SITE CONDITIONS AND OTHER FACTORS

Wood is a hydroscopic material i.e. it absorbs or loses moisture as the conditions around the wood change. Consequently it expands and contracts as it adjusts to the surrounding temperature and relative humidity (RH). Changes in RH are more crucial than changes in temperature. The performance of the floor depends on the maintenance of suitable, stable conditions during the laying and over the life of the floor. It is equally important to ensure that the sub floor structure is dry and well constructed.

Moisture Content

Penny Bricks & Timber flooring is dried to an average moisture content of between 10% and 12% with the majority of the timber around 11%. This represents a cross range of moisture contents for use in intermittently and continuously central heated conditions.

Site Conditions

It must be stressed that everyone concerned should be aware of the importance of dry site conditions before, during and after laying hardwood flooring. The following guidelines should be observed in conjunction with the advice given in BS8201.

1. The overall fabric (walls, floors, timber etc.) of the building should be thoroughly dried out until there are no visible signs of moisture or condensation in the structure. In cold damp periods this may require artificial methods such as the use of heaters and dehumidifiers. The building should then be heated (with adequate ventilation) to its operating temperature for at least 1 month before the floor is fitted and this should be continued until the floor layer is satisfied that the building is thoroughly dried out. Gas or oil fired space heaters should not be used to dry the building. They increase the humidity.

2. All under floor concrete slabs should be dried to 5% moisture content and this may take at least 1 month per 25mm thickness of slab for thin slabs (say up to 100mm), but progressively longer for thick slabs. E.g. It may take 12 months for a 150mm thick ground floor slab.

3. The flooring should be allowed to acclimatise (before laying) for at least 14 days at the temperature and relative humidity expected in service.

4. The floor should be laid at the same temperature and humidity as expected in service.
   (See Conditions During Use).

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Sub Floors

The stability and performance of the finished floor is dependent on the quality and integrity of the sub floor.

Concrete Screeds & Slabs

Existing slabs should be sound, dry & level, with maximum moisture content of 5% and contain a damp proof membrane.
All new screeds/slabs should be laid in accordance with CP204.
All concrete floors should have a smooth float finish and extra care should be taken near edges, corners and movement joints to ensure that localised irregularities do not occur.
Where the concrete is above 5% moisture content (but the rest of the building is dry) the concrete may be sealed with an approved epoxy resin damp proof membrane applied to the surface.

Under normal circumstances the concrete is treated first with the epoxy and then with a self-levelling compound. The flooring (parquet battens, blocks etc.) or softwood battens are then bonded to the new surface with a proprietary flooring adhesive.

Measuring Moisture Contents

The approximate moisture content of the concrete screed may be checked using a correctly calibrated and accurate electronic moisture meter. The moisture content of existing woodwork in a building will also give an indication of the ambient conditions. The most accurate method of testing the moisture content of the screed is by use of a hygrometer. Full details of the method are to be found in BS 8201

Existing Boarded, chipboard or plywood floors

All joists and boards should be in good structural condition, level and free from rot or insect attack. It is advisable to treat any timber against fungal and insect attack regardless of the age or condition of the floor. The moisture content of the sub-floor should not exceed 15%.

All composite boarding such as chipboard or plywood should be of the correct external/flooring grade and be firmly fixed to the joists and adequately supported. The under floor cavity should be well ventilated and the floor of the cavity should be covered with a damp proof membrane and over-site concrete (where possible) to prevent the ingress of water.

New timber joists, battens and supporting timbers

Should have a maximum moisture content of 18% and preferably under 15% and be double vacuum treated with a solvent-based insecticide/fungicide such as Protim 80. Where water based treatments are used, the timber must be re-dried to under 15% moisture content before use.

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Accuracy of Floor Levels

Sub floor levels should be accurate to within about 3 or 4mm over 3 metres and there should be no pronounced high or low areas. Existing uneven concrete floors may be corrected using a self-levelling compound provided that the differences in level are not too great. Ensure that all areas are dried out after treatment.

Sanding with a floor sander may level existing wood floors which are distorted or uneven.

Where wood floors have large deformations, perhaps because of subsidence or in a very old house, the floor may be levelled by fixing shaped timber battens along the lines of the existing joists and perhaps between. A plank floor may then be nailed to the battens. The sub floor must be in a sound structural condition.

CONDITIONS DURING USE

BS8201 suggests a range of average moisture contents to suit varying conditions:
Unheated - 15% to 19%; Intermittent Heating - 10% to 14%; Continuous Heating - 9% to 11%; Under floor Heating - 6% to 8% (See later comments)

All Penny Brick & Timber's floors are air and kiln dried so that the average moisture content lies within the range 10% - 12%.
The recommended ambient conditions in service should be in the ranges:
Average Temperature - 15ºC to 25ºC Average Relative Humidity - 40% to 50%
Provided that the average conditions remain close to the ranges specified then reasonable short term variations should not affect the stability of the floor. As a guideline, a 1% change in moisture content across the floor could produce a movement of about 2mm per metre width of the floor.
Combinations of low temperature with high humidity will cause expansion while high temperatures and low humidity will cause contraction. A change in Relative Humidity of 5% will produce a change in moisture content of about 1%.

