

Historic buildings Flooring

This leaflet describes the materials, character and appearance of traditional flooring in the area as well as some of the problems encountered. It also offers suggestions on appropriate methods of repair.

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

Introduction

Floors have been created ever since man lived in purpose-built homes. In Britain, ground floors were composed of compressed earth for thousands of years. Earth sometimes comprised of chalk, clay, or manufactured lime

mixed with ash, and occasionally with milk which acted as a binder and waterproofer. Later on, pig blood was sometimes included as a colourant to darken the floor to a rich red brown.

History and description

Ground and basement floors

The Romans in Britain used flint cobble, tile, (only occasionally in the form of mosaic) brick on edge, mortar mixed with small pieces of pumice or brick, and flagstone, mostly applied straight onto the earth. There is also emerging evidence that they used timber boards laid on joists, which were located in slots in the earth. However, since the joists were laid on the earth, little evidence of their use remains.

Some time after the Romans left, floors in some of the more expensive dwellings were raised above the ground, by overlaying wooden boards on bearing timbers, which were located on brick dwarf walls (sometimes known as sleeper walls).


During the last thousand years, in various parts of Britain, slate and various forms of lime and later cement-based mass concrete were used for ground floors. These were laid directly upon compacted or stabilized earth.

Vaulted stone ground floors have been used for a thousand years in Britain, mainly in cathedrals and churches, where crypts were sometimes constructed beneath.

Stone flags laid onto earth have been used for many hundreds of years. In the finer houses from the later mediaeval period onwards, flagstones were laid in the hallways and best rooms of the ground floor.

Whilst hardwearing, it was also expensive, particularly in the New Forest which produces little natural stone for building. Later, during the Victorian period stone was used more for functionality, and hence remained in service rooms such as the buttery or pantry.

Encaustic tiles were not only functional, they also had a reasonably hard wearing, decorous appearance. These were patterned with various oxides and powdered marble, formed when still wet. They arrived in England from North Africa, via Spain and France sometime in the mediaeval period. However, following the Reformation of the mid C16th these tiles largely disappeared from England until the



Plain clay tiles have been used for many hundreds of years



◀ A hardwood spine beam with softwood common joints and mid c19th softwood floorboards. Despite appearances both the boards and structural timbers are in excellent condition. This indicates that the design of the floor and the connection to the walls were well considered when the dwelling was built

▶ Stone floor in a cellar, in good condition, which should be retained



industrial revolution when Herbert Minton invented a mechanical technique of production. During the Victorian and Edwardian period many homes used such tiles, particularly in hallways.

Plain clay tiles have been used for many hundreds of years in a variety of standards of dwelling, and continue to be used successfully in many houses across the district from cob 'hovels' to fine Georgian properties.

During the Georgian period, wooden block floors known as parquet were fashionable in expensive houses, some laid around the edges of floors, others covering the whole ground floor.

Brick floors were employed in many houses during the C19th. When fine carpeted timber and tiled floors were fashionable, soft red brick was used in poorer homes or in workaday rooms like cellars. Such floors were usually laid directly upon the earth.

However, the most common, and perhaps the most intact, is timber flooring. Oak and elm have always been the most durable and sought after woods, but in many lesser houses cheaper woods were used. Softwood was grown in Britain and abroad, and from the C17th it was imported from Scandinavia and then later, from America. This flooring was laid on joists which were either placed on top of brick

dwarf walls (sometimes known as sleeper walls) or slotted directly into the walls.

Outbuildings from the Georgian era particularly, including stable blocks and wc's - or thunderboxes as they were commonly known - were also sometimes floored in cobble, clay tile or brick paviour.

First floors

Whilst there is some variety in flooring material and style for ground floors, the vast majority of first floors were constructed from timber boards laid on timber joists. However, on occasion vaulted stone first floors were used in some of the more expensive first-floor hall houses constructed during the mediaeval period. Stone vaulting served to protect the inhabitants from fire as well as from intruders.

