten frames and failing mortar can leave small crevices between the wood and wall that bats use for hibernation or as an entry point into deeper crevices in summer or winter. Gaps in the lintel are common roosting places and they may also use sash cord boxes for roosting or as access points into the rooms beyond.

General good practice

Ask a bat expert to check all crevices before you firm up plans for the work as their findings could affect how and when the work can be carried out. If bats or their signs are found then you must seek advice from Natural England. Usually the advice or licence will stipulate timing to avoid disturbing bats.

Do not fill in any holes and cracks until the survey has been carried out and its findings reported to you.

Be aware that bats may also enter a building over the top of a badly-fitting or open door/

Case study on repairs to a window (stable block listed as Grade II*, Dunster Castle, Somerset)

Context	An upstairs room of the stable block (originally the grooms' quarters) has a leaded window, three panes of which are broken. Although the upper floor is unused, for security and maintenance reasons, the window requires repair.
	Half the upper floor has a ceiling, above which is a void used by roosting bats. Lesser horseshoe bats, and probably other species, enter though the broken window and fly through the upstairs rooms and corridors to reach this void.
Mitigation	<p>The plans are:</p> <ul style="list-style-type: none">• to remove any broken glass, leaving an oblong slot in the leaded window• hood this on the outside with lead to keep out any wind-driven rain and limit draughts• ensure that window fittings are secured and cannot be opened through this slot (for security) <p>When the above works are ready to start, Natural England will be contacted for advice which is likely to be in agreement with the works outlined above. This is a conservation measure so should not require an EPS licence.</p>

window; replacing these could block the access point. In most cases, it should be possible to incorporate an entry point or crevice into the building: a broken window pane used as an entry point could be hooded with lead to make it weather-proof; a crevice

used by bats could be made sound, yet remain open; and even a replacement door or window could have a gap over the top.

Consider carefully the impact of a bat-friendly design on the aesthetics of the building and the protection of its historic fabric; seek advice from the local authority and/or English Heritage.



The gap between the window frame and the wall is used by roosting bats. (Keith Zealand)

Tunnels, mines, bridges and cellars

Bats use underground sites and bridges in a variety of ways depending on the species, sex and time of year. Cold sites, such as disused railway and canal tunnels, ice houses, stone bridges and unheated cellars, are in most use during the bats' hibernation period. Favoured sites typically have stable and low temperatures, high relative humidity and, usually, a good air flow. In these sites, most bats typically use crevices between brick or stone work, or behind flaking layers of soot, selecting temperatures of between 3°C and 7°C. When hibernating, they are unlikely to be seen or detected. Horseshoe bats hang free in relatively large underground sites such

as stone mines that they have been able to fly into. They select warmer temperatures (7–12°C) than other bats.

Some bats breed in underground sites but this is uncommon. However, stone bridges are used extensively in summer by groups of Daubenton's bats.

Cellars that receive waste heat (for example, from a boiler) are attractive to horseshoe bats as breeding sites. It is possible for one large country house, within the range of horseshoe bats, to provide hot summer breeding sites in the roof void, warm roost sites for males and non-breeding females in a heated cellar and a hibernation site in a cool cellar.

Bats also use underground sites in the autumn, when some aggregate at the entrances to certain stone mines or tunnels to 'swarm' at night. Some bats travel for up to 50km or more to visit such sites. Swarming behaviour, which may involve several species, is not well understood. Most swarming bats are male and the phenomenon may be linked to mating.

General good practice

You should check whether bat records already exist and have the site surveyed for bats prior to any remedial or change of use work. It is important that your bat survey identifies potential roost holes as pointing of brick and stone work of bridges and underground sites can incarcerate hibernating bats.

You must maintain access for bats at all times. By installing metal grilles at the entrance to underground sites, you can restrict human access and maintain air flow, however, you must leave a gap sufficient for horseshoe bats to fly through. (The gap should be roughly

the size and shape of a horizontal letter box.)
See p 64 for more on security measures.

Consider whether you can make underground sites not used by bats more attractive to them by restoring air flow, installing bat bricks in or on walls and leaving the site unlit. In structures such as an ice house, you could install removable wooden battens on to the walls for bats to grip.

The lighting of ice houses and other historic structures could disturb bats and therefore may be restricted or avoided. Ice houses are typically only used by bats for hibernation, however; so if you particularly want to accentuate it through lighting, you may be able to restrict this to the summer months.

► See p 60 for more information.

The outdoor environment

Bats require a dark exit route from their roost and use, to some degree, flight lines, such as hedgerows or woodland edges, to guide them to foraging areas. They also like to fly around the outside of the roost for social purposes during the night. A bat survey will identify likely routes and foraging areas.

The effort of safeguarding roosts would be wasted if the surrounding environment is altered to become less suitable for bats to forage or commute through.

General good practice

Try to mitigate planned works around the building site to ensure no loss of sheltered, dark, commutable routes.

Case study on protecting bat roosts in Cotswold stone mines, Gloucestershire

Context	Mining for stone in the Cotswolds has left hundreds of underground sites that are attractive to horseshoe bats for hibernation. Some sites, many with important industrial archaeology in situ, are threatened by vandalism and deterioration of internal supports, making them an unstable and unsafe environment for bats and for any original artefacts.
Mitigation	<p>Measures have been taken at a number of sites to protect the mines and encourage their continued use by bats including entrance grilles which enable access to be controlled but bats to enter freely.</p> <p>At a few sites, air flow has been restored by digging out (but not fully opening) former infilled entrances.</p> <p>In exceptional cases (eg at a stone mine on the National Trust's Sherborne Estate), the ceilings have been shored up with acroprops. Monitoring the use of this mine by hibernating lesser horseshoe bats has shown that their numbers have increased considerably since the mine was made safe and its entrance covered by a grille. A majority of the bats that breed on the estate (c 100 bats) now hibernate in this mine.</p>

This is the sort of outdoor environment which bats like around their roost: no harsh lighting, open areas close to water, and with trees and hedges by which to navigate. (© NTPL/David Sellman)



Ensure that existing flight lines have been plotted (via a bat survey), and that they remain or are replaced after you have completed the building works. This applies to both their structure and size; for example, you should leave high hedges intact – a wire fence would not be an adequate replacement.

Try to make the immediate area around the roost as bat-friendly as possible; you should retain trees, grass and shrubs and avoid adding any extra structures. If it is applicable to your work, you should also monitor historic planting schemes and take into account the need to plant the

next generation of trees in your long-term management plan.

Give careful thought to where you will site temporary facility buildings and consider how their lights might affect flight lines.

Avoid illuminating the roost exit or flight line, whether with security or other lights. Take bat-friendly measures such as switching lights off at dusk, or directing them away from roosts and flight lines, masking them and limiting their number or spread.

► See also Site lighting, p 38 and Lighting, pp 59–60.

Section E

Managing properties for bats and people

Bats are clean in their habits and like to be left alone. As co-habitees, they cause little or no trouble. It is entirely possible to share living and working areas with bats and this section explains how to achieve this to your mutual satisfaction.

