CONSERVATION

Damp in Old Buildings

Why Buildings Need To 'Breathe'

St Edmundsbury

DAMP IN OLD BUILDINGS - WHY BUILDINGS NEED TO 'BREATHE'

Introduction

Living in an historic building is a privilege which should be enjoyable and satisfying. So why does the dream turn into a costly nightmare for some owners? Discovering your building is damp, has death watch beetle or dry and wet rot is a cause of great distress to all but the most stoical of owners. But solutions do not need to cost thousands of pounds or involve putting large quantities of historic fabric into a skip. In fact, many properties have suffered greater damage and loss of fabric through remedial work than was caused by the original problem! There are two important principles to be considered. The historic building should be managed so damp and its associated problems do not occur or are at least minimised to tolerable levels. However, if your home does suffer from damp and decay, you should solve the problem by tackling the causes and allowing time for fabric to dry out. This will help make sure any loss of the building's historic fabric is kept to a minimum.

Owners of expensive new cars carry out regular servicing using parts specified by the maker and mechanics familiar with the car. They do not use non-specified parts from a high street shop, fitted by a neighbour who fixes cars in his garden as a hobby. Nor do they use the car for years without maintaining it, only for it to then break down on a wet and windy night when their mobile phone battery has gone flat. The approach to the repair and maintenance of an historic building, which costs far more money and is for most owners their largest ever investment, should be no different.

The quality of these buildings is self-evident as they have stood the test of time, many surviving relatively intact for periods of up to 500 years. Continuing to use appropriate materials and techniques provides the best protection and will ensure the building remains both a home and a good investment for hundreds of years to come.

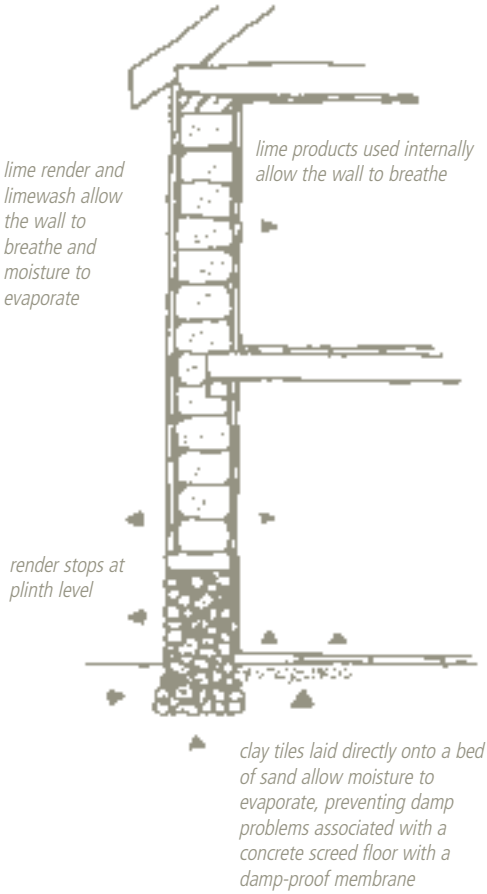
Understanding your building

Why do historic buildings get damp and why have they experienced such alarming and widespread problems with damp and decay in the last 30 years? In order to repair historic buildings, it is important to understand their construction, as buildings constructed before the mid-19th century behave differently to modern buildings. Whereas modern buildings tend to rely on cavity wall construction to prevent moisture

from penetrating the walls, older buildings generally rely on allowing moisture which has been absorbed by the fabric to evaporate from the surface. This is achieved with the use of 'breathable' lime-based mortars, renders and internal plasters.

The walls of timber frame and clay lump buildings were plastered both inside and out with a porous lime plaster. Solid brick and flint walls were laid in a lime mortar and plastered internally with a lime plaster. These porous walls can absorb moisture in damp conditions and release it through evaporation on dry days, allowing the building to 'breathe'. Floors were commonly of ventilated suspended timber floor construction or brick or clay pammets bedded on sand, allowing moisture in the ground to evaporate. As only small amounts of water vapour are involved, evaporation is invisible and does not result in wet walls and floors (see illustration 1)

Illustration 1: How historic buildings breathe - sketch detailing appropriate materials used in solid walled buildings, i.e. clay lump as illustrated, brick, flint and timber framed construction.