Special Floors

During the industrial revolution in Britain, (1760's to 1830's) architects and engineers designed heavy-load bearing floors for use in factories and mills where the new machinery was extremely heavy. These usually consisted of barrel-vaulted brick floors supported by iron beams and propped on iron columns, with lightweight infill material placed on top, to level the surface.

In the New Forest during the later C19th a Mr. Peterson experimented with barrel-vaulted mass concrete roofs and floors, using steel tie bars

to hold the opposing ends of the roof or floor together. The finest examples of this technique still remain in Sway Tower and other buildings in Sway such as 'The Piggeries' at Towers Farm and the stable block at Arnewood Court.



◀ A sole plate with no damp proof course has suffered from years of water penetration. The concrete channel beneath it serves to splash water onto it, adding to the level of moisture in the timber ▶

This fine stone floor is cracking, slightly uneven in part, but gives a cohesive feel to the room and should be left in its natural state. The unevenness of the material is far out-weighted by the positive character that it gives to the room



Flooring problems

Historically, buildings were well ventilated. Porous walling materials, poorly fitting doors, loose windows and little or no insulation meant that draughts were commonplace. During winter occupants dressed in heavyweight clothes to compensate. Open fires, which provided the source of heat as well as the means to cook, warmed the fabric of the structure, though conversely served to draw in more draught from outside. This continual through flow of fresh air kept levels of dampness in the fabric relatively low; but people naturally accepted that some degree of dampness was inevitable in buildings.

(It was only following the 1875 Public Health Act that horizontal damp proof courses were required to be built into the base of walls to prevent rising dampness.)

Nowadays, even many old buildings have well fitted doors, secondary-glazed windows and efficient central heating. The possibility of creating dampness by sealing a building against the elements becomes more real as draughts are sealed and the circulation of fresh air reduced.

Many of the problems and solutions relating to floors are inextricably linked to problems with walls, and are therefore sometimes dealt with in combination.

Damp Penetration

Ground floors

There are several possible reasons for this problem:

- the lack of damp barriers in the walls and the floor;
- the relative levels of internal floor and external ground;
- blocking of air bricks through a wall;
- no air bricks in wall;
- Poorly detailed, leaking or ineffective rainwater goods or water pipes.

Damp proof courses in walls

The vast majority of houses constructed before the turn of the C20th were not built with a damp proof course (dpc). This can allow dampness to penetrate the fabric and migrate up the wall and into the house, particularly if the wall is solid rather than constructed from two separate leaves, as most were, until the late C19th.

In the wall, the level of rising damp is balanced at the point where the rate of evaporation and the rate at which it can be drawn up by capillary forces, equates.

This dampness can also migrate into the floor. Salts from the soil or from the walling material itself develop and show as white deposits on the surface of some flooring material, such as quarry tile or brick, leading to localized crumbling of the surface. On suspended timber

ground floors, the floor joists may be set on small brick walls which generally did not have damp proof courses, or lie directly on the earth, which allowed dampness to migrate to the joists.

However, some later Victorian walls do have dpc's, but on occasion external render may bridge the dpc to transfer moisture up the wall and into the structure.

In other buildings the ground floor joists are built into the wall ends. Dampness is readily drawn into the timbers in this situation.

Damp proof membranes in floors

During the mediaeval period beaten earth or lime ash flooring was sometimes mixed with milk or blood to create a partially waterproof surface which served to reduce damp ingress. Very few of these floors now exist.

The great majority of intact historic ground floors have no damp proof membrane, but they rely partly on the density of the flooring material to prevent excessive dampness entering the building, and partly on the effects of ventilation to draw out the moisture from the floor as it occurs.

In time brick, quarry tile and stone floors can deteriorate through gradual but persistent migration of salts through the material. These salts occur both in the soil and in the clays that make up the tiles and bricks.



