NEW FOREST NATIONAL PARK

New Forest DISTRICT COUNCIL

Slipped slates causing water to enter

Historic buildings

Damp, rot and insect attack

The purpose of this leaflet is to look at damp, rot and insect attack in traditional buildings, the things which might be identified by a surveyor, valuer or other 'specialist', what the causes may be, how they might be tackled and where further advice can be sought.

There is a list of references and useful contacts on the last page.

Damp is often the result of faulty rainwater goods

Introduction

Damp, rot and insect attack are amongst the most common problems encountered in traditional buildings, but are they always dealt with appropriately?

It is essential that the cause and nature of a damp problem, rot or insect attack are analysed properly.

Damp problems frequently come to light when buildings are sold and are the subject of a valuation survey in connection with a mortgage. It is important that this, and any building survey for other purposes, is carried out by a suitably qualified professional who has relevant, up to date historic building experience. Even if further specialist advice is to be sought, the building's construction must be understood, together with the problems which are likely to arise, and the most appropriate solutions, if the right report is to be requested and understood.

If a surveyor's or valuer's report is incorrect or the recommendations are interpreted wrongly, then inappropriate or even damaging conditions may be placed on a mortgage offer. An owner may embark on inappropriate or damaging works.

Damp

Historic buildings generally were not constructed with a damp proof course. Their thicker walls relied on natural evaporation to control dampness which might be drawn up from the ground, or through penetrating rain. Plasters, mortars, renders and decorations were lime based, porous and aided the evaporation process.

It was only from the latter part of the Victorian period that damp proof courses (dpc) began to be used on a more regular basis to prevent moisture ingress from the ground. These dpcs included slate, laid in two courses, thick layers of bitumen, or two courses of dense brick, all laid about 6" or 150mm above the external ground level. The construction materials and methods still meant evaporation played a part in the control of dampness.

In modern construction steps are taken through the use of damp proof courses and impervious construction materials and methods, to cut out moisture altogether.

The fabric of older buildings will often therefore have a higher moisture content than that of modern buildings. A surveyor may assess dampness in walls using a moisture meter. In an older building it is likely to show readings higher than those which would be classed as normal in a modern building, irrespective of whether the building has a damp problem. Dampness may then be misdiagnosed if the contractor is not experienced in dealing with traditional buildings.

Repair and maintain gutters, downpipes and gulleys regularly to avoid problems with damp

The lime render has cracked and fallen off allowing water to penetrate

Sound construction is of course essential in old buildings and modern buildings alike if damp is to be avoided and should be the starting point in investigations and diagnosis of problems.

Diagnosing and dealing with damp

Before embarking on expensive remedial treatments for rising damp or unavoidable penetrating damp in an old building, it is important to ensure that water ingress from all avoidable penetrating sources is eliminated. The building should also be ventilated and all materials allowed to breathe.

Inspect and repair roof coverings and flashings

Defective roof coverings and flashings are the most obvious source of water ingress. It is important to check that all coverings are sound and intact and that flashings are in place. If not, carry out the necessary repairs.

Repair and maintain gutters, downpipes and gulleys

Many problems regarding water ingress are related to drainage problems, caused by faulty rainwater goods. These must be repaired, downpipes cleared of debris and vegetation and falls on gutters must be in the correct direction. Gulleys must be clear allowing water to travel away from the building. These simple expedients alone would halt the majority of damp problems in walls at high level.

Check rendering and pointing

Many buildings that were originally coated in lime render have been re-coated in cement, which is inflexible and impervious. It frequently cracks which means moisture can run behind the render where it collects and cannot evaporate back out. In time this can create a damp problem. It may be necessary to remove the render and replace it with a lime based render which is flexible and porous.

Soft, sand-rich lime mortar pointing may have eroded allowing rainwater into the masonry. Lime mortar may have been replaced by cement, which may have cracked, again allowing the ingress of rainwater, also restricting evaporation and hence holding the water in the wall. Repointing badly eroded areas and if possible replacing cement mortar with lime (the opportunity to do this must be carefully assessed as removal may significantly damage masonry) should help.

Look at drainage and ground levels adjacent to the building

Plants can be removed from the base of the wall. The immediate ground level around the building can be lowered so that it is below ground floor level inside, ideally by at least 6" or 150mm.

Creating a drainage channel on the outside of the building can help to reduce the groundwater level immediately against the wall. A shallow channel is dug and land drains laid in it, soaking away to a suitable location. The channel is then backfilled with pea gravel.

