Thickness board (15+6)

Installation options for installing Cathedral oak flooring on underfloor heating. There are various methods of installing Cathedral Floors over underfloor heating systems to take into account the type of heat source, expected operating temperatures and type of floor covering the build-up.

When installed over underfloor heating Cathedral flooring must be fully bonded to a suitable substrate because it works as a lateral tie to bond the individual boards together and in the case of floating floors reduces rotational movement at board joints to decrease movement and undulation when walked on.

The substrate ensures a greater area of the bond to a subfloor by joining the boards together. The risk of separation from the screed is far greater for individual boards bonded to the screed. By bonding the boards to a sheet substrate and bonding the substrate down the risk of release is massively reduced by the larger overall contact area. In many cases where floors release from the screed it is found that the adhesive has not failed but the screed has separated from itself. Trying to take up individual boards to relay is very difficult. Normally as the problem boards are taken up other boards are loosened and you find yourself chasing your tail. The chance of a board 1200 x 2400 releasing is very slim but if it did the floor would still serve as a mass diaphragm-floating floor.

The substrate helps to disburse heat more evenly onto the floorboards and elevates hotspots, eliminates the possibility of convected air between joints which could lead to floor failure over time and acts to support header/butt joints of floorboards laid over joist, so there is no need to cut boards back to joist for support of header joints.

The substrate in length should be laid with staggered joints at 90º to the length of the Cathedral plank for the best lateral stability. This may, however, be impractical over joists.

The following options include relative calculations of output and energy efficiency.

Carpets and underfloor heating

The maximum tog value of a carpet to be laid over underfloor heating is 2.5 tog (0.25 w/m2k).

In a timber floor system R = 0.00 includes a layer of 18 mm chipboard and then the 2.5 tog carpet is allowed as an overlay. The total resistance of the carpet at 2.5 togs and the chipboard at 1.05 tog is 3.55 tog (0.355 w/m2k).

<u>Fitting over UFH in screed</u>

Option A:

6mm plywood bonded to screed with polyurethane adhesive. Cathedral 21 mm plank fully bonded to the plywood with D3 moisture resistant PVA. PVA is also required along the top of the tongues. Total resistance = 0.1588 W/m2k. 1.58 tog

Option B:

9mm plywood bonded to screed with polyurethane adhesive. Cathedral 21 mm plank fully bonded to the plywood with D3 moisture resistant PVA. PVA is also required along the top of the tongues. Total resistance = 0.1764W/m2k. 1.76 tog

Option C:

12mm plywood bonded to screed with polyurethane adhesive. Cathedral 21 mm plank fully bonded to the plywood with D3 moisture resistant PVA. PVA is also required along the top of the tongues. Total resistance = 0.1941 W/m2k. 1.94 tog

Option D:

15mm plywood bonded to screed with polyurethane adhesive. Cathedral 21 mm plank fully bonded to the plywood with D3 moisture resistant PVA. PVA is also required along the top of the tongues. Total resistance = 0.2117 W/m2k. 2.11 tog

Option E:

18mm plywood or chipboard bonded to screed with polyurethane adhesive. Cathedral 21 mm plank fully bonded to the plywood or chipboard with D3 moisture resistant PVA. PVA is also required along the top of the tongues. Total resistance = 0.2294W/m2k. 2.29 tog

Option F:

Fitting over UFH in batten or joisted floor Choose your substrate, 12mm plywood, 18 mm chipboard etc. The substrate and the Cathedral plank in length should be laid at 90º to the joist. The substrate should be laid with staggered joints. Screw the substrate to the batten/joist making sure that all joints are structurally supported and then fully bond the Cathedral floor to the substrate using PVA to bond wood to wood and Polyurethane to bond wood to Fermacell. Do not use liquid batten system. PVA is also required along the top of the tongues.

Option G:

Fitted over floated system UFH The substrate should be laid with staggered joints floated 90º to the desired direction of the Cathedral flooring. Float the substrate over the UFH and then fully bond the Cathedral floor to the substrate using PVA to bond wood to wood and Polyurethane to bond wood to Fermacell. Do not use liquid batten system.