◀ A floor board replaced without addressing the problem of debris build up in the void below the boards. There are no air bricks in the wall and the debris continues to transfer moisture from the wall to the joists. The rot will continue to damage the substructure until it is cleared out and air bricks are introduced into the wall

▶ Recently exposed, this air brick is now functioning as it should. However, the ground floor joists have rotted after years of no ventilation



Floor levels and ground levels

The internal floor level is usually raised above the external ground level. This reduces moisture ingress through the floor and prevents moisture ponding.

There are, however, many buildings that have a floor that is lower than the ground outside. On occasion this can create severe dampness in the floor.

There are several possibilities why this reverse level change occurs:

- Floors are dug out to increase headroom, or to accommodate new floors of differing type.
- Alternatively, the ground level outside could, through time, rise. This might happen through the accumulation of debris thrown off a roof or collected by the outpourings of nearby downpipes, or by allowing plants to grow against the wall.

On low level wooden floors, dampness can result in wet floor boards and joists, and sometimes wet and dry rot, if conditions are right. (Further information on this subject is available in the leaflet entitled 'Damp, Rot and Insect Attack'.)

In combination with salts present in the soil or the fabric itself, damage can also occur.

Air bricks and their effective use

Air bricks are usually made from iron, steel or terracotta. Original ones were built into many Victorian buildings as work progressed. However since construction, many older buildings have however had bricks inserted, or old ones replaced. They are located below the floor level on timber floors, to aid the circulation of fresh air. Blocking such bricks causes dank air to build up, sometimes leading to rot. In time vegetation, raised earth beds or patio slabs can all cover over these bricks.



This outbreak of dry rot developed as a consequence of no through ventilation in the floor void

Rainwater goods and other pipework

A lack of basic maintenance of rainwater pipes can lead to severe ingress of moisture. Blocked and cracked gutters and pipes are a very common cause of dampness and can damage fabric all around a house, not just at eaves or ground level. Mis-directed outflows from the bottoms of downpipes can also lead to dampness in flooring.



The guttering to this building is cracked in various areas. The result is severe moisture damage, dampness within the building and erosion of the brickwork



◀ The joint between the frame and infill panels may move allowing moisture to enter the building



Faulty gutters and leaking downpipes may lead to saturated walls and floors ▶

Other floors

Other floors above ground level are susceptible to dampness for a variety of reasons.

In some cases, design detailing might be faulty. For instance:

- In some cob structures, particularly those which are unrendered and have been re-roofed in slate or tile, (therefore reducing the overhang, since thatch is designed to hang sufficiently over the walling to keep it dry), the structure may become saturated.
- Poor detailing of window sills to masonry walls, allowing water to penetrate the structural fabric.
- Timber lintels over window heads can on occasion draw moisture into the structure. More commonly however, a lack of general maintenance can lead to a break down of the fabric of a structure, allowing ingress of moisture.
- Failed pointing in brick walls can allow driving rain to penetrate.
- Waterproof cement render can fail, allowing water to penetrate behind it, which in time becomes drawn into the fabric of the structure.
- In timber framed structures, the joint between the frame and the brick infill panels may move and crack. Moisture might then be driven in.



Failed pointing in brick walls can allow driving rain to penetrate



Lack of general maintenance can lead to a break down of the fabric allowing ingress of moisture



A fruiting body at the base of a door frame. Despite the floor being tiled, dampness in the floor structure has led to dry rot in the door frame



The brittle cracked timber door lining is affected by dry rot, which appears to have crept up from the floor

Damp

Wet rot

Wet rot in timber can occur when several factors are present in a building: namely, a suitable food source (wood), a moisture content above 20%, air and a suitable temperature, usually between 20° and 22°. Cellar fungus (*Coniophora Puteana*) a common wet rot, usually only takes hold in very damp buildings, where timber is in contact with wet masonry, or in association with wet ground. Wet rots do not spread readily, but can infect both soft and hard woods.

The signs of wet rot include blackish-brown strands spreading fan-like across the surfaces of timber and walls. Fruiting bodies are very rarely seen.