Damage by bats is unusual and generally slight. They do not gnaw at wood, wiring or enlarge entry holes, and nor do they make nests.

Where it does occur, most damage or nuisance is associated with bat droppings and urine, which occasionally smell or stain, particularly if allowed to accumulate. See Droppings and urine, p 56.

All visits to bat roost areas by staff, visitors or contractors must be planned for and appropriate instruction given. See Rewiring, plumbing and other service work, p 62.

Include bat awareness training in all staff inductions.

At dusk or after dark, a bat may occasionally stray into areas of buildings not used for roosting and this could trigger security alarms where fitted. See Building security and fire precautions, p 64.

Formalise the balance between visitors and bats by drawing up a building or property management plan. This should provide a consistent framework by which you and your staff could manage visitor access around bat habitats and roosts, with continued bat monitoring. The management plan can specify levels of numbers, noise etc that avoid committing offences. See Managing visitors around bats, p 69.

The impact on bats and the appropriate mitigation will depend on the time of day and season in which events will take place. Bats should be monitored before and after events to assess the impact on them. See Events, concerts and fireworks, p 72.

Living with bats

Removing stray bats

A room alarm may be the first indication of a 'stray' bat. Young inexperienced bats are probably to blame, especially in July and August, but it can happen in any season. They may enter through the building, for example, down cavities from the roost site, emerging under skirting boards or around pipe work, or even down chimneys. Once inside they can easily enter rooms, even under closed doors.

Bats are more likely to enter through open windows or doors at night when following insects attracted by a light. They may also enter an open window by mistake if it is close to their roosting entrance.

The following guidance applies to bats found in late evening/night when they are still foraging. See p 35 for full instructions on moving a bat and what to do with one found during the day.

If you find a bat indoors, keep it restricted to one room by keeping the doors closed. Switch off any lights, open a window as wide as possible and leave it alone. If leaving it alone for some time has not enabled it to

find its own way out, keep a careful watch until the bat has rested in one place for five minutes*. After this time, it may have become torpid and therefore easier to move. Using something like bite-proof gloves, card or cloth, carefully put the bat outside, hanging it up on a wall. (* When not flying, the bat may be hard to locate. Try searching pleats in curtains, on the floor, behind wall hangings and pictures, or in corners of the ceiling.)

You may be able to stop or reduce future incursions by keeping windows closed at dusk, especially near a roosting area. Net curtain pinned inside the frame allows ventilation through an open window but stops bats from entering.

Urine spotting causes permanent damage to metal. (Keith Zealand)



If bats are finding their way in to rooms through internal gaps, locate the entry point into the room(s) – with the help of an experienced bat worker if necessary – and seal it with a narrow gauge mesh. If you were first alerted to the presence of a bat by an alarm being triggered, use the system to locate the room where the bat first appeared. Check any holes in the inner wall – around window frames, the chimney, under skirting boards, around water pipes, behind panelling. Sealing can be temporary to ensure the problem has been solved before a permanent seal is made; whether temporary or permanent, you should be careful not to do this in such a way that prevents airflow through the building; use a narrow gauge mesh if necessary.

No offence will be committed by excluding stray bats as no harm or damage to the bat roost has been caused.

Droppings and urine

Droppings are largely made up of the indigestible exoskeleton of bats' insect prey, with additional nitrogen compounds and a small percentage of fats and oils. They may cause small amounts of pitting, long-term staining, and etching to porous materials such as sensitive painted wall surfaces, stone, and wooden monuments and sculptures. Droppings act as a source of nutrients for bacterial and fungal decay which can cause paint and gilding to detach from its plaster backing, causing permanent damage and loss.

Bat urine is 70 per cent urea, decaying to form dilute ammonia and other compounds and is therefore alkaline. It is chemically more aggressive than droppings and its deposition, although harder to observe, is therefore of greater conservation concern. Urine causes spotting and etching of wooden, metal, and painted surfaces.

Some bat species enter large, open buildings at night, such as churches and barns, and fly around, often for hours, as a type of display. Those already roosting in a large building may do the same below their roosting area. It results in a scattering of urine and droppings on the walls, floor and all objects.

When concentrated under a roosting place in a roof void, droppings and urine can discolour plaster in the room below. There have been one or two supposed cases in which a pile of urine-soaked bat droppings has caused a plaster ceiling to collapse, but this may have been due to damp getting in or other factors; droppings, even damp, are not very heavy. Such reports are limited to only a few species – horseshoe bats in south-west England and pipistrelles.

Roosts of soprano pipistrelles can exceed 1,000 in a small area. They have a very strong, distinctive smell which, if it did permeate a building, might be considered a nuisance. These bats penetrate the building, squeezing into cavities and above ceilings (such as under flat roofs). Their droppings, soaked in urine, can build up into piles many centimetres deep; where these sit on a plaster ceiling or above a plastered wall, discoloration will occur. When bats roost above a soffit, the droppings and urine can build up on the wood and cause some rot; urine splashes on windows can become sticky and unpleasant. Pipistrelles commonly roost in such places during the summer, especially at the gable-end apex of a building. Other species generally roost in smaller numbers in a roof void so their droppings build-up is slight.

There has been one recorded case of urine from roosting pipistrelles dripping onto metal ties in a cavity wall, causing corrosion and failure. It was noticed when the top part of the gable-end wall began to move.

When bat roosts are identified within a traditional building, it is important to identify any potential risks to surrounding historic fabric vulnerable to damage. Advice should be sought as soon as reasonably possible from specialist conservators and Natural England once risks are identified or damage/discoloration is spotted. They can advise or provide short-term solutions until more permanent measures can be planned and executed.

Reducing the potential for smells or discolouration to occur

There are a few measures that you might take but be careful that your actions do not restrict the air flow between the exterior and the roosting site. Draughts are essential to allow buildings to breathe and to prevent condensation and fungal infection developing and damaging the fabric of the building. Also ensure that airflows inside are not affected.

One option is to line the floor of the roost to contain the droppings and make the roost easy to clean out. Line the roosting area with a vapour-permeable membrane and clean this out after each summer season – make sure that the annual clearance is in your maintenance plan. Care must be taken to ensure that air flow is not interrupted and that condensation does not build up.

Building a large 'bat box' within the roof structure around the bats' entry point confines the bats to one area and may make cleaning easier for you. This should also reduce the smell from soprano pipistrelles. Again, it is important that any such box is ventilated and does not block ventilation paths within the roof void. NB This should only be done after seeking advice from Natural England.

You can also reduce or prevent draughts drawn through the roost from reaching the rest of the building. Roof voids should not be sealed as ventilation is important but by keeping doors closed or having a well-fitting loft hatch, you can reduce any smell of bats.

Preventing contact with sensitive surfaces

The easiest way to protect surfaces from damage by bat droppings or urine is to move or cover an artefact. If you can, re-position objects or furniture to a more protected

place further from the roost or flight path. Artefacts can be covered with cloths or other porous materials during the night, and padded seat covers turned over. Plastic materials, including foam-backed carpets, should not be used as covers, as they may create a moist microclimate around the artefact.