Specification and design-Hardwood flooring

Underfloor heating systems need to be well thought out in advance. Common mistakes at the design stage cannot always be rectified and can lead to substantial embarrassment and cost. If you are uncertain about any elements of underfloor heating or Hardwood flooring we are only a phone call away. The heating design will leave certain areas of the floor without heating such as under kitchen units, walk-in larder, baths, showers, toilet pans, pedestals and under stairs cupboards. Bear in mind when redesigning after the heating has been installed that you may be having heating where it is not suitable and cold spots where floor space is exposed but not heated.

Existing buildings may need a review and most certainly upgrade of their current insulation to reduce heat loss on which calculations of output for the heating system will depend. In areas such as hallways and corridors where multiple heating circuits are on route to their destinations, it is necessary to insulate some of the heating pipes to reduce uneven heat build-up where the heat source is gathered. This is particularly required by the manifolds. This will ensure that all areas of the floor produce an even output which intern produces more even expansion and contraction rates of the Cathedral flooring reducing problems that might otherwise occur.

BS EN1624 guideline figures for maximum floor temperatures are occupied areas 29ºc, peripheral areas 35ºc and bathroom or similar 33ºc. Cathedral flooring has been tested 100% positive to withstand a variance of combined temperature in the same floor area exceeding the parameters of these figures. When fitted to our guidelines Cathedral flooring will withstand fluctuating moisture contents of 6.5% to 11%.

When installed over any type of underfloor heating system it is critical that Cathedral flooring is bonded to a suitable substrate sheet. The purpose of the substrate is to strap the individual boards together for greater lateral stability and eliminate possible rotational force on individual boards.

This sheet also helps to disburse heat more evenly to the hardwood floor reducing hotspots and also eliminates any air from venting up between individual boards. The bond of the sheet material to the screed is

much less likely to fail than individual boards but if it did the floor would still survive as a floating diaphragm. Many a time we have surveyed floor failure where the adhesive has kept its bond to the screed but the screed surface has failed. Trying to take up individual boards and re-bonding can be a nightmare as adjacent boards come loose in the process and you end up chasing your tail. We do not recommend bonding (CF) direct to screed even when UFH is not present.

Cathedral flooring 21mm 15 + 6 can be laid as a floating floor without a substrate only when UFH is not present. Cathedral flooring 21mm 15 + 6 must not be laid as a floating floor over underfloor heating unless it is bonded to a suitable substrate which is floated or fixed down. The combined Cathedral flooring bonded to a wood substrate can be floated over UFH but the best option is a fixed down system. Until tests have been approved we do not advise to float Cathedral Flooring bonded to Fermacell over UFH “Dated 1.3.2002” Please check with the supplier.

If the UFH design uses metal diffuser plates these must be in full contact with the overlaid floor for best efficiency. The best methods of using these plates are for them to be set in grooved ridged insulation. This helps to prevent them from being damaged when walked on and ensures they are in contact with the underside or the floor covering. Some less expensive UFH designs have a standard off the shelf insulation on which the pans rest. This leaves an air void under the plates, which we would not recommend. 25mm quilt insulation between the pans and the rigid insulation would help to eliminate some of this and support the pans to ensure they are in contact with the floor.

Another less expensive method of using plates is to nail then to joist or batten with Rockwool slab or quilt beneath. Again air voids are present, not good. Often on-site these plates get trod down and replacing them is not simple once the pipe has been laid. The result will be poor heat transfer, inefficient heating. A suitable underlay compatible with UFH can be installed between the plates and underside of the wood flooring to eliminate the possible sound of the plates creaking against the flooring. UFH works best when all air gaps are eliminated and heat transfer is by direct conduction.

Air gaps present in a design rely on higher operating temperatures and only create low floor output temperature. If the air gaps are not totally sealed the heat can be vented out of the floor into cavities etc taking away any possibility to warm the floor. If air is allowed to vent up and between floorboards, floor failure will surely follow owing to the severe uneven drying of the boards. Underfloor heating in screed is at most risk during the screeding process.