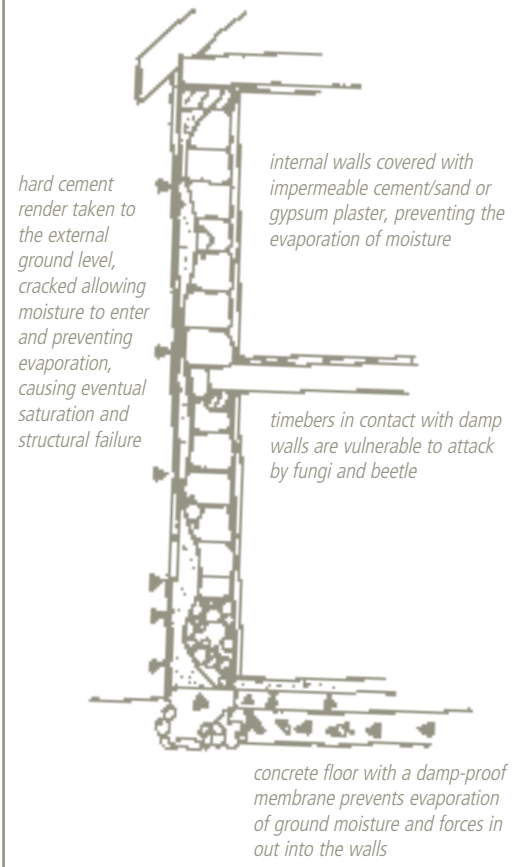


By changing the materials of the building by replacing a lime render with a cement render or a timber floor with a concrete floor, for example, the special breathable qualities of an historic building can be damaged, leading to problems of damp and decay.

Since the 1950s, many owners of historic buildings have tried to keep out the weather by using cement renders, waterproof coatings, oil-based masonry paints and waterproof sealants. Traditional porous floors were replaced with concrete floors with

a damp-proof membrane. This is standard practice in a new house, where the membrane is linked to a damp-proof course in the walls, but it will stop evaporation through the floor in an historic building, forcing any moisture to travel under the non-porous floor until it reaches the walls. If the moisture cannot escape through the walls because they have a cement render or a waterproof coating on them, it will accumulate in the wall, eventually compromising its longevity (see illustration 2).

Illustration 2: Effects of modern materials on historic buildings.



Such work is often done on the advice of builders, surveyors and architects who are well-versed in modern building technology but have little understanding of historic buildings. However, sealing the walls and floor to repel water does not take into account the amount of moisture generated inside a building through cooking, showers and baths and washing or drying clothes. As a result, these well meaning alterations actually increase the build-up of moisture in the walls by preventing the building from 'breathing'. Once the fabric is damp, the environmental conditions exist where wet rot, dry rot and the death watch beetle can flourish.

The breathable fabric of historic buildings naturally holds some moisture. Relying on a 'damp-meter' when trying to measure the level of damp in lime plaster, brickwork, clay lump or wattle and daub will inevitably lead to the 'discovery of damp'. These meters are quite useful on timber, giving reasonable approximations of the moisture content in wood (which is what they were designed for). However, they give readings which are way too high when used on bricks, plaster and wallpaper, giving the impression that a wall is damp when it is actually in a perfectly normal equilibrium state with its surroundings.

Common causes of damp

If you find a damp problem in your property, it can be due to a variety of causes. Some are the result of poor or lacking maintenance whereas others may indicate a more serious problem. Sometimes there may be more than one cause so it is important to investigate all of the possible reasons for the damp. You should also remember that the damp area may be some distance from the cause of damp or be related to work done several months, or even years, ago.

The most common causes of damp are described below:

Cement render and plaster and waterproof coatings and sealants prevent the structure from breathing and lead to a build-up of moisture within the walls when they are applied to the walls of historic buildings. This then causes the walls to deteriorate.

A **concrete floor** inside a building to replace a historic breathable floor means ground moisture is forced out to the walls, increasing the damp within the walls.

High ground levels can lead to damp penetration when the ground level outside the house is allowed to build up until it is at the same level or higher than the internal floor. This allows water penetration directly into the wall. Concrete paths laid around the outside of the building can prevent moisture from evaporating and channel ground water into the walls. If the inside wall has a breathable lime plaster on it, the moisture could escape into the room, maybe causing damp patches and flaking wall finishes at a low level if the wall is very damp. If the wall has an impermeable cement render both inside and out, the moisture will remain in the structure of the wall, causing it to gradually decay. This type of damp is particularly damaging to timber frame properties as it can lead to the decay and failure of the sole plate (the timber which forms the base for the whole of the timber frame structure) and the studs forming the walls. Similarly, if clay lump walls become saturated, this will inevitably cause them to slump.

