

Guidelines for Underfloor Heating

Underfloor heating is becoming a more popular way to heat domestic buildings. With the move towards more heat efficient construction this type of heating is seen as a good solution to maintain constant levels of warmth and to give a cost efficient option; in Germany over 40% of all new housing has underfloor heating installed. In view of this growing popularity it is important that the potential problems with underfloor heating and timber flooring are understood to ensure that appropriate measures are taken to minimize the chances of avoidable issues arising.

The information below is designed as a general outline and summary of underfloor heating. Specific installation / operating advice must be obtained from the underfloor system manufacturers.

The screed

Typically the underfloor heating system is either constructed with PE-pipes, filled with warm water, embedded in a screed or electric matting under a screed.

- The use of a 'floating' construction of the screed is not unusual in normal building practice. In this instance, 'floating' means the screed is laid on a heat isolation layer. If the layer is not installed correctly there will be localised spots where heat is lost downwards, into the screed, rather than being focussed upwards. This means that the moisture content in the timber flooring will vary due to some areas being 'colder' and not having been 'dried out' as much. In turn this brings different levels of stress to the timber flooring in various parts of the floor.
- The screed may be considered to be dry in relation to its acceptability to lay a timber on, i.e. below 5.5%, but a normal "dry" screed in relation to underfloor heating may be considered to be 'wet'. This may in turn cause problems with joints opening in the timber floor or poor adhesion.
- Irrespective of the use the condition and strength of the screed must be of the highest level as the potential stresses from underfloor heating can be considerable. As with all structures a floor is only as good as its weakest link and a poor quality screed could affect the subsequent behaviour of the timber flooring above.

Ensure that the screed is of a good quality and the moisture content is acceptable prior to the installation of the timber floor.

Checks before laying the timber

Moisture testing of floors with underfloor heating is problematic as intrusive measurements, such as the Protimeter gel system, might harm the installation and non-intrusive measurement may give false readings due to the water in the pipes or electric cables. The physical nature of the screed may be affected if the heating system is turned on too early as forced drying will prevent hydration of the cement and in turn affect the strength of the material. Also there exists a possibility of cracks developing.

It is generally accepted however the underfloor heating system should be run before installation of the timber flooring. Consultation should be undertaken with the system manufacturers to determine the required procedure. A typical example is as follows:

- The screed must be mature: Cement > 28 days, Anhydrite > 7 days
- Maintain for 3 days at temperature of 25° C
- Raise the temperature by 5° C/day to the maximum temperature of the system
- Maintain for 4 days at the maximum temperature of the system
(Cement: not > 60° C - Anhydrite: not > 55° C)
- Allow the screed to cool slowly, approx. 5° C a day. If cooling occurs too quickly it can cause cracks in the screed which may damage the pipes or matting.
- Ideally the timber flooring should be laid immediately after cooling. If the screed is not laid within 7 days the heating cycle should be repeated (increase by 5° C / day, hold 1 day at max., cool down with 5° C / day)

Maintenance of the temperature levels is important and any changes in temperature should be gradual and not excessive. The figures quoted relate primarily to the temperature of the water based systems but there will be corresponding figures available from manufacturers of electric systems.

The process described is designed to remove residual constructional moisture, bringing the screed to a level of dryness it will have when in use, and to leave the screed ready for laying a timber floor. Additionally it also allows for the efficacy of the heating system to be assessed. If problems remain with the moisture content the use of liquid damp proof membranes can be considered but it is usually more cost effective to follow the standard heating recommendations to remove surplus moisture.

In all cases the manufacturer of the heating system should be consulted with regard to the preparation process / installation checks.

Laying the floor

When it is established that the heating system is working effectively it is possible to proceed with laying the timber floor. It is important that the adhesives manufacturer is consulted with regard to application procedures. Similarly with engineered / multi-layered flooring advice should be sought from the manufacturers as to the most appropriate products / fixing methods.

Some timber species may be described as having 'interlock' grain; such species are unsuitable for use with underfloor heating systems. Examples of such species includes Tasmanian Oak, Spotted Gum and other timbers such as Wenge, Beech, Maple, Kempas and Jatoba.

Key points with regard to the installation include:

- The surface temperature of the screed must be below 20°C
- Always apply a primer prior to the adhesive or follow the manufacturer's instruction
- Allow the adhesive to dry and the floor to stabilize before increasing the temperature
- Always increase / decrease the temperature in small steps
- Unfinished timber should have an appropriate moisture content. Remember, where new underfloor heating has been installed acclimatization to site conditions may mean the timber absorbs considerable amounts of moisture as constructional moisture may still be present
- Total heat conduction resistance of the floor covering shall not exceed 0,15 m²*K/W. Typically hardwood floors 15 - 22 mm thick (depends on the type of wood) or engineered / multi-layered flooring with a thickness below 16 mm work well.

Coating the floor

Coating a floor with underfloor heating is no different to coating any other timber floor. The same requirements regarding moisture content, site conditions, etc exist. Where care should be taken is in the operation of the heating system in conjunction with the coating process.

With newly installed flooring the floor should have experienced the heating system running prior to coating. Once the adhesive has dried the floor should be brought to operating temperature by gently increasing the temperature in small steps over several days. The system should be allowed to run for a week so as to acclimatise the floor to the conditions of service. Assuming acclimatisation of the timber or specification of the moisture content, in consultation with the supplier, was undertaken then minimal shrinkage should occur.

The temperature of the floor should then be reduced slowly so that the surface temperature is no greater than 20°C. A primer must be used for the first coat. Once the finish system has dried and has been allowed several days to cure the floor can be brought once more to operating temperature by gently increasing the temperature in small steps over a few days.

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Key points to remember include:

- Ensure the floor is acclimatised / installed at the correct moisture content
- Run the heating system between installation and coating

- Don't have the surface temperature of the timber above 20°C
- Use a primer for the first coat
- Always take the temperature up and down slowly

After completion

It is important that the owners of underfloor heating systems appreciate that the running methods used by them can affect the stability of their timber floors. Wherever possible underfloor heating systems should be set at a 'comfortable' temperature and allowed to run constantly throughout the year; thermostatic control will mean that when it is not required during summer the heating will not run. Any temperature changes made should be in small increments so as to allow the floor to adjust to the changes.

If large or quick changes are made to the heating system temperature settings this potentially will have similarly large effects on the timber flooring.

Outside of these considerations timber floors with underfloor heating will react with other factors, such as changes in moisture content, in exactly the same manner as any other similar floor. Therefore information should be provided so as to make the floor owner aware of the potential effects of humidity, poor maintenance, etc in the normal way.