It is important that the screeders are supervised to make sure the pipework remains where it was positioned to ensure the correct even output. If the pipe gets bunched up or randomly placed after coming free from its fixings the heating design will suffer. Wheelbarrows with poorly inflated tyres are not to be used. Photos of the laid pipe should be taken prior to covering. These can be compared to an infrared image at a later date if a problem is found with the performance of the floor. Any leaks can also be pinpointed by an infrared image.

Beware if a pumped screed is to be used (not to be mistaken for a flow screed). The pipe will deliver a bucket full of screed on each pulse. When the pump pulses its sheer weight whips the pipe and can rip the heating pipe up in large sections. The screeders will not normally be too careful how they replace the pipe as long as it is covered. If they are made aware that is will be possible to see the placement of any disturbed pipe they will take more care.

An Anhydrite flow screed is the best option, incredibly fast to lay, faster drying and easy to level. This application is less likely to damage the pipework as long as the preparation work has been done to make sure the pipework does no float up.

After the heating system has been connected to the manifold the engineer will fill the system and prepare a pressure test to 6 bar. After confirmation that the installation is free of any leaks, he will reduce the pressure to 3 bar and leave the system under test to be monitored during screeding.

Thermostats should be wired to floor probes to ensure the floors do not overheat causing damage to floor coverings. It is advisable to specify that a second-floor probe is installed with each thermostat that can be wired in at a later date if the first probe fails. If the thermostats work on air temperature only the floor may be

trying to heat more than one zone. If a connecting room with the door open is at a lower temperature or if an external window or door is left open. The result will be overheating of the floor.

It is important that from the start of any project the relevant trades and professional are made aware underfloor heating is to be installed and the types of floor coverings intended. Details of intersecting floor coverings finished floor levels and expansion provision need to be taken into account.

Site supervision and scheduling of works will play an important factor in the safe care and usage of the heating system, protection and performance of the floor coverings. Instruction on the correct use of the heating system should be passed on to the end-user.

Scheduling the fitting of hardwood floors

It is essential that the heating system is covered either temporary or permanently as soon as possible for its protection. The hardwood flooring should be scheduled as a finishing trade as close as possible to the end of the project. If the floor is installed too soon it will be at risk from high moisture levels as well as damage by working practices of various trades. The traditional screed should be allowed 28 days and an anhydrite screed 21 days natural curing before heat is applied to assist drying.

Moisture tests can only be carried out on a cold screed, so time needs to be allowed for cooling and testing with the expectation that the heating and testing sequence will need to be done again. In practice, it is fairly common that this is often left to the last minute when the Hardwood flooring installers arrive and the Architect is required to sign a disclaimer because the schedule is running out of time. The correct test is a surface hygrometer test to be carried out prior to the installer date.

The maximum (ERH) equilibrium relative humidity as specified by British Standards is 75%. The heating needs to be commissioned and working for at least 14 days prior to the installation of the wood floor. Thermostats need to be programmed at a temperature high enough to make sure that the floor is warm 24 – 7 and prevision of constant ventilation is required to prevent excess humidity in the building.

Concrete Base

It may be that the heating system and the hardwood floor are to be installed as a fully dry floated system straight over the top of the concrete base. It is important that this information is made clear to ensure that the concrete is put in flat and level. Normally the concrete is covered with screed and therefore the workman is not too particular with level and flatness because they expect the screed to give a finish floor level and not their concrete. A floated flooring system can only be laid parallel to the base it is laid over.

Calculations

Calculations should be obtained to access the room temperatures that will be achievable based on the type of heating installation combined with the chosen method of installing Cathedral plank flooring.

As a precaution to protect the hardwood floor the heating system should be thermostatically controlled in all zones regulated by floor sensors so that the maximum permitted floor surface temperature is not exceeded. The industry standard is 27ºc, (CF) is 30ºc.

BS EN1624 guideline figures for maximum floor temperatures are occupied areas 29ºc, peripheral areas 35ºc and bathroom or similar 33ºc. These temperatures would achieve an ambient air temperature of about 23ºc that would be far too uncomfortable for most people.

Suitable Substrate for Cathedral Oak Plank flooring

When installed over any type of Underfloor heating system it is critical that Cathedral flooring (CF) is bonded to a suitable substrate.

We do not recommend bonding (CF) direct to screed.