Lack of ventilation restricts the evaporation of moisture within the building and leads to condensation on the walls.

Penetrating damp is water coming through the walls and roof. There are several areas where water can find its way into a building. These include missing, leaking or blocked guttering or down-pipes, missing pointing, cracked or missing render, decayed joinery around windows and doors, missing or cracked roof slates and tiles and faulty flashing around chimneys. Staining on walls and ceilings can also indicate leaking plumbing.

Rising damp is moisture which is absorbed up the walls from the ground. Many causes of damp are mistakenly identified as rising damp, but most reports of damp can be attributed to one or more of the above causes. True rising damp is relatively rare.

Signs of damp

How do you spot a damp problem? There are several signs to look for, depending on the cause of the damp problem. Many signs of damp will be accompanied by a musty smell.

Low level staining or flaking paint along the inside face of ground floor walls could be a sign of a build-up of moisture in the walls caused by a hard or waterproof render, high outside ground levels or a non-porous floor. **Cracking or movement** of the structure at low level or in corners could also indicate decay of the sole plate causing the timber frame structure above to move.

Crumbling brickwork is a sign of damp bricks which are deteriorating. This can be caused by the use of unsuitable, hard and impermeable mortar which forces moisture in the wall to escape through the softer bricks. Bricks can also become damp due to leaking guttering or down-pipes which do not take the water away from the surface of the wall. When they become damp, bricks are also susceptible to frost damage. The face of the brick can be pushed off when the moisture freezes and expands. The softer material behind then deteriorates and can be brushed away.

Black spot mould is caused by condensation and it appears in corners and behind furniture in poorly ventilated or unheated areas. It is usually a surface mould and does not cause any damage to the structure.

Staining can indicate penetrating damp or rising damp. Penetrating damp can appear in patches and in any location on a wall or ceiling, depending on the exact cause. A leaking gutter, for example, will lead to a high level damp patch, whereas faulty joinery will result in damp around the window opening. Rising damp is only ever found on the ground floor walls. It is recognisable by a 'tide mark' along the length of the wall which rises to about 900mm (about window sill height). Staining on ceilings can indicate a leaking roof or chimney flashing. It could also be due to a faulty water storage tank in the loft space.

Holes in timbers or fungal growths on them can indicate an infestation of wood-boring beetles or an outbreak of wet or dry rot.

Wood boring beetles, such as death watch beetle, will attack damp wood. Consider how difficult it is to drive a nail into a piece of old oak. Then imagine how hard it would be for a beetle to work its way into a dry, sound, oak timber frame. If a house has death watch beetle, it has a damp problem. It is important to correctly identify this beetle as it can cause severe structural damage.

The holes left by the **common furniture beetle,** also known as woodworm, provide timber treatment firms with one of their main sources of income. Most of the holes seen in old buildings are no longer active and are not evidence of an active infestation. Look for fresh bore dust (saw dust) beneath the holes. If this is present you should be able to dig into the wood around the holes and find new grubs.

Dry rot fungus spores are found everywhere. To thrive, dry rot fungus needs wood to have a moisture content of between 20 and 40%. It will then spread by sending out strands through dry areas to reach other sources of moisture. Look for timber which has darkened in colour, white or grey strands on wood, fruiting bodies growing and a pattern of large, square cracks – known as 'cuboidal cracking' – in woodwork. The affected timber will be light and will crumble between your fingers.

Wet rot is caused by a number of fungi which occur in persistently damp wood. Depending on the species, the strands vary in colour. Wet rot fungi are confined to the area of damp. Again, affected timber will change in colour, some becoming darker and some becoming much lighter, giving it a bleached appearance.

A householder, aware how damp and musty her house had become, invited a representative from a timber treatment and damp proofing firm to do a survey. He recommended several thousands of pounds of work to deal with the 'rising damp'. Fortunately, the owner looked for other advice. It was recommended that she should remove the secondary glazing installed several months before and open all the windows whenever she was at home. Within two weeks the damp had gone.

The actual problem was condensation. The outer walls had been treated with a 'never decorate again' waterproof coating, trapping the moisture inside the house. Along with the secondary glazing, which prevented any air from circulating, this created the perfect conditions for damp. You should seek the advice of the conservation team at the borough council or an independent specialist, such as a building surveyor, who can demonstrate an understanding of the care of historic buildings.