Varnishes and wax polishes (including natural organic coatings such as beeswax or microcrystalline wax) offer little protection

Case study on droppings and urine in a roof void (cottage, near Shrewsbury, Shropshire)

Context	<p>The roof of the cottage has a large nursery roost of soprano pipistrelles, peaking at 1,500.</p> <p>The upstairs room near the roost began to smell and staining appeared on the ceiling. To cure the problem, it was necessary to clear the roof void of droppings and improve conditions for future maintenance.</p>
Advice given	<p>Natural England suggested the following:</p> <ul style="list-style-type: none"> • Clean out all old droppings and roof insulation. • Fit a membrane over the top of the ceiling to catch the droppings. • Fit ventilators in the roof along the ridge and in the soffit. • Fit a hinged soffit so that the droppings can be removed annually. • Enter the roof void annually and remove the droppings together with the collecting membrane. • Ensure that the ceiling hatch for loft access is well sealed. • Carry out the works in winter when there would be no bats.
Mitigation	<p>The roof area was opened up in January 1997 and a small number of pipistrelles were discovered. As a consequence, and in agreement with Natural England, the works were delayed until early April, when they were carried out according to the advice given.</p>
Postscript	<p>Bats returned but fewer and fewer in subsequent years, before a sudden increase six years after the works, almost to their original number.</p> <p>This case highlights a problem in that bats vary their numbers in roosts for reasons we do not understand – the decrease in numbers may have been unrelated to the work. It also shows how long monitoring may have to continue to show accurately the results of mitigation.</p>

for metal, wood and tiles. They are only acceptable for surfaces of low artistic and historic interest; contact a conservator to ensure such treatments will not be harmful to your objects. Wax polishes also require regular application.

You can erect a canopy over objects in need of protection or erect a shelf beneath the roosting place – this prevents the droppings from building up on the ground, and limits the urine splashes on anything beneath.

Inside a large building, you can erect 'baffles' to disrupt the nightly flights of bats. Flying bats will veer away from long, hanging 'banners' which can be hung in front of significant objects, such as wall paintings, or sensitive areas to protect them. Take care not to block the bat access points when hanging the banners.

It may also be possible in a large building for you to exclude the bats from one roost site above a sensitive area, but to allow them to use other places in the same building. This could only be done under licence and the blocking of entry points could only take place when the bats were absent; seek advice from Natural England. It is most likely to allow you to exclude the bats from an area where they were causing damage or were affecting public health or public safety.

Allergies

Although some parasites associated with bats can cause allergic reactions in people, they rarely do so. The bat bug *Cimex pipistrelli* lives in bat roost areas and can bite humans, but cases of them actually doing so are rare.

Any problem is usually restricted to the parasites that live in the droppings of bats. This relates mainly to species such as soprano pipistrelles if their droppings build

up in large quantity and if the roost is in a small area close to where people live and work. Droppings may build up not just above ceilings, but in cavity walls, under floorboards and around window frames. If all these factors were present, although there would be more chance of an allergic reaction from associated parasites, it would still be rare.

Lighting

Interior lighting in a roost site should be avoided, however, it may be necessary to have it if people also use the same area. In such situations, you should take steps to reduce the possibility of disturbing resident bats, such as:

- ensuring that roof void or cellar/basement lights are always switched off after maintenance visits
- a warning light in a position (by the fire alarm panel, for instance) which will alert staff if lighting is left on accidentally
- having no additional light sources in the roost area, such as ultraviolet fly 'zappers', or lights to illuminate roof timbers

It is best to avoid two-way switches in bat roosts which turn lights on/off in more than one place to reduce the likelihood of a light being left on accidentally. You should also avoid having a single light switch which turns on the lights in more than one area of a building, including the bat-roosting area. Where you do have these, for instance, in linked cellars or roof voids, you can easily remedy this by removing the bulbs from the sockets in the roosting area.

Check that any ceiling lights in upper-floor rooms do not leak their light into the roof void where bats roost. You can stop this, where it occurs, by shading the light from above with a light-proof and heat-resistant box or upturned metal bucket.

Outside the buildings and near to roost sites:

- You should ensure that the floodlighting of a building does not point towards the roost exit. Adjust the lights or mask off part of the beam.
- When you are floodlighting trees or other external features, do make sure that they are not part of the bats' flight line.
- When lighting paths and the vicinity of the building, make sure that this will not

disrupt the bats' flight lines. You can reduce the effect by using low-level lighting (both height above ground and intensity), yellow sodium lights, and ensuring that the lights are shielded to point downwards.

- Likewise, you should not fit security lights close to the roost exit as these will disturb emergence.

► See Site lighting p 38.

Case study on lighting for filming of emerging bats

Context	<p>Roost of over 200 pipistrelles roosting above the soffit at the gable end of a two-storey house.</p> <p>A TV company requested to film emerging bats. A licence to disturb bats by the lighting was obtained from Natural England.</p>
What happened	<p>Bats in residence were heard chittering as dusk approached, the cameras and lights were set up in position ready to begin operating.</p> <p>The first few bats began to emerge, followed by a steady stream.</p> <p>When the camera lights were turned on, illuminating the exit point, the bats stopped emerging. The lights were turned off and more bats began to emerge.</p> <p>As soon as lights were turned on, the bat stream stopped; when the lights were turned off, they resumed emergence soon after.</p> <p>Eventually the camera lights were rearranged to produce a vertical curtain of light a metre in front of the roost, and the bats were filmed as they flew through it.</p>
Postscript	<p>Recounting a similar situation, a study (Shirley <i>et al</i> 2001) made at the site of a Daubenton's bat roost showed that a concert operating close to the roost exit caused the bats to emerge very late, and this was probably due to lights. Foraging coincides with prey peaks so when the bats have young to feed, a delay to foraging could be critical.</p>

Stores and storage space

It is important that you do not allow your storage needs to encroach on space already used by bats as this could reduce crucial flying space or cause disturbance to bats when visited.

Should you need to clear a storage space used by bats, seek advice from a bat worker on the best time and how it should be done. Advice and/or a licence will be required to continue using the storage space if you, in agreement with Natural England, deem your use of the space to be essential. You will also need to give some thought to protecting the stored objects from bat droppings and urine.

Facilities and services

Insect pest control and bats

Some insect pests use roof voids and may use the same entrances as bats. Any pest control treatment in bat roosts should only be carried out with advice from Natural England. The danger to bats in attempts to eradicate insects are that:

- blocking out the insects could exclude the bats
- sprays used on insects may also affect the bats (directly through inhalation or later grooming, or indirectly through eating a poisoned insect)
- treatments such as fly-papers, impregnated strips and ultraviolet electrical 'zappers' may harm or have a detrimental effect on bats

Pheromone or blunder traps (sticky, covered strips used to assess the number of insects, species and their location) should be of a design that only insects can enter, not mammals such as bats or shrews, and set

in places where it is unlikely bats will be present. Remember that bats need only 15mm of access.