Consider the possibility of condensation

Owners of buildings often find it difficult to believe the extent of a damp problem that can be caused by condensation, thinking instead that it must be due to a construction defect.

Creating a drainage channel to reduce ground water level against a wall.

The effects of condensation

Condensation occurs when warm moist air meets a cold surface. The risk of condensation therefore depends on the amount of moisture in the air and the temperature of surfaces in a room. Both of these to some extent depend upon how a building is used. When houses were more draughty and open fires were common, the moisture in the air used mainly to go up the chimney. Now where chimneys are closed and draughts prevented, condensation can result, particularly in winter when windows tend to be closed and the building structure itself is cold.

Land drain back-filled with shingle

Everyone is familiar with condensation which occurs for short periods in bathrooms and kitchens, but it can also occur for longer periods in unheated bedrooms, cupboards or corners of rooms where ventilation and movement of air are restricted.

It is important, in order to avoid condensation, to:

- provide good ventilation to kitchens and bathrooms and to prevent very moist air from spreading from these rooms
- to provide some ventilation to all rooms; and,
- to use heating reasonably, ensuring that all rooms are at least partially heated, since in order to maintain the temperature of building fabric it is better to have a small amount of heat for a long period than a lot of heat for a short time.

Damp proof course

Before embarking on the insertion of a damp proof course, it is essential that all of the above have been investigated and addressed as far as possible and the building given time to dry out. There is no doubt that on many occasions these steps are not followed and damp proof courses are needlessly inserted in historic buildings.

If a wall is built in continuous horizontal courses and is not too thick to cut through then it may be possible to install a physical damp proof course. This would not be possible in a random rubble wall, a wall with a rubble core or flintwork. It is also not advisable in cob (if not impossible because of the thickness of the walls), or the plinth below a cob wall, as the material relies on a certain level of moisture for its integrity.

Short lengths of masonry are cut through in stages to allow a damp proof material to be introduced. Though this can be highly effective it is disruptive and inevitably damaging to the historic fabric. It is essential that it is installed below the internal ground floor level and shallow foundations can make this impractical. Structural problems can also occur as a result of the disturbance caused by cutting through the wall.

A chemical damp proof course is more frequently used. The wall is impregnated with a chemical

Example of damp penetration

Dry lining

solution that works by either blocking the masonry pores or forming a water repellent film within the pores. The solution is either injected under pressure or percolates by gravity into the masonry through holes drilled at close intervals near the base of the wall.

Success is dependent upon the effectiveness of penetration. It is therefore less likely to be effective in flint walls which are difficult to drill and walls where there may be voids, such as in rubble fill. Again the damp proof course should be below the internal ground floor level.

Companies installing chemical damp proof courses may insist that in order to guarantee their work, the internal plaster up to about 1 metre be removed and replaced with a salt resistant, impervious plaster. This can obviously be damaging to historic fabric and the internal character and appearance of the building, and indeed in the case of a listed building can require listed building consent. It may be more appropriate or necessary to simply leave the plaster to dry out, brushing off any salts as necessary and then repairing it with lime plaster as required.

In addition, companies installing these damp proof courses will normally remove skirting boards, architraves, dado rails and other wooden fittings in the area of the damp. As a result they are often thrown away. It is important that any company carrying out this work is instructed to carefully remove these fittings and set them aside. They should then be examined for damage, repaired and replaced on completion of the work.

Timber framed structures are much less likely to suffer from rising damp than masonry structures provided that the ground level outside is lower than the floor level inside. However the timber sole plate (the bottom timber) may suffer from damp rising up from the masonry below and hence decay.

If the sole plate becomes totally saturated the infill panels above may suffer from rising damp. This can be stopped by introducing a damp proof course slightly below the underside of the sole plate (not immediately below, in order to avoid condensation).

Dry lining

If it is not practical or desirable to install a damp proof course but rising damp, or unavoidable penetrating damp has been identified as the cause of unacceptable levels of moisture in the wall, it may be possible to consider dry lining. This could be carried out using stud framing clad with polythene sheet and plaster board or with plaster on expanded metal lath. It must however be properly isolated and the cavity formed ventilated, otherwise there is a real danger of dry or wet rot.

In terms of its impact on the appearance of the interior of a historic building, dry lining can significantly affect the character. Walls become unnaturally smooth, regular and lifeless, there are detail problems at window and door openings, the proportion of rooms is changed. Dry lining will always therefore require listed building consent.

Dry rot

Moisture leading to damp

The qualities that make old buildings attractive include the visible effects of many years of weathering. However, some signs of age, such as holes left long ago by wood-boring insects or stains from rot are often misinterpreted as problems that inevitably require chemical treatment. Consequently many old buildings have been subjected to unnecessary works and timber treatment.