How to solve the problem

Don't panic! Taking a little time to establish the real cause of the problem and carefully considering your response could save you thousands of pounds. If you need expert advice, contact the conservation team at the borough council or look for an independent specialist consultant or surveyor to establish the cause and extent of the damp and decay.

Replace hard **cement render and plaster** with lime render and plaster. It is preferable to replace the render and plaster entirely, but if money is limited, replacing them on the lower parts of the walls, near to the ground, will help alleviate the problem. In the case of timber frame buildings this method will allow the sole plate to dry out. Lime render and plaster should be decorated using limewash on external walls and distemper internally. There is absolutely no excuse for any builder, architect or surveyor to recommend cement or part-cement plasters for use on a historic building. If they do, they are demonstrating a lack of understanding and you should question their ability to work with historic buildings. Working with lime is not rocket science but it does require an understanding of how to use the material.

Waterproof coatings and sealants can be impossible to remove without damaging brickwork. You should take advice from a professional paint removal firm to find out what the coating is made of and if it can be removed. If removal is not possible, some of the other methods of controlling damp may help. If the coating is applied onto render and this is causing damp problems, you should consider replacing the render.

Concrete floors should be replaced where possible and replaced with a breathable floor. The level of the floor should be below the sole plate in timber frame buildings. Traditionally, suspended timber floors, bricks and pammets were used, although a modern product, such as Limecrete, laid without a damp-proof membrane, may be an acceptable replacement. This will give a solid floor finish but with breathable qualities. If the whole floor cannot be replaced, then making a breathable channel around the edge of the room, to allow the base of the walls to breathe and keep dry, will help. The channel should be filled with a breathable product such as Limecrete or covered with a narrow grate.

High external ground levels should be lowered so they are below the level of the floor inside the building, taking care not to undermine shallow foundations. A French drain around the outside walls will ensure that the base of the walls remains well-drained and dry. Ensure **external paths** are sloping away from the walls of the building to channel rainwater away.

Opening windows and heating a room will help prevent damp caused by inadequate **ventilation**. Windows which have been sealed shut or painted so they don't open should be overhauled so they work properly. It may be possible to install an extract fan or air vent in severe cases or in areas which are difficult to ventilate.

Check the condition of the roof, chimneys, guttering, render, brickwork and joinery to establish the cause of **penetrating damp**. Remember to check for leaking plumbing. Carry out the necessary repairs, using matching traditional materials on listed buildings, and allow the fabric to dry out thoroughly before redecorating.

If you have a true case of **rising damp**, then lowering external ground levels, improving drainage around the building with French drains and laying breathable floors and walls will help to improve the situation. There are exceptional cases where these measures will not help solve the problem and a damp-proof course, if possible, may be the only option.

Injecting a chemical damp proof course into a historic building seldom works and can actually make the problem worse. Water will be concentrated within the base of the wall below the level of the damp-proof course, causing its saturation and preventing it from drying out. This will then freeze, expand and thaw over winter, damaging the stability of the wall.

The thickness and solid construction of the walls of historic buildings make it very difficult for a contractor to guarantee that the damp-proof course will be effective. To

compensate for this, many contractors remove lime plaster and finish the injected walls with modern, waterproof plaster, which merely serves to disguise a continuing damp problem. Ask yourself why waterproof plaster would be needed if a damp-proof course is going to solve the problem. If the treatment is effective and the lime plaster surface is still in place, salts will appear on it as the wall dries out. These can be brushed off until the drying process is complete and act as a useful measure of the success of the damp-proof course. They also show up any recurring problems. As chemical damp-proof courses often fail in historic buildings, the waterproof cement plaster would stop any reoccurrence of damp appearing on the surface. Many contractors do not explain the process to the customer and prefer a cement render which will continue to hide the problem and damage the building. After several months have passed, it is common for the damp to reappear above the height of the cement render.

A physical damp-proof course may be acceptable in brickwork, including the plinth of timber frame buildings. This involves cutting out a line of pointing and inserting an impermeable layer, such as slate, to restrict moisture moving up the wall. Although not ideal, it is more effective than injecting chemicals into a solid wall and does not require the replacement of lime plaster with waterproof plaster.

The irregular nature of flint walls means that it is very difficult to insert any type of damp-proof course, as it is not possible to form a continuous barrier. Any gaps in the barrier will allow moisture through and the damp-proof course will fail. Drilling into a flint wall to inject a chemical damp-proof course will damage the wall and can also disturb its structural stability.