Treatments to rid a roof void of insects are common, but may be unnecessary. The following insects are the ones you are most likely to want to deal with:

Wasps, hornets and bees, if not creating any hazard to the public, should be allowed to carry out their life cycle. Wasps and hornets build a new nest each year and, because the old nests harbour other insects that rely on their nests, ideally they should be left in situ. In situations where the wasps, hornets or bees are causing a nuisance and have to be removed whilst the nest is still active, then contact Natural England for advice if bats roost nearby. It is likely to advise that you must enclose the insect area before spraying and removing the nest. It may specify a bat-safe insecticide. Blocking the entry points should only occur if it is known that bats do not use them.

'Clothes moths' are best treated at the source of the infection (the cloth or object) and a number of proprietary materials are available to kill or deter the insects. The moths may breed or feed on detritus in roof voids or elsewhere, such as on dead cluster flies, and these should be removed.

House flies can be spot-treated, but check first for breeding places such as old food, waste bins, dirty areas, dead birds or mice. Tidying up and making such places unavailable will solve the problem.

Cluster flies (a general term for a few species of fly that hibernate in buildings in large numbers) enter roofs in autumn to hibernate and are not a health-hazard, unlike the similar looking house flies (which never

occur in such numbers). Although many enter the roof voids and may penetrate the house from there, some enter the main rooms of the building directly around poorly fitting frames and vents, or through cavities and under floor boards, usually on the warmer south side, high up. Cluster flies re-use the same site each year. The buildings and voids chosen are often the same as those used by roosting bats. It is a common misconception that the flies are emerging from, or feeding on, the bat droppings.

Where cluster flies are creating a problem, your safest option is to remove them with the hose-fitting on a vacuum cleaner.

Often fogs of insecticides are used in roof voids to kill the flies, but this treatment will also affect any bat tucked out of sight in a roof crevice. Since most of these insects will die over winter anyway, such extreme treatments seem unnecessary and rarely cure the problem long-term.

Flypapers in roof voids used by bats are likely to catch bats and may, therefore, result in a prosecution. You should also not place ultraviolet zappers in areas used by bats. In cluster fly cases, they soon become overloaded so are not the best treatment.

To reduce the number of flies entering rooms:

- Temporarily seal up the small gaps around windows (or fix a clear plastic sheet across the whole window frame) and doors, skirting boards and floorboards leading into the rooms affected, or around the roof void hatch.
- Cover the top of sunken ceiling lights inside the roof void (eg using an inverted metal bucket) to prevent light leaking upwards which would attract the flies. Be sure to use fire-proof material, avoid direct contact and allow heat to escape.

- Wipe down the points of entry and surrounding areas with a detergent or disinfectant to remove any pheromones left as attractant sign-posts by the insects.
- If wiping down painted woodwork or stonework or metalwork, use as little water and detergent as possible (a couple of drops). This will avoid damage to the paintwork and underlying materials. If wiping down paintwork, test a small area first to ensure stability of the paint.

Rewiring, plumbing and other service work

Some areas used by bats as roosting places, like roof voids and cellars, may need to be entered by maintenance staff, plumbers, electricians and other workmen to carry out repairs, servicing and tests, and building surveys. Although vital to running a serviceable building, all of these operations could disturb roosting bats; advice must be sought from Natural England on the best way to proceed.

If the work involved will not take long (such as repairing the ballcock in a water tank or testing a smoke alarm), then, provided you do not disturb maternity colonies of bats, any disturbance is likely to be below the threshold of an offence.

When the work will not take long but needs carrying out regularly or is in a small void where the bats will be disturbed by any entry, then seek advice from Natural England as to whether this would exceed the threshold for a disturbance offence. Each situation is different, but there is normally a way of operating reasonably, so that disturbance is kept to a minimum.

If the work is prolonged (such as fitting new water pipes) and cannot be done at a time when the bats are absent, seek advice from

Natural England. It may be able to suggest ways that you might keep any disturbance below the threshold, such as fitting protective sheets to keep roosting bats in the dark or zoning the roof so that only one area is disturbed at a time and the bats have other areas to use. If this is not possible and you're unable to work without disturbing the bats, a licence will be needed.

Whatever the work, you should always warn contractors about the presence of bats and the importance of not disturbing them. Contractors should be reminded to keep trap doors to roof voids closed to prevent draughts, unless they are routinely open and used by bats for access.



Sign at entrance to roof void alerting contractors to presence of bats. Note also the sheet that has been thrown over the insulation to aid cleaning. (Keith Zealand)

Case study on sensor testing in roof voids (Arlington Court, Devon, Grade II*)

Context	The roof void has limited access points, and the voids are continuous in a square around the whole building. Reaching one void may mean crawling through six others.
	The voids are broken up into eleven separate sections by firewalls. Each section has a smoke detector which requires testing annually.
	Lesser horseshoe bats have a large (100) summer roost in parts of the void. Recently it has been noticed that some bats also spend the winter in the roof void (possibly because of milder winters) whereas they used to hibernate in the cellars or elsewhere.
Mitigation	Sensors tested in early spring or in autumn when bat numbers are low and less vulnerable to disturbance.
	Licensed bat workers work on the estate and one of them accompanies the contractor when they visit.
	Contractors are informed about the presence of bats in advance (both to remind them of the legal protection afforded to bats and their roosts, and also out of consideration that someone might be afraid of bats). It is essential to inform or remind the contractor before entry not to disturb any bats unduly with torch-light or accidental knocking (the bats can hang low over crawl-ways through the voids).
	A good suggestion to train the person doing the testing proved unworkable as personnel change and the work was sub-contracted out.

Building security and fire precautions

Alarms

Bats do sometimes set off alarms. The two types most commonly affected are **smoke alarms** where a bat (or its urine or droppings) comes into close contact with a smoke sensor, and **intruder alarms** where a bat triggers a movement sensor in a building.

Smoke alarms

Sensors in rooms are less often affected by bats. However, each roof void section of a large or traditional building is likely to have its own smoke sensor on the ridge beam, which is where bats often roost. The extra roosting-perch offered by some designs of sensor may result in bats actually hanging on the sensor.

Although bats may be thought to have set off an alarm, there could be another cause such as insects, spiders or a malfunction.

Sensors require regular testing which may involve a technician entering the roof void and working close to the ridge where bats may be roosting (see previous section).

Intruder alarms and movement sensors

At night, small numbers of bats may find their way from their roosts into rooms, or stray into buildings during the night and fly around. This behaviour is more common in July and August. Where the movement sensor is in a living space, your best solution is to prevent bats entering the room.

You should first ensure that all likely entrances are made inaccessible to bats. This includes all gaps of 15mm or wider over, under or around doors, under skirting boards and around window frames. If

pipes penetrate the inner wall (such as in bathrooms and kitchens), ensure that there is no access around them.

In rooms with an unused fireplace, you can prevent access via the chimney while still allowing some ventilation. Where fireplaces are still used, you can fit a metal mesh fire-screen around the opening. In all cases where such gaps are made inaccessible to bats, ensure there is ample ventilation for fires to burn safely, and to prevent damp or humidity changes in sensitive areas.