Society for the Protection of Ancient Buildings

Rot and insect attack

The most common causes of timber decay are dry rot, wet rot, common furniture beetle, and death watch beetle. Some remedial treatments can result in the loss of irreplaceable decorative finishes, floors and ceilings. In addition, treatment of the infestations with chemicals is not only expensive, inconvenient, and potentially hazardous to the operatives and occupants but also of concern environmentally.

Timber decay in old buildings should be prevented and controlled by maintenance and appropriate repair as far as possible and hence unnecessary invasive repairs and treatments avoided. That is not to say that timber treatment is never necessary, but it is important to understand how and when it can be beneficial.

There are a number of ways in which inappropriate repairs and treatments may come about, which include:

- a lack of understanding and mis-diagnosis of fungal decay and insect attack
- significance and structural implications of decay not being understood
- the desire to obtain instant single solutions with a guarantee
- Remedial companies specifying more work than is necessary to minimise the risk of claims on their guarantees.

Decisions about repairs and treatment of timber should be based on a careful inspection and analysis of the building. The surveyor must understand the construction, the timber used and the types of decay that can occur.

The principal environmental factors which will affect the decay of timber are temperature, moisture, including humidity, and a lack of ventilation.

Moisture leading to damp can come from a number of sources which have already been described in this leaflet. Essentially rot and insects will usually only cause damage where there is moisture. If the sources are not addressed and removed then deterioration will continue, whatever other action is taken.

The first course of action must therefore be to investigate any areas of dampness and to eliminate the source. Ventilation is essential and the building must then be allowed to dry out.

The following matters should then be considered before permanent repairs and any treatments are undertaken.

Evidence of poor maintenance which has allowed water penetration, leading to rot

If decay is localised, then localised methods of repair may be practical

Condition of the timber

A detailed assessment of the timber must take place, looking at staining which may be evidence of water penetration, cracking or movement which may have been caused by rot, flight holes and bore dust from insects.

Probing accessible timbers with a screwdriver will test their resistance and give an indication of the extent of surface decay. Sounding larger timbers with a hammer for hollowness can indicate decay.

Where timbers are concealed a reasoned assumption will need to be made about their condition and potential risk from decay.

What is causing decay?

It is essential in order to decide what action to take, to diagnose the precise cause of decay, which means identifying the type of rot or insect. The powder post beetle, for example, will only attack the sapwood of hardwood timbers in the early years after the tree is felled. Therefore no treatment is needed against these insects in timber that is centuries old and any infestation will be extinct.

Correct identification of the rot or fungi is important as not all fungi are equally destructive. Some rots are present in timber when it is cut or are acquired in storage. Fungal material may also be dead or dormant, the product of conditions now past.

Type of timber

The species, type and age of timber provides an indication of vulnerability to decay.

For example, softwood and hardwoods are vulnerable to different sorts of rot and insect attack.

Extent of decay and impact on the structure

Just because some form of decay is evident, it does not mean that drastic measures must be taken.

The seriousness of any problem will depend upon the type of structure and the timbers which have been affected by decay. If structural timber has been affected and its performance is in jeopardy then structural repair will be required.

If decay is localised, then localised methods of repair and, if necessary treatment, may be practical.

In some cases decay may affect only a small percentage of the timber and may not require repair.

Timber on this fascia has decayed to such an extent that it no longer performs its function and needs to be replaced

The same fascia following repairs

Repairs and drying out

Once the extent of decay has been determined appropriate repairs can be undertaken. Timber which has decayed to the extent that it no longer performs its function will need to be repaired or replaced.

As far as possible timber which is of historic value or where removal cannot be achieved without damage to important historic fabric - for example, where it supports a fine plaster ceiling, should be retained in the process of repair.

See leaflet Timber Frames and Roofs for some basic information on the repair of historic structures.

With damp eliminated, the structure ventilated and the fabric dried out, timber should not suffer from further decay. However the type of timber and the drying out period needed must be considered. Whilst oak should be able to withstand conditions conducive to decay, some softwoods may be susceptible. Timbers must be carefully monitored to ensure that decay does not take place during the drying out period.

With a knowledge of the cause of decay, it will be possible to assess whether ongoing decay is likely and hence the need for chemical treatment.

Chemical treatment

In order for treatment to be justified, there must be active decay which cannot be dealt with by other construction means. Usually it will be the case that timbers will be subject to prolonged damp or the structure cannot be dried out quickly, for example in the case of timbers which are built in and difficult to ventilate.