Dry rot

Serpula Lacrymans, the true dry rot, usually infects soft woods, but on occasion can infect hard woods. It requires the same set of factors to take hold as wet rot, but can spread more readily into sound wood.

The most common effect is embrittling timber, resulting in total loss of structural integrity.

Much of the mythology about this fungus is based on the belief that the strands (or hyphae) can transport their own water to dry areas of wood, and for the fungus to manufacture its own water.

This ability is limited. Dry rot is recognisable by the fruiting bodies that usually appear in the form of flat plates or brackets and the grey strands. In very active growths, white masses of hyphae are covered in droplets of moisture.

Wet or dry rot can take hold in floor voids below ground level, as the air does not always circulate efficiently.

Beam ends or joist ends built into wet walls can also lead to wet or dry rot.

Similar problems can occur in floors above ground. Further information on dampness can be found in our leaflet entitled 'Damp, Rot and Insect Attack.'



The dusting seen on the wall plate signifies severe Deathwatch Beetle infestation. Even though the sections of timber appear sound, the ends have been eaten away



Example of wood badly affected by furniture beetle

Beetle infestation

Much of the hardwood timber used in house construction was wet when it was cut and installed. It is likely that some of it had been infected with fungus before being cut down. In large sections of timber the moisture content would have remained high for many years, helping to sustain the fungus.

Deathwatch Beetle (Xestobium Rufovillosum)

The fungus inherent in some hard wood became a suitable environment for Deathwatch beetle. Softwood is also sometimes infected, particularly when adjacent to hardwood. Some infestations were present in buildings at the time of their construction many hundreds of years ago. Over the years, most buildings suffered from periods of damp ingress, due to a lack of basic maintenance. As a result new fungal growths were set up from which new beetle infestations occurred. In many instances the conditions for infestation are only just being met, so the life cycle of the beetle continues at a very slow rate; nevertheless, structural damage also continues, but at a reduced rate. The usual result is severe infestation. Structural integrity can be wholly destroyed, by removing the core of the timber; and it can be difficult to see if the damage has occurred in the ends of joists built into walls.

Powderpost Beetle (Lyctus Brunneus)

This beetle is so called because of the effect it can have upon the sapwood of hardwood timber. The beetle is usually only found in timber with a high starch content and large pores, in which females may lay their eggs. Wood becomes less susceptible as it ages, and it is generally assumed that by 15 years old wood is immune from further attack. In severely attacked timber, the sapwood can almost completely disintegrate, leaving thin but intact skins of wood. Softwoods are immune.

Furniture Beetle (Anobium Punctatum)

Furniture beetle readily attacks hardwoods and softwoods. It is only the sapwood that is attacked, unless wood rot is already present, when it may then be found in heartwood. As most structural timber uses the heartwood of the tree for strength, the damage caused rarely affects the integrity of the timber, except sometimes on floorboards that have been sawn 'through and through'.



Old common joist slots have been avoided when the newer, Victorian joists have been inserted. Although a neater joint is created, this practice effectively weakens the integrity of the main spine beam. Notches created by plumbers and electricians further weaken the spine beam



Fine stone flooring in a listed cottage - replacing it would need listed building consent

Structural problems

Timber floors above ground tend to be most likely to be affected by structural problems.

Structural timber was generally used in a wet state. It was usually felled, converted and installed into a new building in a short space of time. The slow shrinkage of wood over time meant that many of the joints constructed strained or pulled out of their sockets.

The majority of historic floors that remain do so primarily because they are structurally efficient - notwithstanding the side issues of rot and infestation, they are inherently strong enough to withstand domestic loadings and vibration from pedestrian traffic.

However, in some instances, floors are severely bowed. This can happen for several reasons:

- Rarely, post mediaeval main beams or joists are undersized. Interestingly, some of the remaining timber floors from that period feature oversized common joists but undersized main beams, which conspire to create a sagging ceiling, which sometimes requires structural support.
- Major floor timbers might also be either excessively long for their section, or looked at another way, too narrow in section for their span.
- The floors are sometimes overloaded.