In some areas, it is neither possible nor desirable to block out bats, such as passageways, cellars or rooms close to the roof void where bats roost. Bat roosting areas are protected by law. If exclusion of bats from a roost is considered necessary, a licence from Natural England will be required. In most cases, small modifications will solve your problem; some sensors can be set to be less sensitive, so that a passing bat will not trigger them but a human will. A walk-test should always be undertaken to confirm that sensors will be activated by human presence.

You may be able to relocate the position of the sensor to where it is unlikely to detect movement from bats, such as nearer to floor level and away from corners. NB Ensure re-positioning is not contrary to manufacturer's instructions and that a walk test still results in an activation. Alternative sensors may need to be sought.

You can fit active infra-red twin beam sensors (or cable and programme existing sensors as a beam pair) so that both beams have to be tripped concurrently to trigger the alarm, and ensure they are arranged so a bat cannot do this.

Case study on reducing false alarms (Lodge Park, Gloucestershire, listed Grade I)

Context	<p>This is a two-storey 'grandstand' built in stone with a lead roof and overlooking a deer course.</p> <p>Brown long-eared bats have a summer roost in the void of one part of the roof.</p> <p>Very rarely, one or two bats enter the ornate Great Room on the first floor at night and set off the security alarms as they pass movement sensors. It was necessary to block the holes where they exited into the Great Room to avoid these false alarms.</p>
Mitigation	<p>The bat roost was entered by licensed bat workers and the exit point was determined. The Great Room was also surveyed for possible entry points of the bats.</p> <p>The roost and the Great Room are separated by a wall at least 2m thick. The bats usually exit the roost by squeezing between this wall and a steel roof support. They then scramble their way through crevices in the wall before squeezing beneath lead flashing in a lead-lined drainage gully to emerge out on to the roof. Some bats occasionally take a wrong turn in the wall and end up emerging into the Great Room behind a plaster frieze.</p> <p>The gaps in the frieze are hard to block due to their height, delicate nature of the plasterwork and length. Plastic mesh was used to block the worst area.</p>
Post-operation monitoring	<p>The alarm seems to be triggered less frequently, but the problem has not been completely solved; more blocking is necessary.</p>
Postscript	<p>No licence or advice from Natural England was required (other than licences held by the trained bat workers), as the works did not affect the bat roost.</p> <p>Bats in the living area of a building can be removed by unlicensed people; staff at Lodge Park have been trained on what to do.</p>

If these suggested modifications are not possible, and the bats cannot be excluded, consider whether you can replace the movement sensors with floor pressure pads on entry routes, magnetic contacts on access doors and vibration sensors on window frames.

Do remember to have the sensors checked by your security adviser when they are fitted and if they are moved. It is

important that security is not compromised when adjustments are made. It should be impossible to remove assets without generating an alarm. Thorough walk testing should help to determine whether adjustments are suitable.

Repeated false alarms may result in response by the emergency services being withdrawn and a requirement that the alarm system is upgraded prior to response being re-instated.

Security measures

Many traditional buildings are prone to attack by vandals or thieves, particularly if in an isolated location or neglected condition. Although bats may be detrimentally affected by intruders, through lighting, smoke and excessive noise, you could do them more harm if, by blocking access to unwanted visitors, bat access were blocked too; such work would be illegal without a licence.

In large buildings, most bats tend to use access points quite high up for summer roosting, rather than at ground floor level; it may not be a problem for bats if you were to seal up openings on the ground floor for security. This is not always the case, however, and a survey would be needed first to see how bats are accessing the building.

When planning security or anti-vandalism measures for single-storey buildings, tunnels, etc, which are used by bats, you will need to consider the design very carefully because of the limited number of access points. For instance, cellars with ground-level ventilators, access holes (such as coal chutes), and windows or doors may be used by bats, especially at night and in winter.

Floodlighting may be used (and insisted upon by insurance companies). This can affect bats as they emerge from their roosts, so you will need to take advice on installing lights at bat roost access sites from Natural England.

► See *also* Lighting, p 59.

As ever, always have a survey done to locate bat entry points before you undertake any remedial work to ensure that you do not block bat access or roosts and therefore commit an offence.

For security, windows are commonly boarded up with chipboard panels as a cheap, temporary solution. Doors may be boarded up similarly or replaced with a solid steel door. As well as the risk of blocking access to bats, such boards can also prevent adequate ventilation of the building and may quickly become targets for graffiti. Instead of boards, you might be able to use a steel grille which would allow bat access, maintain ventilation and prevent graffiti. Even better for bats are horizontal bars with a minimum air space between bars of around 130mm. These would allow bats to fly through, yet keep people out. If there is a risk that people might climb the bars, fit vertical bars but allow a gap over the top of 130mm. You might find that a combination of a solid panel (wood or metal) with horizontal bars over the top is a suitable solution at some sites, such as the entrance to a low tunnel. This combination may be used to exclude foxes and allow bats to hibernate in safety.

Bars need to be removable to allow human access when required and you can do this by making the grille into a hinged door or into a removable panel. By fitting the lock on the inside of the bars and in a protective steel cover, you can securely padlock the door or panel in a reasonably vandal-proof way.

It may help to prevent or curtail persistent vandalism if you were to erect a sign just inside the building, and visible through the bars, which stated, for instance, that the site contains nothing of value and that the bars are there to protect rare bats from disturbance.

In some cases the solution may be to keep people away from the building with secure fencing.

If you must use floodlighting, you should ensure that any light does not point directly at a roost exit, and try to keep such areas in shadow by masking the lamps. Orange lamps seem to affect bats less than white lights.

When security lights are used, they should be fitted so that the light does not shine on to roost exits and they are not triggered by bats in flight.



(left) The bars on this service tunnel are wide enough for bats to fly through. (Ian Chadwick)



(right) Entrance further blocked to stop foxes but still leaving bat access. (Ian Chadwick)

Case study on restricting access to an underground site (Victorian service tunnel at Tyntesfield, North Somerset)

Context	<p>A significant proportion of the roosting lesser horseshoe bats at this site hibernate in one of the few underground sites available – a small service tunnel leading to a large water tank for the water supply.</p> <p>The tunnel is low, short and dead-ended, and any bats inside are vulnerable to disturbance or damage by humans, foxes or other predators.</p> <p>The work required a barrier to be fitted that would not hinder the bats' use of the tunnel.</p>
Mitigation	<p>A grille has been fitted to the tunnel entrance with suitable spaces between the bars to allow the bats to fly straight in.</p> <p>The lower portion of the door has a metal sheet across it to keep out foxes.</p> <p>The door is padlocked to prevent human access and a bat roost notice fitted prominently inside to dissuade anyone from breaking in.</p> <p>Natural England were contacted for advice when the work was ready to commence, so that it could confirm that the bar spacing and timings of the works were acceptable for the bats.</p>

Firewalls in roof voids

Fire regulations require that long and large roof voids are divided up into shorter sections with fireproof walls usually of brick, breeze-block or similar. These prevent the spread of fire or smoke from one area to another through the roof void.

