

WOODEN FLOORS AND UNDERFLOOR HEATING

Brian Sensecall of UHMA describes the basic steps required to ensure a perfect match

We live in hard times – at least when it comes to flooring. In many UK homes carpets have been confined to the bedrooms while the public indulges its current tastes for hard floor finishes – stones, ceramic, slate and, the current favourite, *wood*.

Sales of polished timber floors have risen sharply – matching the booming demand for underfloor heating systems. But are they a match? There are those with insufficient experience of underfloor heating and/or timber who question the relationship. Their minds can and should be put at rest.

However, since success and failure often march close together, it's worth restating a few of the fundamentals to make that "success" is the certain outcome.

Many types of wood flooring are suitable for use with underfloor heating (and cooling) - *but not all*. If in doubt, the first step is to consult a Specialist Supplier, the Timber Research and Development Association (TRADA), British Standard 8201:1987, or all three, as to the characteristics of the type in question.

The most essential prerequisite before heating a wood floor is moisture control. Being a natural organic material, wood has a density in the region of only 500-700 kg/m³, which is about 33% of concrete. Newly felled timber is made up of long cellulose strands bonded by lignin with "veins" and "arteries". Sap and water vapour content accounts for more than 50% of the log's mass.

Mature 'seasoned' timbers from the specialist suppliers have controlled moisture contents ranging from 28% saturation - below which point shrinkage effects become noticeable - to 6% when 'bone dry' where shrinkage ceases to be a factor.

The Laws of Thermodynamics inextricably link moisture content, vapour pressure and temperature, so when wood is used to conduct heat, best practise requires that the floor top surface temperature should not exceed 27°C (75W/m²). A practical guide to moisture content can be found in *BS;8201:1987*.

Virtually all shrinkage takes place across the grain (not along the length) where 1% moisture content change or +/- 5% Relative Humidity = approximately 2mm per metre movement of timber. However, this should not be confused with thermal linear expansion of timber which is about half that of concrete.

Importantly, if boards are initially laid at say 9-10%, then during operation the moisture content can be expected to fall to 6-8% with an attendant shrinkage.

Clearly, not all wooden floors are heated *continuously*, but in all cases a suitable gap to

permit thermal and humidity driven expansion and contraction effects must exist around all room perimeters, internal corners, floor ducts, posts, manholes, and neighbouring floors. The amount of expansion gap is never less than 8mm, and often 13mm -15mm (*if in doubt consult a timber expert*).

Pre-Installation Measures

It's essential that the on-site team consider how a suitable environment for kiln-dried timber is to be created during installation in any newly constructed or refurbished building. It will be necessary to pre-condition the room by pre-heating the floor very carefully by raising the temperature of the embedded pipes, or cables.

Modern timber floors - must meet Building Regulations Part L: 2006, and Part E which requires a layer of not less than 100mm thick mineral wool insulation to be laid between joists as an acoustic barrier. This also acts as additional thermal insulation, enabling the floor heating system to operate even more efficiently

Whenever wood floor/electric underfloor heating is involved, attention should also be paid to the Electrical Regulations BS 7671: 2001 (see Para 5.2) where cable temperature limitations require cables to be oversized to cope with unusual temperatures.

A word of caution - the addition of carpets on wooden floors can add 15°C to the temperature between floor and carpet. Thus to achieve a 27°C floor surface temperature (75 W/m² output) may require water pipes to operate at 50-55°C

Designers should, therefore, make sure that the heat loss of the structure is less than 75 W/m² to ensure the timber floor can operate *at or below* the maximum permitted 50°C contact temperature for timber and wood products.

Finally, installing a remote thermostatic sensor device below timber floors will limit temperature and associated humidity, thus safeguarding the client's interests.