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THE EFFECTS OF HEATING, SEASON AND CLIMATE ON STABILITY

In reality it is often difficult to maintain the exact range of conditions unless the environment is fully controlled. Consequently a number of precautions are taken.

A. The moisture content of the timber should be checked on delivery from the supplier. This will enable the floor layer to make the correct decision regarding acclimatisation in individual situations.

B. The timber should be acclimatised in the room where it is to be laid at the conditions expected in service for at least 14 days. Softwood battens to enable thorough circulation of air around the timber and to ensure uniform acclimatisation should separate (each layer of boards).

C. Expansion gaps are left around the perimeter of the floor and occasionally at intervals across the width of the floor depending on whether the floor is expected to expand at some point in its life (See Laying Guidelines).

The designer / Contractor should be aware of how the following factors affect the moisture content:

1. The time of the year the floor is laid.

   Ambient humidities are usually higher during summer when heating systems are turned off. This usually leads to an increase in the moisture content of the floor which produces expansion across the grain. Consequently floors which are acclimatised and laid during the winter months in centrally heated conditions will tend to expand during summer and allowance should be made for this expansion. Conversely floors which are fully acclimatised and laid during the summer months will normally require less allowance for expansion and will usually contract a little in winter.

2. The geographical location of the building.

   E.g. A cool high rainfall area such as Northwest Scotland is more likely to have high summer humidities and cooler temperatures than say Kent. The ambient conditions may produce a higher average moisture content in the floor and extra time should be allowed for acclimatisation. Allow for sufficient expansion.

3. The age and condition of the building and the type of heating system to be used.

   Old buildings with inefficient heating systems usually have higher humidity and lower temperatures. This may produce a moisture content in the floor higher than expected and lead to more expansion than normal. Allow extra time for acclimatisation and / or for more expansion.

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UNDER FLOOR HEATING AND SOLID HARDWOOD FLOORING

Heat Loss

All buildings loose heat and the amount of heat loss will depend on the age & shape of the building, its location, degree of insulation, ventilation etc. If the building is to be maintained at a constant temperature, the heat loss must be balanced by the heat input from the heating system.

Older and perhaps more traditional buildings are usually draughty & poorly insulated and there is a high level of heat loss both through the fabric of the building and via air changes. In consequence the heat input required to maintain a constant temperature is high. However, the latest timber framed houses are well insulated, designed to conserve energy and in consequence, suffer little heat loss. They require only low energy input. Traditional buildings of the type built from the 1930's to say 1990 have varying degrees of insulation and are generally not very energy efficient.

The Heating System and its Effect on the various types of Buildings.

The under-floor heating system is an active part of the building and the total heat input is transmitted through the fabric of the floor. In the traditional building with large losses, more heat has to be pumped into the building to maintain the temperature thereby increasing the floor temperature & the difference in temperature between the floor surface and the air.

The high temperature in the wood coupled with low air humidity can produce a moisture content in the wood of about 5 or 6%. If the original moisture content was say 9%, the floor would shrink about 7 or 8 mm per metre width of floor during a prolonged period of heating. When the heating is turned off and the humidity rises, the moisture content may rise to 10% or 11% (in summer) causing an expansion of 2 to 4mm width per metre width of floor over and above the original 9% moisture content.

The overall change in moisture content of the floor from summer to winter is thus from 5% to 11% at worst i.e. A maximum of about 12 mm per metre width of floor. It is this range of movement, which is unacceptable; causing large gaps which open and close with the seasons.

In the modern timber framed building with minimum heat loss the energy input is low and the floor may only need to be 2° or 3°C, on average, higher than the air temperature. Also, this type of house experiences less seasonal fluctuations in humidity & temperature & this helps maintain stability
This lower temperature may reduce the moisture content of the floor a little - to about 8% or 7% - at worst causing a little shrinkage. The range of seasonal expansion and contraction is consequently less and similar to that experienced with conventional heating systems.
However there is no hard and fast rule about the suitability of the house and heating system, it will depend on many factors, i.e. .U value, room geometry, air circulation etc. plus the design of a suitable heating system.

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It is essential to have the plans of the building examined by a competent heating engineer early in the planning of the building so that amendments may be made, if necessary, to accommodate an under floor system. If it is not possible to use an under-floor system they will tell you. It is essential that you use a company that understands solid wood floors.

SOUTH FACING CONSERVATORIES & SUN ROOMS

During the summer months, the temperature and humidity within a closed, south-facing conservatory are likely to considerably exceed the recommended values and solid wood floors should be used with care. Automatic ventilation and temperature control may be used to regulate the conditions and a solid roof and blinds will eliminate the worst effects of the sun.

MOVEMENT IN SERVICE

Seasonal variations and levels of heating cause the floor to expand and contract. Under normal circumstances small gaps may appear during winter, especially towards the end of winter and after particularly cold and dry periods (when the heating has been turned up). These will close up again during the summer months and the whole cycle is perfectly normal for a solid wood floor.

References

BS 8201

British Standard Code of practice for flooring of timber, timber products etc. CP 204

In situ floor finishes. CP 209

Care & maintenance of floor surfaces - Part 1. GBG 28 Parts 1 to 5 - Published by the Building Research Establishment.

Further references are to be found at the end of BS8201.

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