Bats will use all or most of a large roof void according to the time of year and conditions. A firewall would restrict this free movement and can make a roosting site unsuitable or inaccessible for bats. The fitting of the wall could cause disturbance to roosting bats, too. Seek advice from Natural England before you fit any firewalls inside an area used by bats.

It is possible to provide access for bats by building a bat door, flap or shutter into the firewall. These can be set to automatically close in the event of a fire to make the fire barrier complete.

The aperture for bats should be at least 150mm high and 400mm wide if the larger bats use the roof void, but can be narrower (300mm) if only smaller bats use the site.

Bat doors

These are spring-loaded fireproof doors set in a frame and held open by an electromagnet (as commonly used on fire doors in public buildings). When the fire alarms are activated, power is cut to the magnet and the door closes.

The door provides human access so that maintenance work may be carried out in different voids without the need for ceiling access hatches into each void.

If you have or plan to have these doors, it is important to fit an electrical contact on the door to a warning light on a downstairs fire-control panel. This panel should be in an

area used daily so that the warning light can be readily seen if the door closes. (This advice applies to bat flaps and shutters too.)

The main disadvantage to the electro-magnetic link is that the door will close each time the fire alarm system is tested or if there is a power cut. This means that someone has to be responsible for re-opening each door immediately after such events. Failure to do so could trap bats. A battery back-up system could prevent the doors closing in the event of a power cut.

Bat flaps

These are fireproof flaps, hinged at the top, which fall down into the aperture when activated by a fire alarm or heat. The release mechanism can be an **electromagnet** or a **fusible link**.

- The **electromagnetic** type should be fitted with a fire-panel warning light and battery back-up (see Bat doors, above).
- A **fusible link** has the advantages of functioning only when there is an actual fire (so no need to re-set after fire-alarm tests or power cuts) and being maintenance-free. However, it is also impossible to test and will only operate when the fire has taken hold and the temperature has risen considerably.

Bat flaps tend to be used over apertures too small for human access.

Bat shutters

These are steel concertina shutters which fall under gravity to close a small aperture when released. Again, there should be a warning light visible in a public area and a battery back-up to ensure that they are not left closed.

As with bat flaps, these are used over apertures too small for human access.

Managing visitors around bats

When planning new visitor attractions or events near to a bat roost, you must consider all potential impacts on the bats, their habitat and roosts. It should then be possible to plan mitigation of the likely impacts identified and a solution found.

The disturbing factors that have to be controlled are light, heat, noise and draughts.

Staff or the public may often use areas near to where bats roost or hibernate, with the potential for disturbance, such as in churches or halls (where bats may roost in the roof timbers) and basement passages and rooms (where bats may hibernate). Additionally, some areas where bats roost may also be of interest to the public. Typically these will be structures of special interest such as mills, dungeons, barns, stables, mines and ice houses.

At large sites, the occasional presence of people is unlikely to affect roosting bats, and at very small sites that have always been used by people, it is unlikely that bats will have moved in. In between these two points, there could be conflict.

Larger sites (churches/chapels, large halls, large barns, large undercrofts) can cope with a certain amount of public access, depending on the species of bat, the number of people and the site dimensions. Regular church services, for instance, might continue with no adverse effect on bats roosting in the roof timbers, whereas holding a floodlit concert at night would be likely to disturb the bats.

Smaller sites (stables, cellars, ice houses) are more sensitive. For instance, it may be

possible to convert an area, say, a ground floor of a stable block, to a sales outlet or other use, and leave a bat roost unaffected in the upper floor or loft. However, showing off single-space areas like an ice house or vaults would cause more problems as there is nowhere for bats to go. You may be able to get round this by only giving public access during the summer months (May to August) to places used by bats as winter roosts. Similar access arrangements would be suitable for disused mines, caves or grottoes where regular access would be inconvenient to organise.

Each site is different and needs to be assessed individually to produce a balance of acceptable use by the public and by the bats.

Surveillance is critical. Regular bat counts should indicate whether the level of activity is having any detrimental effect on the bats. Local volunteer bat groups may be happy to conduct such surveys and this would provide you with results useful for future planning.

It may be sensible to draw up a management plan for a site to link the level of use to bat monitoring. In this way certain sensitive areas could be highlighted in the plan as 'no-go' areas for the public at certain times. The plan might set out lighting and heating levels (eg stating that downward-pointing spot lights are acceptable but upward-pointing ones to illuminate roof beams are not) and define acceptable noise levels. Natural England will be able to give you specific advice and the local bat group might also be able to help.

Overall, plan for the bats at an early stage. From the regular opening of servants' quarters to opening up a stable for shelter in wet weather, all public venues and events should be planned around the bats, ensuring lighting, noise and heat cannot interfere greatly with roosting bats.

Case study on refurbishing an open interior space (Clyston Mill, Devon, listed Grade II)

Context

The building is a water-driven flour mill with all the working parts intact. It has been refurbished and is now open to the public three afternoons a week in summer. All floors are accessible but access to the top floor is restricted to just the stair head.

Brown long-eared bats have a small summer roost on the top floor (along the ridge of the roof), night roosts throughout, and lesser horseshoe bats have a small night roost on the second floor.

Light and draughts from open window shutters flooded up from the floor immediately below the top floor.

During refurbishment of the visitor areas, further work was done to separate an area used by bats and reduce the amount of light entering their roosts.

Mitigation

During the refurbishment, repair works were confined to the floors below the top floor.

The few works that were undertaken on the top floor were as follows:

- The roosting area along the ridge was enclosed by erecting side boards and an end board; bats are still able to enter but now have their own 'room' which is kept dark and draught-free.
- The light fitting was removed from inside the roosting area.
- A hole in the gable end wall was adapted for the use of bats.

Gaps (over doors and window shutters) on other floors remain available for bats at night.

Postscript

Long-eared bats were using the roost site the following year and serotines had also moved in.

It is hoped to put some bat interpretation in the mill.

Interpretation opportunities

Bats are often found in and around traditional buildings – indeed, the public expect them to be present in places such as crypts, dungeons, and caves. Bats can provide good publicity and raise the profile of a building, as well as put across nature conservation messages.

Because bats fascinate many people, they can themselves be used to draw visitors through

evening guided bat walks, viewing CCTV in bat roosts, and talks about bats.

You can also use the resident bats to continue interest while parts of the building and other attractions are closed during building works. Do remember to allocate funding for bat interpretation during the feasibility stage of a building project.