- The joint made between the joist and the main beam can be weak, of insufficient depth, or shrunken away.
- Another reason is based on previous interventions, when old joists have been removed and replaced in newly cut slots in the spine beam. This leaves the spine beam with various notches, all of which reduce the tensile strength of the timber. (Modern alterations like this still occur when electricians or plumbers insert cables or pipes through a floor joist.)

The junctions between joist and spine beam can spread out during drying and loosen, and of course the integrity of the floor will fail when the joists have reached the point where they are no longer effectively connected to the main beam.

Flooring repairs

In any case where work is required to a listed building, the conservation officer should be contacted to discuss the proposal. Any work that affects the character of a listed building requires listed building consent. It is for the Planning Authority to determine whether works require such consent or not.

Note should be made that replacing historic floors with concrete is usually unacceptable in a listed building, and would be an unfortunate loss in any historic building.

A holistic approach to remedying floor problems, as with all structural problems, should be taken. The cause of the problem must be ascertained and comprehensively remedied before any works of repair to the fabric are undertaken. If not, the problem will probably re-emerge later on.



This is how not to do it. This reconstituted stone floor was laid without listed building consent and is wholly inappropriate in a historic building. Poor substitute materials are rarely suitable and should be avoided



Whilst this is probably a pre-war concrete floor it is still nevertheless a pity to have removed the timber. Damp ingress and/or rot probably caused its removal



Inherent defects in flooring material

Floors can sometimes fail because of problems associated with the material chosen for the job, rather than any external influences affecting integrity, such as dampness, loading or poor detailing.

Earth Floors

Clay, lime ash or beaten earth floors, which served many houses for thousands of years, are now very rare. The reasons for this are twofold: the functional status of most of these sorts of floor indicated low social class.

Therefore, as and when occupiers could afford it, such floors were removed and replaced with brick, quarry tile, timber or flagstone; secondly, as such floors were effectively only thin coatings over compressed earth, and had to withstand much pedestrian traffic over many years, they inevitably broke up.

Ironically, 'scagliola' floors, an expensive and therefore historically higher class version of beaten earth, which consisted of plaster compounds polished to look like marble, deteriorated as readily as their lower class counterparts.

Brick or tile floors

In the pre-industrial period, much of the clay for brick and tile manufacture was not cleaned and graded by machine, nor was it fired evenly. The result was that large stones and under-fired sections of

brick and tile were included in the finished article, causing weakness in the material.

Salts inherent in the under-fired material can also cause problems. When in contact with damp earth, clay can powder as the salts are released. This is known as efflorescence.

Encaustic tiles can sometimes show uneven wear, because certain colours of clay which are overlaid on the base material when wet, are harder-wearing than others. Ridges and hollows can therefore develop.

Stone floors

Stone is less likely to deteriorate through the migration of inherent salts, but nevertheless can still occur. There is however the possibility of fissures or small cracks in the grain of the stone opening up through either moisture ingress or pedestrian movement, which can cause more noticeable cracking.

Timber floors

Timber ground floors are usually built off dwarf walls or, occasionally, immediately off the earth. Timber joists which sit upon dwarf walls either run along or across the dwarf walls.

On occasion, timber ground floors also sit immediately upon the earth. In either case, sizing the joists is not as important as for floors above the ground, because the load is transferred directly into the walls or earth immediately below.

First floors can however be subject to problems. Experienced carpenters in the post-mediaeval period usually knew through experience what size a wooden joist or beam should be in order to carry the proposed loading.

