

PARQUET AND FLOORING INSTALLATION ON COOLED SUBFLOOR CONSTRUCTIONS

COOLED SUBFLOOR CONSTRUCTIONS

Subfloor heating systems rank among the standard in new building sites, especially in private residential construction. Even in modernisation or renovation of old commercial buildings and industrial buildings, subfloor heating systems are being installed more and more frequently. Among other things thinner constructions of subfloor heating systems were influential in that matter. Also concrete core activation with pipes directly in the concrete core is more common as before. For example in Germany, Austria and Switzerland it is estimated that over 25 million square meters of subfloor heating systems are installed. The proportion of hydraulic systems is about 90%. According to further estimates, 80% are able to provide a cooling function in addition to the heating function. However, the exact proportion of systems used for cooling is not known.

NOTICE OBLIGATION

The floor installer must be informed whether surface cooling is taking place via the subfloor/floor. The contracting authority (customer) has the notice obligation to hand out all information. As well as the floor installer has notice obligation about possible risks and specialities in combination of floor coverings/wooden floors and cooling subfloor constructions. Note that the installer should solely point out information and not take over any planning.

COOLING SUBFLOOR CONSTRUCTIONS – PROS AND CONS

Cooling down room temperatures by subfloor constructions in combination with suitable floor coverings is possible. According to experts it is better to speak of "tempering" and not "cooling" in this context.

Due to the lower density of warm air compared to cold air, warm air rises while cold air descends. So air conditioning by higher areas like walls or the ceiling should be preferred. The circulation of the air, due to that effect, supports a steady tempering of the room.

Only small low temperature differences could be realized by cooled subfloor systems because of possible damages of the floor construction by big temperature differences, e.g. by formation of dew.

REQUIREMENTS FOR COOLING SUBFLOOR CONSTRUCTIONS

1. *The distance between the pipes must be chosen as small as possible. If the distance between the pipes is too large, the temperature between the pipes is too high so that the cooling performance is generally lower.*
2. *The water temperature rises while passing through the pipes so that effective air conditioning can only be achieved by shorter cooling circuits or by raising the pump speed. Raising the pump speed effects economic and ecologic disadvantages so that efficiency should be increased by short cooling circulation lengths.*
3. *Efficiency could also be raised by choosing wider pipe diameters. The pressure loss is lower with wider pipe diameters with the effect that the faster flow velocity is possible by keeping the pump capacity steady.*
4. *Floor coverings with a good conductivity ensure faster and more efficient cooling. Therefore the thermal conducting resistance of floor coverings should be limited to a maximum of $R = 0,15 \text{ m}^2 \text{ K/W}$.*
5. *To speed up regulation of the temperature, the pipe covering should be chosen as low as technically feasible.*
6. *All valid standards and technical rules must be followed.*

WHAT ARE THE RISKS OF INCORRECT USE?

There are different risks that could result in irreversible damages to the subfloor, floor coverings and as well to the installation materials. Most damages are caused by humidity due to large temperature differences. Reducing the temperature effects a higher relative humidity because of less water absorption and water storage capacity of cold air in relation to warm air. By the effect that cool air has a higher density than warm air, the cold air can't rise and a microclimate could arise above the floor. Hygrometers set up at the usual height therefore only offer a deceptive level of safety. In the worst case, dew moisture occurs above or below the upper edge of the finished floor, which can cause long term damage. The risk damages caused by humidity also exists by forming of dew moisture around the pipes by condensation due to very low temperatures. This favors, in addition to the subsequent moistening of the substrate and the resulting moisture damage, the so called secondary ettringite formation" in cementitious mortar systems. Long chained ettringite molecules are formed by a chemical reaction of the dew humidity and the concrete which can cause damages of the structure of the cementitious mortar system like weakening the screed/concrete or "blowing it up" due to volume increase.

TECHNICAL DATA SHEET

THE TEN COMMANDMENTS FOR WOODEN FLOORS ON COOLED SUBFLOOR SYSTEMS?

A German Expert, Prof. Dr. Andres Rapp, defined the so called "Ten Commandments" in the year 2012 to prevent damages by cooled subfloor systems. Also today these "Ten Commandments" form the basic requirement for the use of cooled subfloor systems in combination with wooden floors as well with resilient and textile floors.

1. *Air conditioning by subfloors should not take place below a room temperature of 26°C.*
2. *The subfloor cooling system should not run more than 21 days a year.
Cooling periods by floor for longer than 2 consecutive weeks have to be avoided. Each one or two weeks of continuously cooling by the floor, have to be followed by at least two weeks of not cooling by the floor. The use of separate air conditioners with dehumidifier is needed if a longer cooling period is unavoidable.*
3. *The cooling must be operated in such a way that a relative humidity directly at the cooled floor surface of 75 % is not exceeded under any circumstances, i.e. not even for a short time. This can be taken for granted if the temperature difference of the air and the floor surface is less than 4 kelvin.*
4. *In common use, the floor temperature shouldn't be less than 2 - 3 kelvin than the room temperature while a cooling phase of max. 2 weeks.*
5. *Monitoring you can monitor the Commandments 3 and 4 with an IR-thermometer by comparing the floor temperature and the temperature of for example a wooden table or wood cabinet in the same room. The measured difference must never be more than 4 Kelvin and should not be more than 2 - 3 Kelvin.*
6. *Monitoring the temperature and humidity with an acoustic warning data logger installed underneath the floor covering is recommended and provides security.*
7. *The temperatures while heating by the subfloor should be as low as possible regardless the type of floor coverings or screed. To prevent too high temperatures in individual areas, the heating must take place in all possible areas and all heating circuits must be used. A maximum of 30% of the floor surface is allowed to be covered with carpets or furniture with low distance to the subfloor.*
8. *Air humidifiers must be used in winter if the relative humidity is lower than 30% for more than 1 week. Further it is gener-*

ally necessary to keep the relative humidity in winter above 40% by air humidifiers.

9. *A hygrometer is recommended for checking humidity and helping to create a healthy room climate.*
10. *Independently of the points mentioned above, the care instruction of the floor must be observed and the floor must be used as intended.*

CONCLUSION

Considering the „ten commandments“ all kind of floor coverings including wooden floors could be full surface glued on cooling subfloor systems. A proper setting and regulation of the cooling system, installation according to valid instructions recommendations and national standards must be adhered to. Also monitoring while running and the combination of identifying and evaluating the values "temperature", "relative humidity" and the "humidity of the wood" are to be considered. Therefore a "wood humidity calculator" as on the website www.faktum.eu is helpful. Because of the matter that cooled subfloor systems are special constructions, the installer as the customer need to fulfil their notice obligations.

The use of a damp proof membrane like for example STAUF VEP 195 or STAUF WEP 180 is not mandatory but helps preventing damages by humidity caused by later moistening like previously described. The use of compatible STAUF system components like levelling compounds, adhesives or the surface treatment products from the AKZENT program in combination with the damp proof membrane and the 10 commandments will secure a long lasting floor.

The information provided above corresponds to the current state of the art. The information is purely indicative and non-binding, since we have no control over the installation process and because the actual installation conditions on site vary. Thus no claims can be made based on this information. The same is true for the commercial and technical advisory services that are provided without obligation and free of charge. We therefore recommend carrying out sufficient testing of your own in order to determine whether the result is suitable for the intended purpose. V29082019