Case study on visitor management near a bat roost (Dunster Castle, Somerset, listed Grade I)

Context	<p>The basement has many rooms and hundreds of metres of connecting passageways. These passages are used by staff to move around the building and some rooms are used as stores and workshops. A few rooms (kitchen, boot room, wine cellar, etc) are in their original state and on view to the public to show how castle life was organised below stairs. The whole area is open to the public through guided tours.</p> <p>The same area is used by lesser horseshoe bats for hibernation and some are present throughout the year; greater horseshoe bats also use the area and other species have been recorded on the estate.</p> <p>The work involved planning access, visitor routes and visits around the bats' needs.</p>
Mitigation	<p>There is a risk that people might disturb the bats but steps have been taken to mitigate this as follows:</p> <ul style="list-style-type: none">• Access is not permitted to rooms where bats are known to roost regularly. The corridors and rooms that the public visit are used by the bats mainly as routes in and out; occasionally a bat is seen roosting (they tend to use the lower rooms and places where access is not allowed).• The rooms in regular use as stores are also not used by the bats and doors are kept closed to avoid the bats getting in (other doors are kept open to avoid the bats getting trapped).• Visitor guides are educated about bats, where they hibernate and their importance. <p>A management plan which included further measures was produced in agreement with all parties. These included: no tours in January and February when most bats are hibernating, and, during other months, look out for bats and avoid rooms where they have gathered; keep people moving in corridor areas where bats are present; do not use torches on bats; include bats and their conservation in the tour talk.</p> <p>The mitigation was supervised by licensed bat workers.</p>
Postscript	<p>CCTV films bats roosting on a nearby spiral staircase (unused by people in the summer) and bat walks are organised around the castle.</p>

Some form of interpretation will be particularly useful when:

- areas have to be made out of bounds for the public when bats are present
- artefacts have to be covered because of droppings or urine
- lighting has to be reduced to prevent bat disturbance
- nationally rare bats are present or any species in exceptionally high numbers

In all these cases, there is a strong case for bat interpretation: it gives an opportunity to explain why bats are a protected species, what you are doing to conserve a traditional building and its contents, plus the building's role as a habitat. It also gives an insight into another side of the work of your staff.

There are plenty of sources of bat information: the bat facts on p 14, your local bat group, the Bat Conservation Trust and the internet.

Bat walks

These are a summer activity, often preceded by a talk. They can be very popular; potentially attracting hundreds of people. Ideally, you should issue or sell tickets to keep the group to a safely manageable number.

It is important that you complete risk assessments before undertaking the walk. Choose a route which has been walked and timed beforehand, in daylight and in the dark. Walk the route with the person who will be leading it to identify and anticipate potential hazards.

The local bat group will often provide the leaders. As well as the person leading the group, there should be at least one designated person supervising at the back to keep the group together. The leader and other supervisors should wear reflective slips; torches and spare batteries must be taken; ensure you discuss beforehand who is bringing what.

On the walk, electronic bat detectors will be used to listen to the bat calls. The leader will help to identify species, what they are doing, and answer other questions about the bats.

You could also couple the walk with soup beforehand or coffee and biscuits after.

Bat talks

A talk by a local bat group member should be easy to set up and has the advantage of being unrestricted by the time of day or season. Generally these prove popular.

Media

The local newspapers, radio and television are always after news stories and a bat story can be of interest. Biggest roost, rarest bats, odd behaviour, unusual monitoring, forthcoming bat walk etc, are all potential stories, and can lead to beneficial publicity for the site as well as the bats. The national media may also pick up on items put out by their regional counterparts.

Leaflets

Information about bats can be written into guide books or leaflets. Free leaflets about bats and most topics related to bats are available from the Bat Conservation Trust (see contact details on p 76). They may also be able to supply information and images of bats for display panels or leaflets.

Events, concerts and fireworks

Bats are protected by law from any disturbance. This includes protection from disturbance by one-off events.

Impacts

Summer evening concerts at traditional buildings are becoming increasingly popular; as are events such as son-et-lumière and theatre; in winter, there may be carol concerts or mystery plays. There is also a growing demand for interesting venues for weddings, parties and corporate events.

Be aware that noise, heat and light may well disturb bats. If you want to use areas inside

the building that are typically used by bats or wish to use the building as a back-drop, this could have an impact on bat roosts. Noise and lights can affect emergence or disrupt foraging or flight lines. During summer, the nights are short so feeding times are reduced.

Take these steps to mitigate in favour of bats:

- 1 Ensure that roosts, their entrances and bat flight lines are known through prior survey. Plan ahead to keep them in darkness and free from obstructions, and keep the main noise as far away as possible.
- 2 In winter, ensure any event is not close to any hibernating bats, and not in the same room. The warmth from the public, as well as the noise and lights, may arouse them, causing them to use up some of their limited, stored body-fat.
- 3 Ensure lights used to illuminate the stage, the façade, features or pathways are positioned to leave roost exits in darkness. Indoors, ensure the lights do not affect the bats – use downlighters rather than uplighters. Research has shown that event lighting does deter bats emerging – they wait until the event has finished and the lights are turned off. This delay in emergence means that the bats are not able to forage at their optimum time, thus reducing their foraging efficiency. For lactating females, this delay could mean producing less milk and therefore less healthy young.
- 4 Limit noise. Noise that could disturb bats in their roosts may be produced by the public (loud whistles, shouts, claps), the performers (high-pitched sounds from instruments, high volume), car-parking (brakes, car doors, tyres on

gravel). Bear in mind that the closer the source of noise, the more disturbing it will be for the bats.

- 5 Check proposals for the use of fireworks. One option is to let the public know that instead of setting off any fireworks the money has been given to a named charity, and state how many thousands of pounds is involved. If fireworks are essential, try to set them off before sunset, rather than during the main bat emergence period of an hour after sunset. Position them as far from the roost as possible.

For annual events, once a bat-friendly format has been agreed, it can be repeated.

Monitoring

Monitoring the bats and any effect an event may have had is important. In some cases, you may want to agree a management plan with your consultant or Natural England and monitoring would be a decisive check to address such questions as:

- how many events should be permitted in a building with known bat roosts
- what the timing should be (frequency, time of day, time of year)
- how many people should be permitted to attend (considering heat as well as noise)
- what type of event would be least disturbing
- what type of music/sound system would be acceptable (and what volume)
- what type of lighting should be allowed

Bats change their roosting and hibernation places so ensure that your knowledge of the bats' whereabouts is kept up to date with regular surveys as well as monitoring.

Case study on hosting events (Tattershall Castle, Lincolnshire, a scheduled monument)

Context

This is a high, four-storey, tower-shaped brick building (with basement), standing prominently in a flat landscape. Each of its floors comprises one large room and the ground floor room is the main entrance for the public.

The ceiling of the ground-floor room is supported on large square wooden beams set in the walls. The shrinkage gaps around each beam and the wall are used for summer roosting by up to 200 Daubenton's bats. They also sometimes roost in the adjacent church.

At dusk, these bats emerge, fly around the ground-floor room and exit through an arrow slit in a corner tower above the moat.

There has been encouragement to hire out the room for functions, such as wedding receptions, and to use it as a venue for concerts. The local bat group and Natural England showed strong concern about the disturbance that such events were likely to cause, especially if they coincided with emergence time.

Mitigation

A bat management plan was drawn up, and agreed by all parties.

The local bat group agreed to regularly monitor the bat numbers.

The property manager agreed to keep the use of the room for functions as low as possible, and restrict it to those that would be less noisy and/or finish before bat emergence time.

Occasionally some bats roost out in the open: when this happens, rope barriers would be put in place to prevent the public getting too close.

Regular communication between the parties will resolve any issue and fine-tune the arrangement.

Natural England was happy with the compromise.