If the UFH system uses metal diffuser plates these must be in full contact with the overlaid floor for best efficiency.

A suitable underlay compatible with UFH should be installed between the plates and underside of the wood flooring to eliminate the possible sound of the plates creaking against the flooring.

Air gaps

We do not recommend using a UFH system that incorporates an air gap in its design in conjunction with (CF).

UFH works best when all air gaps are eliminated and heat transfer is by direct conduction. Air gaps present in a design rely on higher operating temperatures and only create low floor output temperature. If the air gaps are not totally sealed the heat can be vented out of the floor into cavities etc taking away any possibility to warm the floor. If air is allowed to vent up and between floorboards, floor failure will surely follow owing to the severe uneven drying of the boards. We have surveyed installations where this advice has been ignored and the heating systems were found to be totally inefficient causing the requirement for secondary heating systems to be installed.

Floating Floors

Cathedral Flooring 21mm 15+6 floors can be laid as a floating floor without a substrate only when UFH is not present. They must not be installed as floating without firstly being bonded to a suitable substrate, and the only form a structural floor once bonded to a substrate. Cathedral Flooring can be laid as a floating floor without a substrate only when UFH is not present. The combined Cathedral floor bonded to a wood substrate can be floated on Underfloor heating but the best option is a totally fixed down system. UFH works best when all air gaps are eliminated and heat transfer is by direct conduction.

Moisture conditions

Moisture tests can only be carried out on a cold screed. The correct test is a surface hygrometer test to be carried out prior to the installer date.

The maximum (ERH) equilibrium relative humidity as specified by British Standards is 75%. The heating needs to be commissioned and working for at least 14 days prior to the installation of the wood floor. Thermostats need to be programmed at a temperature high enough to make sure that the floor is warm 24 – 7 and prevision of constant ventilation is required to prevent excess humidity in the building.

Wood floor thickness and heat resistance over UFH The maximum resistance floor covering with a boiler feed system is 2.5 tog – 0.25 W/m2k. The lower resistance the better the performance and energy efficiency of the heating system. At this higher limit, the operating temperature of the floor needs to be as high as 55ºc.

With ground source or air to water heat exchangers, the highest operating temperatures achievable are 41ºc at a push. This means that the resistance of the floor covering needs to be kept to a minimum. Fermacell (Gypsum fiberboard) is the desired substrate to be used in this situation due to its low resistance. (There are on-site difficulties with the use of `Fermacell due to the fact that it can not be walked on unless fully supported, so over joist etc crawl boards will be required).

In the event that CF needs to be raised above a screed to obtain corrected levels, Fermacell may be the only product suitable to build up in layers, as a substrate to minimise the resistance calculations. Fermacell has the advantage of being laid at a thickness of 205.5% more than wood. The resistance of 20 mm of wood is equivalent to 41.1 mm of Fermacell.

On-site protection of hardwood flooring.

The hardwood flooring should be installed as close as practicable to the end of a project.

The hardwood floor should be protected after installation from moisture conditions and working practices. It is best to use good supervision and temporary covering in working areas. Clean dustsheets and hardboard should be used carefully and then cleared between jobs to expose the floor. This will encourage respect of the floor and highlight any damage as well as the persons responsible.

Selected persons who are aware of safe operating temperatures and procedures for the hardwood floor should be the only ones authorised to adjust settings.

Permanent boarded covering may cause condensation and damage the floor. Any dust, grit fixings etc that may find their way under the boarding will go unnoticed until close to hand over and could cause severe damage.

Expansion

As with all wood flooring, provision for expansion should be allowed. The expansion should also be considered in the screed especially when UFH is present. Because timber expands at a far greater rate across the grain rather than in the length it is good practice to lay the floor in the longest direction of the room. It also looks better this way. An expansion gap must be maintained around the perimeter of each room – doorways – any abutted hard surface – obstructions passing through the floor such as radiator pipes.

The intersection of hardwood floors and stone

Expansion is required here. This can be achieved by keeping the wood surface 7mm above the stone and rebating it to overall the stone with an expansion gap out of sight. Many designers and Architects want the stone and wood on one level which requires the expansion joint to be visible and the use of a third material to fill the gap.

This often looks unsightly, especially after time.