

THE USE OF FLOOR HEATING WITH PRE-FINISHED PARQUET FLOORINGS

1. INTRODUCTION. Challenges of using floor heating with wooden floorings

The combined demand for energy saving and higher comfort has powered the rapid spread of floor heating. However, this new application aspect has brought along a number of problems specifically related to the parqueting of heated floors. Apart from general requirements to be met during installation of conventional floorings, further conditions need to be taken into account when laying the parquet floor on a surface with pre-installed floor heating. These conditions differ from those valid for conventional installation methods and materials.

2. Requirements related to joint application of floor heating and parquet floorings

The following summary provides an overview of engineering, installation and operating rules and instructions for laying parquet on heated surfaces. These instructions essentially apply to Hungarian-produced hot water heating systems with plastic piping installed in a poured concrete base. Requirements to the application of floor heating with wooden floorings can be grouped into three major categories:

- **engineering**
- **installation**
- **operation.**

2.1. Engineering requirements towards wooden floorings installed on heated sub-floors

- a) An important fact to consider during engineering is that wooden parquet basically functions as thermal insulator. Therefore, product thickness exceeding 15 mm as well as the use of soft broadleaf wood and pine wood having low heat insulating capacity should be avoided. The best choice of product for use with floor heating is ready-to-install (pre-finished) parquet. Tongue-and-groove parquet and mosaic parquet should not be excluded either, although their installation requires great care and expertise.

- b) No insulating foil or felt underlay (a compulsory insert between the concrete base and the floor in conventional installations) should be used when laying the parquet onto heated floors.
- c) All employed supplementary materials should be tolerant of the operating temperature of the heating pipes and resistant to ageing.
- d) The distance between the heating pipes should not exceed 150 mm in order to ensure optimal temperature distribution on the parquet floor surface.
- e) The piping should cover the entire floor area of the premises, even if this is not justified by the actual heating demand.
- f) As heat loss of the floor surface is limited, the premises may need to be (additionally) insulated. The resulting insulation efficiency must match the minimal thermal control requirements applied to newly constructed buildings.
- g) The heating should be designed in such a way that the operating temperature of the water does not exceed 50°C even on very cold days.
- h) The surface temperature of the parquet floor (sole temperature) shall not under any circumstances exceed 27°C (physiological threshold).
- i) The height of the concrete base layer above the heating pipes shall be at least 45 mm. The recommended layer thickness is 60 mm.

2.2. Installation instructions

- a) The moisture content of the installed parquet floor shall not exceed 7–8%, otherwise cracks can appear as the wood dries up.
- b) Numerous problems can result from installation of the parquet flooring on a wet concrete base. The appropriate moisture content of the screed, as indicated in related publications, shall not exceed 1,8%.

- c) Do not start the heat-up before screeding has been completed and the concrete has fully set. Heating up shall be carried out according to the enclosed instructions at a temperature of at least 50°C or at the highest allowed temperature specified by the designer. After switching on the heating system the temperature of the heating water can be gradually raised by 10°C per day.
- d) The heat bridge between the concrete base and the parquet floor can be efficiently reduced by gluing. A solvent type polyurethane adhesive shall be used for the purpose. After gluing, leave the adhesive to harden for the time indicated in the manufacturer's instructions. As the heat bridge is usually small, it is recommended to apply a layer of self-leveling mix on the suitably dry screed surface. Upon drying up it provides a very smooth surface with an excellent heat transfer capacity.
- e) An expansion gap shall be left between the wall and the border of the screed layer, the wall and the parquet floor and – for premises larger than 50 m² – in the middle.

2.3. Operating instructions

- a) Relative air humidity in the premises with wooden parquet installed on top of a heated floor shall not go below 50%. Lower moisture levels should be compensated.
- b) Both the heating up and the cooling down should be carried out gradually to prevent temperature stress. The standard 5-day turnaround shall be maintained in all cases.
- c) A temperature switch shall be used to control the flow temperature of the heating water and prevent it from exceeding the set limit values.
- d) Avoid applying excessive moisture to the parquet floor during wet cleaning, as these systems are extremely sensitive to any change of moisture content.

3. Conclusions and recommendations

The floor heating equipment and the flooring constitute an integrated module and should be treated as such. A change implemented in one part of the module inevitably affects the

other component as well. This circumstance should be very carefully considered during both engineering and installation.

The floor heating and the wooden floor can coexist within one system. However, both the designer and the installation personnel should keep in mind that the element to show on the surface of the module is the parquet. Laying the parquet floor within such an application requires special expertise and should only be performed by qualified personnel.

The heated floors can be topped with pre-finished wooden parquet. The heat irradiated by the screed layer will not harm the wooden covering. Observations have revealed no parquet damage on locations where the instructions were closely followed.

Beech and *maple* finished floors are not recommended for joint application with floor heating due to a higher degree of swelling and shrinking typical of these materials.

4. Installation of the floor heating system

Taking measurements and keeping records of the obtained data, making use of the information below and precise fulfillment of the instructions contribute to the precise and safe implementation of the project.

Customer:

Location:

Thickness of the concrete layer: mm

Completion date of the concrete work: day month year

Heat-up starting date upon concrete setting: day month year

Heating up procedure:

- Day 1:** heating up at water temperature +20°C
- Day 2:** heating up at water temperature +30°C
- Day 3:** heating up at water temperature +40°C
- Day 4:** heating up at water temperature +50° (or the highest temperature allowed by the system designer)
- Days 5–15:** heating at the highest allowed temperature, 24 hours a day
- Day 16:** reducing the heating temperature to +40°C
- Day 17:** reducing the heating temperature to +30°C
- Day 18:** reducing the heating temperature to +20°C
- Day 19:** moisture control (1.8% for concrete base, carbide (CM) test)

Moisture control procedure according to the carbide (CM) method shall be carried out by the parquet installation specialist. Depending on the size of the floor area, the designer will indicate the sampling points for running the carbide test.

For systems with heating pipes built inside the concrete layer, a 5 days' break should be allowed upon completion of the cooling period. After that the heat-up procedure should be

repeated. The second heating/cooling cycle shall take place as described for Days 1–4 and 16–18.

Parquet installation can start after the appropriate working conditions have been reached. These imply concrete temperature 18°C (matching the heating water temperature 25°C) and indoor air humidity below 65%.

If the measured concrete moisture is not satisfactory, heating should be continued at water temperature 40°C, and repeated measurements shall be taken to check whether the concrete moisture has reached the desired level.

In the case the break between the end date of the cooling period and the starting date of the parquet installation exceeds 7 days, heating at water temperature 40°C should be repeated for at least 2 more days and followed by another moisture test. The premises should be briefly ventilated at regular periods throughout the heating/cooling cycle

During the drying period the concrete floor shall be kept free of building materials or any other stuff that may cover the surface.

The described procedure applies to concrete layer max. 80 mm thick.

The above described drying procedure is based on the minimal turnaround sufficient for reaching the concrete moisture level able to ensure safe parquet installation. Any extension of the drying period will improve the quality of the sub-floor and hence the product safety.

In floor heating applications the highest allowed temperature of the parquet surface is 27°C. Higher temperature values will severely damage the top hardwood layer.

Throughout the heating season special efforts shall be devoted to maintaining adequate air humidity in the premises where genuine wood parquet has been installed. Various kinds of humidifiers are available for this purpose. Air humidity levels below 50% will lead to excessive drying of the wood. As a result, gaps can appear between the parquet sheets and lamella. In extreme cases detachment of individual pieces can occur. Low indoor air humidity can also compromise the healthy residential/office environment.