In these cases treatment of the specific timbers at risk should be carried out. In the case of dry rot, localised treatment of masonry may also be undertaken, to form a barrier to prevent spread to timber in adjacent areas.

It must be remembered that chemical treatment alone cannot provide a long term solution.

Where the environment remains damp, the risk of decay will remain.

Wet rot followed by insect attack

Localised repair was necessary to these sections of timber follwing an insect attack

Rot

Dry rot

Dry rot fungus destroys softwood timber, and occasionally attacks hardwood. In order to survive and thrive, true dry rot requires moisture content in timber of between 20% and 30% with a relative humidity of 95%. Temperature is also an important factor and growth usually ceases above 25°.

Dry rots usually have spectacular fruiting bodies, red with white edges, which tend to take the shape of a bracket or plate. The bodies have white to grey speading tubes or threads known as 'hyphae', or 'mycelium'. These enable the dry rot to spread across inert material such as brickwork. Affected wood is usually light brown in colour, dry and brittle with cuboidal cracking.

Wet rot

Wet rot fungus attacks both softwood and hardwood, causing a darkening of timber (brown rot) or a bleaching of timber (white rot). Wet rot usually requires persistently damp conditions, with optimum moisture content of between 50% and 60%.

Visual evidence is usually in the form of blackish brown strands. Although some wet rots do produce fruiting bodies similar to dry rot. Wet rot is responsible for up to 90% of wood decay in buildings.Affected wood is dark brown in colour. Cuboidal cracking occurs but is shallower than dry rot.

Insect attack

The three most commonly found wood boring insects in the south coast region of England are the common furniture beetle (anobium punctatum), powder-post beetle (lyctus brunneus) and death watch beetle (xestobium rufovillusom).

Furniture Beetle

- Borehole diameter

This beetle is commonly known as woodworm. Attack is usually confined to the sapwood of hardwoods and softwoods, but it may occur in the heartwood of timbers which have been affected by rot. It is usually in areas of dampness, such as timber ground floors and roof voids with little circulation of fresh air that are most affected by this beetle. (Timber with a moisture content below 12% is attacked only extremely rarely.) Emergence usually takes place between May and August through holes 1-2mm in diameter. Bore dust is cream coloured and gritty in texture.

Powder-Post Beetle

- Borehole diameter

So called because of the effect that the beetle can have upon the sapwood of hardwoods such as oak, chestnut, ash and elm, where a pile of dust might be created. Softwoods are immune to attack by this beetle. Wood becomes less susceptible as it ages, and it is usually assumed that by 15 years old, wood is immune to further damage from Powder-Post beetle.

Emergence takes place throughout the year in heated buildings, through emergence holes of about 1.5mm diameter. The bore dust is very fine.

Death Watch Beetle

- Borehole diameter

Infestation usually occurs in large-sectioned hardwood timbers such as oak or elm, where there is already some form of rot present. For this reason, this form of infestation occurs commonly in older properties. Whilst damp conditions are necessary for an attack to establish itself, a slower pace of attack may continue if timbers dry out, and the rot no longer progresses. Softwood is sometimes also attacked if it is adjacent to infested hardwood, or very occasionally if rotten, in ground floors.

Emergence is usually in the spring through a 3mm diameter hole. The bore dust is gritty in texture.

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Further information

Click on the website address for link

Listed Building Consent

If repairs are to be carried out to a listed building that are strictly on a like-for-like basis, no consent is required. However, should materials vary, or if the repairs are extensive, then it is likely that listed building consent would be required. It is therefore prudent to contact the National Park or the District Council before you undertake any works to ensure that you comply with the necessary legal requirements.

Society for the Protection of Ancient Buildings
37 Spital Square London E1 6DY
0207 377 1644
info@spab.org.uk
www. spab.org.uk

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

Royal Institute of Chartered Surveyors RICS
0207 222 7000
www.rics.org.uk

Other organisations that may be of assistance include:

English Heritage
1 Waterhouse Square 138-142 Holborn London EC1N 2ST
0207 973 3000
www.english-heritage.org.uk

Georgian Group
6 Fitzroy Square London W1T 5DX
0207 7529 8920
office@georgiangroup.org.uk
www.georgiangroup.org.uk

Victorian Society
1 Priory Gardens Bedford Park London W4 1TT
0208 994 1019
admin@victoriansociety.org.uk
www.victoriansociety.org.uk

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If you require further information about any of the issues raised in this leaflet or any other building conservation matters, please contact the Building Conservation Officer at

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