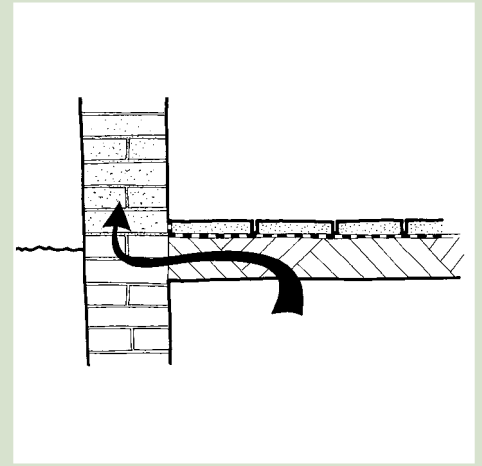
Basic mathematical calculations became available for sizing structural timbers late in the C18th.

Defects in the wood itself such as shakes or knots can also cause problems with strength of timber. This is discussed further on.

Sometimes, inherent long cracks known as shakes may weaken a beam so much that the floor loading, which was previously acceptable, has become intolerably heavy.



Much of the flooring in historic buildings is slightly damper than we would expect in modern flooring material



The insertion of a damp proof membrane underneath the tiled floor has caused moisture to be driven up the walls

Rectifying causes of dampness

Ground floors

Damp proof courses in walls

Before embarking on remedial treatment it is worth considering the following questions:

- Is the problem being caused by leaking gutters or pipes?
- Is the problem caused or exacerbated by condensation?
- Is any timber exposed to dampness and therefore fungal attack? Can it be isolated? If so, does the dampness matter?

Each of these questions should be assessed in detail. In many instances overcoming one or more of the above reduces or removes the problem. Sometimes the most effective measure to overcome damp relates to allowing the structure to breathe, rather than trying to restrain the dampness.

The Society for the Protection of Ancient Buildings (SPAB) suggests that it 'might be wiser to let the damp naturally present provide the humidification. Installation of central heating can so dry the atmosphere that a small amount of damp evaporation from the wall will counteract this effect.'

However, on occasion where rising damp is a serious problem that cannot be ameliorated by other means, the introduction of a dpc might be necessary. Further information is available in our leaflet 'Damp, Rot and Insect Attack.'

Damp proof membranes in floors

As with damp proof courses, it is worth considering the questions noted above.

Most solid historic floors do not have damp proof membranes (dpm) as we understand them. However, stone flags and some dense clay tile or slate floors do a reasonable job in containing dampness because of their inherent density, but in general much of the flooring in historic buildings is slightly damper than we would expect in modern flooring material.

There are two types of modern membrane available: a plastic membrane, or a painted-on plasticised coating. Naturally, both require wholesale removal of the flooring surface before application. It is for this reason that lifting an old floor to insert such a membrane would not normally be recommended and it is unlikely that listed building consent would be granted. However, if the floor were relatively modern, this would be acceptable.

PLEASE NOTE:

It must be recognised that by inserting a dpm moisture will be driven away from the floor and up the walls. This must therefore be considered before lifting the floor.

Is there a damp proof course (dpc) in the walls?

Is one required?

What damage might be caused by inserting one?

What alternatives could be adopted to avoid the effects of inserting a modern dpc?



◀ Air bricks should be kept free of leaves and debris to allow a good through flow of air. In this example, the pavement has been applied right up to the air brick, reducing its efficiency

▶ Rainwater goods should be maintained on a regular basis



Floor levels and ground levels

The essence of the solution to this problem relates to changing the ground levels outside, and creating effective site drainage around the building.

Vegetation, raised soil beds and patio slabs or concrete hard standings should be removed or reduced to at least 150mm below the level of the internal floor.

Around the base of the walls a drainage channel should be dug. A land drain should be inserted and, along with any downpipe fed into a trapped gully, should lead to a soakaway.

However, caution must be exercised. Internal floor levels have sometimes been significantly lowered, usually to provide additional headroom. In such cases, lowering the ground level outside to below internal floor level could expose the foundations and might even undermine the integrity of the structure. In these instances, it might be possible to reinstate to the original floor level over a dpm.

On occasion, windblown rain might penetrate underneath a door and pool on the floor, or trickle through floor boards to create dampness and rot underneath the surface of the floor. This should be ascertained before considering a change to the floor itself.