Beetle and fungal attacks on damp timbers are best cured by solving the damp problem which has created the conditions allowing them to thrive.

Solving the damp problem is the most important step you can take in ridding a building of **death watch beetle**. Chemical warfare may be appropriate in some cases but in isolation it will not eradicate the infestation. *Changing the very particular environment required by death watch beetle is the most important strategy.*

If you find an active **woodworm** infestation, treating the affected area should solve the problem. Spraying an entire house because of one or two out-breaks is unnecessary.

To tackle problems of **wet and dry rot**, cut off the source of damp and allow the timber to dry out. The fungi will become dormant and eventually die.

Building societies often ask for timber treatment and damp-proofing or a survey by a 'specialist contractor' as a condition of a mortgage. If this happens, you should consider calling in an independent consultant to see if such work is really necessary. Usually it is just a waste of time and money and can sometimes fail to identify a problem which should be dealt with. A report from a qualified, independent specialist surveyor or conservation officer questioning the need for such work will normally be enough for the building society to withdraw this condition from a mortgage offer.

The need for consent

Some of the remedial works described above to solve or alleviate problems of damp in listed buildings will need consent from the borough council, depending on the extent of the work. The installation of a damp-proof course, whether physical or chemical, will always need consent and will only be permitted in exceptional cases where no other measures are suitable and where it is likely to solve the problem.

You should contact the borough council's conservation team for advice specific to your damp problem and to check if consent is needed.

Conclusion

Damp and decay in historic buildings is a complex subject. It is because of this that so many mistakes, often well intentioned, have been and continue to be made. It also means incompetent or dishonest operators can easily deceive unwary owners. Timber treatment and damp-proof courses will not deal with the causes of the damp penetration. There may be cases where their localised use may be beneficial - but only as part of remedial works to remove the sources of damp from a building.

This leaflet is intended as a basic guide and solutions must be tailored to individual cases of damp. There are builders, architects, surveyors and specialist historic building consultants who understand old buildings and give a good service to the homeowner. Make sure you find one.

Advice and Contact Details

For further advice about the identification and treatment of damp in historic properties please contact:

The Conservation Team
Planning and Engineering Services
St Edmundsbury Borough Council
Western Way
Bury St Edmunds
IP33 3YS

Tel: (01284) 757356 or 757339
E mail: conservation@stedsbc.gov.uk

Further reading

The information in this leaflet is based on the following publications, which are recommended as further reading:

AF Bravery, JK Carey, RW Berry and DE Copper **Recognising Wood Rot and Insect Damage in Buildings** Building Research Establishment 1987

Pamela Cunningham **Caring for Old Buildings** Donhead 2002

Jeff Howell **Daily Telegraph Guide to Looking After Your Property** Pan 2002

Stafford Holmes and Michael Wingate **Building with Lime** Intermediate Technology 1997

Phillip Hughes **The Need for Old Buildings to Breathe** SPAB 1987

Hugh Lander **The House Restorers Guide** David and Charles 1986

A Lawrence, D Wrightson **A Stitch in Time** IHBC 2002

Richard Oxley **Is Timber Treatment Really Necessary** SPAB 1999

Richard Oxley **Survey and Repair of Traditional Buildings: a Sustainable Approach** Donhead 2003

Jane Schofield **Lime in Buildings** Black Dog Press 1999

Jagjit Singh and Nia White **Timber Decay in Buildings** Journal of Performance of Construction Facilities 1997

Jagjit Singh **Biology and Ecological Control of Timber Decay Organisms in Historic Buildings** Structural Repair and Maintenance of Historic Buildings

Rory Sumerling **Lime Plaster – A Regional Variation in East Anglia** The Journal of the Buildings Lime Forum Vol 10 2003

Brian V Ridout **An Introduction to Timber Decay and its Treatment** Scientific and Educational Services Limited 1992

Ed M Wood **Building Regulations and Historic Buildings** English Heritage 2002

Adela Wright **Care and Repair of Old Floors** SPAB 1999

Useful Websites

English Heritage www.english-heritage.org.uk
Institute of Historic Building Conservation www.ihbc.org.uk
Building Conservation Directory www.buildingconservation.com
Ancient Monuments Society www.ancientmonumentssociety.org.uk
Council for British Archaeology www.britarch.ac.uk
Society for the Protection of Ancient Buildings www.spab.org.uk
Victorian Society www.victorian-society.org.uk
Twentieth Century Society www.c20society.org.uk
Georgian Group www.georgiangroup.org.uk

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