Contacts and further information

Statutory Nature Conservation Organisations (SNCOs)

These are government agencies which implement nature conservation legislation through leadership and advice. SNCOs operate within regions in each country; local office details will be in the telephone directory or on their websites.

SNCO for England:

Natural England
1 East Parade
Sheffield S1 2ET

www.naturalengland.org.uk

(Licence applications can be found under Conservation > Wildlife Management and Licensing Service > Species > European Protected Species)
enquiries@naturalengland.org.uk
0114 241 8920

SNCOs for other countries:

Countryside Council for Wales
Maes-y-Ffynnon
Penrhosgarnedd
Bangor
Gwynedd LL57 2DW
www.ccw.gov.uk
enquiries@ccw.gov.uk
0845 1306 229

Northern Ireland Environment Agency
(Biodiversity)
Klondyke Building, Cromac Avenue
Gasworks Business Park
Lower Ormeau Road
Belfast BT7 2JA
www.ni-environment.gov.uk
anne.murray@doeni.gov.uk
028 9056 9605

National Parks and Wildlife Service [for the Republic of Ireland]
7 Ely Place
Dublin 2
www.npws.ie
natureconservation@environ.ie
00353 1 888 2000 (1890 202 021 within the Republic of Ireland)

Scottish Natural Heritage
Great Glen House
Leachkin Road
Inverness IV3 8NW
www.snh.org.uk
enquiries@snh.gov.uk
01463 725000

Advice on bats or working near roosts

Bat Conservation Trust
Unit 2, 15 Cloisters House
8 Battersea Park Road
London SW8 4BG
www.bats.org.uk
enquiries@bats.org.uk
020 7627 2629
Bat Helpline 0845 1300 228 (local rate)

A national conservation organisation which can provide help, advice and information leaflets. BCT can also be approached about information and images of bats for display panels or leaflets. As a charity, a donation towards printing and postage is appreciated.

County bat groups: Groups of volunteers in every area of the UK. Details can be obtained from BCT or from individual websites.

Department for Environment, Food and Rural Affairs (Defra)
Customer Contact Unit
Eastbury House
30 - 34 Albert Embankment
London SE1 7TL
www.defra.gov.uk
helpline@defra.gsi.gov.uk
08459 33 55 77

Health and Safety Executive (HSE)
Rose Court
2 Southwark Bridge
London SE1 9HS
www.hse.gov.uk
hse.infoline@natbrit.com
0845 345 0055 (HSE Infoline)

Institute of Ecology and Environmental Management (IEEM)
43 Southgate Street
Winchester SO23 9EH
www.ieem.org.uk
enquiries@ieem.net
01962 868626

IEEM is a source of licensed bat workers.

The National Trust
Heelis
Kemble Way
Swindon SN2 2NA
www.nationaltrust.org.uk
enquiries@thenationaltrust.org.uk
01793 817400

*The National Trust has a number of guidance notes on all aspects of bats in buildings which can be found on its website:
www.nationaltrust.org.uk/bats*

Care of traditional buildings in England

Churchcare
Cathedral and Church Buildings Division
Archbishops' Council
Church House
Great Smith Street
London SW1P 3AZ
www.churchcare.co.uk
enquiries.ccb@c-of-e.org.uk
020 7898 1866

Department for Culture, Media and Sport (DCMS)
2-4 Cockspur Street
London
SW1Y 5DH
www.culture.gov.uk
enquiries@culture.gov.uk
020 7211 6200

Communities and Local Government
Eland House
Bressenden Place
London SW1E 5DU
www.communities.gov.uk
contactus@communities.gsi.gov.uk
020 7944 4400

English Heritage
Customer Services Department
PO Box 569
Swindon SN2 2YP
www.english-heritage.org.uk
(Contact details for regional offices can be
found under About us > Contact us)
customers@english-heritage.org.uk
0870 333 1181

Institute of Historic Building Conservation
(IHBC)
Jubilee House
High Street
Tisbury
Wiltshire SP3 6HA
www.ihbc.org.uk
admin@ihbc.org.uk
01747 873133

Society for the Protection of Ancient
Buildings (SPAB)
37 Spital Square
London E1 6DY
www.spab.org.uk
info@spab.org.uk
020 7377 1644

Care of traditional buildings in other countries

Cadw
Welsh Assembly Government
Plas Carew
Unit 5/7 Cefn Coed
Parc Nantgarw
Cardiff CF15 7QQ
www.cadw.wales.gov.uk
cadw@wales.gsi.gov.uk
01443 33 6000

Northern Ireland Environment Agency
(Built Heritage)
Waterman House
5-33 Hill Street
Belfast
County Antrim BT1 2LA
www.ni-environment.gov.uk
bh@doeni.gov.uk
028 9054 3095

Historic Scotland
Longmore House
Salisbury Place
Edinburgh EH9 1SH
www.historic-scotland.gov.uk
0131 668 8600

The National Trust for Scotland
Wemyss House
28 Charlotte Square
Edinburgh EH2 4FT
www.nts.org.uk
information@nts.org.uk
0844 493 2100

Bibliography

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Anon 2004 *Scheduled Monuments: A Guide for Owners and Occupiers*. English Heritage. Available in PDF format from www.english-heritage.org.uk

Anon 2008 *Bats and lighting in the UK*. London: Bat Conservation Trust. Available in PDF format from www.bats.org.uk

Briggs, P 2002 *A Study of Bats in Barn Conversions in Hertfordshire in 2000*. Hertford: Hertfordshire Biological Records Centre. Available on CD from HBRC, County Hall, Pegs Lane, Hertford SG13 8DN

Jones, K and Walsh, A 2006 *A Guide to British Bats*. (First pub 2001). Shrewsbury: Field Studies Council (www.field-studies-council.org)

Mitchell-Jones, A J 2004 *Bat Mitigation Guidelines*. Peterborough: English Nature. Free download from www.naturalengland.org.uk

Mitchell-Jones, A J and McLeish A P (eds) 2004 *Bat Workers' Manual*. Peterborough: Joint Nature Conservation Committee (3 edn). Covers all areas of bat work and the law; includes bat-related risk assessments. Available in PDF format from www.jncc.gov.uk

Mitchell-Jones, et al 2007 *Protecting and Managing Underground Sites for Bats* (EUROBATS Publication Series 2; English version). Bonn: UNEP/EUROBATS Secretariat (www.eurobats.org)

Natural England 2008 *Bats in Churches: A Management Guide* (Natural England Technical Information Note TIN043) London: Natural England. Available in PDF format from www.naturalengland.org.uk

Parsons, K et al 2007 *Bat Surveys: Good Practice Guidelines*. London: Bat Conservation Trust. Available in PDF format from www.bats.org.uk

Richardson, P 2000 *Distribution Atlas of Bats in Britain and Ireland 1980–1999*. London: Bat Conservation Trust. Available in PDF format from www.bats.org.uk

Ridout, B 2001 *Timber Decay in Buildings: The Conservation Approach to Treatment*. London: Spon Press

Schofield, H 2008 *Lesser Horseshoe Bat Conservation Handbook*. The Vincent Wildlife Trust (www.vwt.org.uk)

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