Air bricks

If there are air bricks around the base of the house, it should be ascertained that they serve a useful purpose. Occasionally, new solid concrete floors have been laid. In these instances no air is required, and so the bricks become obsolete. If, however, the bricks serve a functioning under floor void, then they must be maintained to allow a good through flow of air.

It should further be ascertained whether there are sufficient air bricks around a house to allow for a direct through flow of air. In some dwellings, bricks are located on only one or two sides, thus reducing their effectiveness in allowing air to pass straight through the void, drawing out damp air.

Rainwater goods and other pipework

Rainwater goods should be cleaned and seals checked. Downpipes and gutters can easily fill with detritus which can clog and back up any water in the pipes. This should be carried out on a regular basis. Many old buildings which have fallen into disrepair began to deteriorate through a lack of roof and rainwater goods maintenance.

Water pipes such as those serving a radiator should also be checked. It is not unknown for broken pipes to empty into brickwork cavities. In some properties, radiator pipes run through floor voids and their condition may require assessment.



Remedial works being carried out to support a wooden floor at first floor level.

The insertion of electric cables and water pipes can seriously damage the structural integrity of a floor. This common joist has been strapped across to increase bending capability and has been attached to the spine beam using a 'joist hanger' to reinforce the original, and now rather weak, structural connection into the beam



Structural repairs

Repairs to timber floors above ground are generally based on better supporting the existing timbers. In these instances, timber scarf joints using new sections of timber are the traditional repair. However, since the early Victorian era metal straps and brackets have been used to bolt fix separating timbers back together.

In cases where new services such as plumbing pipes have been run through spine beams, a simple reinforcement features bolting or screwing a steel bracket across the top of the area affected, thus strengthening the weak point and spreading the load. These brackets can also be applied over old joist holes in such beams.

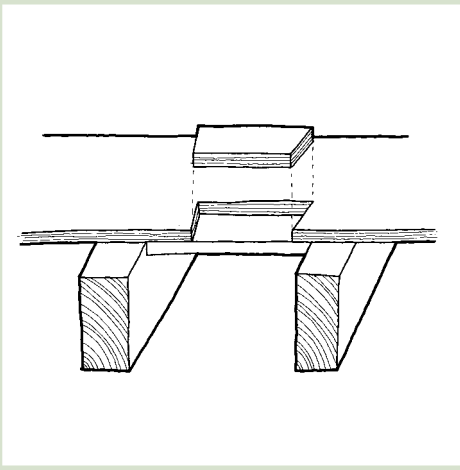
If a timber floor is sagging excessively then the services of an experienced structural engineer versed in the problems of old buildings, would be usefully employed. If an engineer could prove the floor is unsafe, then remedial works are necessary.

Major interventions to restrain movement and support a floor may include flitching or introducing posts.

A flitch plate is usually a 'T' shaped steel beam which is inserted into a slot, cut along the length of a spine beam from above. This tailor made beam would not seek to rectify any bend or sag, but rather stabilise it. This approach saves harming any

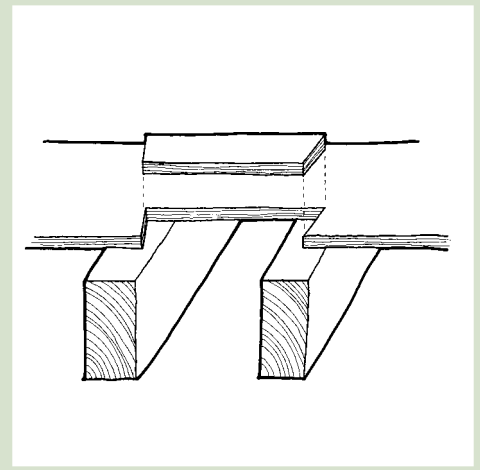
aspect of the character of a room, but particularly it prevents damage to ceilings from cutting from below.

The alternative, which should only be proposed as a last resort, is the introduction of timber or iron posts to support the beam from below. On occasion, their use at either end of a beam is sufficient, but sometimes the sag might be so severe that only by placing one in the middle of the room will the deflection be stabilised.



◀ A supporting timber located between the joists will carry the load and help consolidate this repaired section of board

▶ When a repair is bigger, the joists themselves can carry the ends of the new section of board



Repairs to flooring materials

Earth floors

These coatings were usually applied reasonably thinly over a consolidated earth floor. However, given their nature, the swelling and shrinkage of the subsoil would directly affect the integrity of the floor.

Where a section has cracked through and lifted, relaying with a slurry mix of the appropriate material combined with up to 10% lime putty-based mortar will strengthen the surface.

In areas of limited surface crazing or light cracking, an accepted method of repair involves raking the surface and laying a wetted mix of high calcium lime and fly ash or hydraulic lime, depending upon the clay content of the floor.

Brick or tile floors

If occasional bricks or tiles are severely damaged, they can be lifted and replaced with closely matching copies. It can however prove difficult to remove and replace on a level bed a new brick or tile, given the variety in thickness of many old flooring materials.

On occasion, a cleanly broken brick or tile need not be removed if it is sound and does not move. It is only if the cause of the break continues to damage the integrity of the material that a new brick or tile should be introduced.

Stone floors

The natural laminations of stone can occasionally splinter, slabs may crack and an unevenly worn surface is quite common, as pedestrian traffic over the centuries creates undulations. It is preferable to retain these imperfections as the solidity of stone means that deterioration is very slow. If however a crack has created a dangerous surface, it can be carefully raked out and re-pointed with a lime putty-based mortar.

Historically, the joints between floor stones were not usually pointed. In this way, the integrity of the stone remained intact as the moisture from the ground beneath evaporated out into the room through the open joints and any slight movement did not cause damage to the edges of the stone.

Sometimes however, lime putty pointing was used. This was almost as effective at allowing moisture through the joints, but in some instances sandstone floor slabs reacted with the lime in the mortar, which damaged the area of stone adjacent to the joint.

Lime pointing has sometimes in the recent past been replaced with cement based pointing. As this is waterproof, this has the effect of transferring the movement of moisture from the mortar into the stones, which can in due course deteriorate. Salts from the ground, which are drawn into the stones,

evaporate on the surface of the stones, creating a dusty, crumbly surface.

Timber floors

Some timber joists or boards have cracks or shakes along their length. This is not necessarily a problem, as timber has a surprisingly high tensile strength which depends upon the continuity of its grain. A wide shake or split might however reduce the strength of the timber. The services of an experienced structural engineer should in this instance be sought.

A knot can, however, cause problems. If it is found that a knot is so detrimental to the structural integrity of a timber that repair is required, then one of several courses of action might be taken.

In cases relating to the junction of two timber members, copying the original joint is the best solution, perhaps reinforced with a steel plate to help carry load. If the knot is on the edge of the timber and has damaged the fabric, then it could be cut out and replaced with a new edge.

However, if the problem is at the centre of a beam or joist, a halved scarf joint is the most appropriate repair, but strapping or bolting a steel plate either side of a structural timber will effectively spread load and contain any weakness.

For more information please refer to our leaflet 'Timber Frames and Roofs'.

Historic buildings Flooring

Further information

Click on the website
address for link

References

Wood, Glass & Resin by **Ashurst, J & N** English Heritage Technical Handbook Volume 5

Floors by **Parissien, S**
The Georgian Group Guides 11

Technical note 6: An introduction to Rising Damp in Old Buildings by **Williams, G and Ashurst, N** SPAB

Technical note 15: Care and Repair of Old Floors by **Wright, A** SPAB

Technical note 10: Patching Old Floorboards by **Hughes, P** SPAB

Technical note 12: Introduction to the Repair of Lime-Ash and Plaster Floors by **Hartley, P** SPAB

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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
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