Preparing for Installation

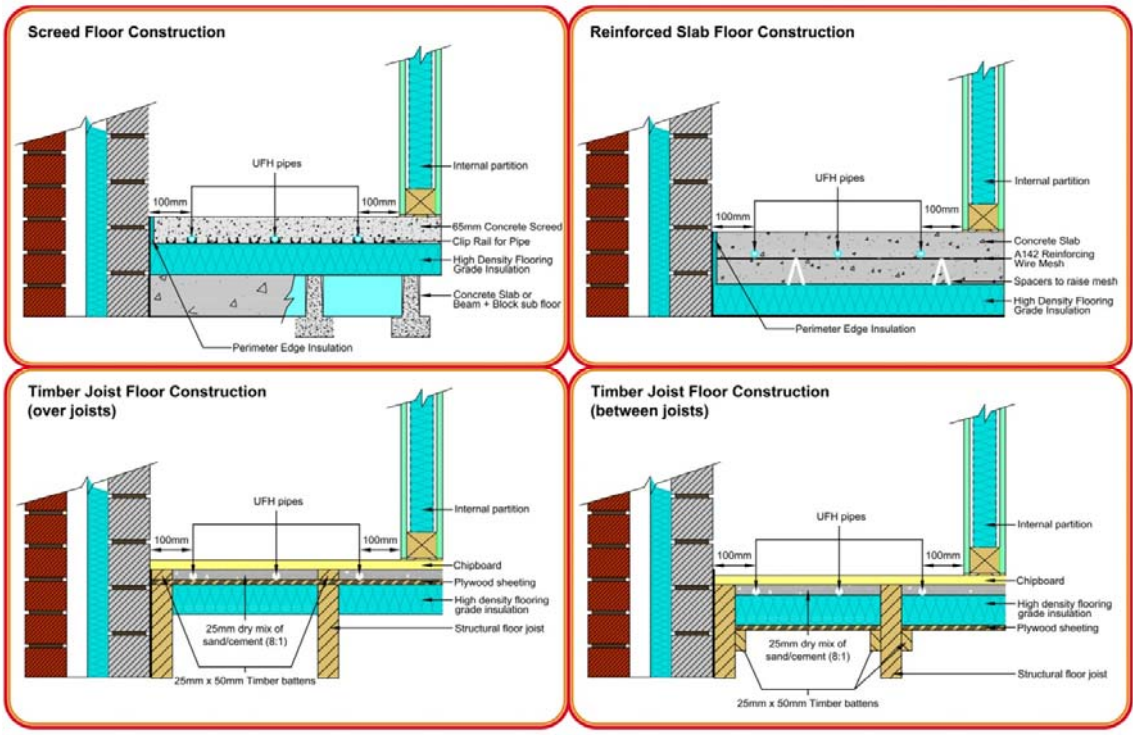
Prior to installing any pipework it is important to prepare the floor and general area for installation, by taking the following steps you will ensure that the pipes are laid as closely to the AutoCAD layout as possible with minimal difficulty.

First ensure that all floor areas that pipe will be installed on is free from any potentially damaging debris.

Next it is advisable to mark out any sections of floor which are to be avoided whilst laying pipework i.e. kitchen units, sanitary wear, partition walls. This can be done with the use of a self-adhesive tape or line-marking spray paint. If fixing rails are being used, loose lay throughout the whole floor area to ensure you are using the correct amount in each area. Remember to leave a 100mm gap from all walls/partitions to minimize the risk of any them being damaged by any joinery/building work.

Optimum strongly recommends that internal stud partitions are bonded to the screed using a suitable adhesive and not fixed by drilling into the floor

Once the floor area has been marked out appropriately, the underfloor heating manifold(s) should be secured into position as per the AutoCAD drawing. The manifold should be fitted flush against the wall, leaving 700mm clearance from the top manifold block to what will be the finished floor level. If your manifold has been pre-assembled and mounted on a board ensure that it is fitted so the bottom of the mounting board is 20mm above what will be the final floor height. In the event that the wall/partition has not yet been built, the manifold board should be secured to a temporary frame until such time a wall is built. This is important as it ensures that pipe can be connected to the manifold as it is installed and then filled and pressure tested.

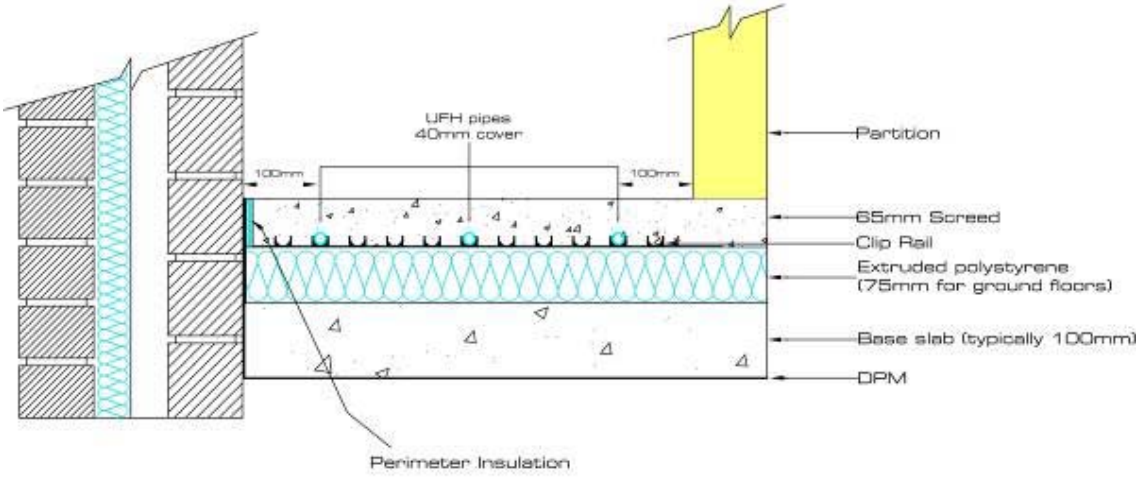


Installing Pipe – Screed

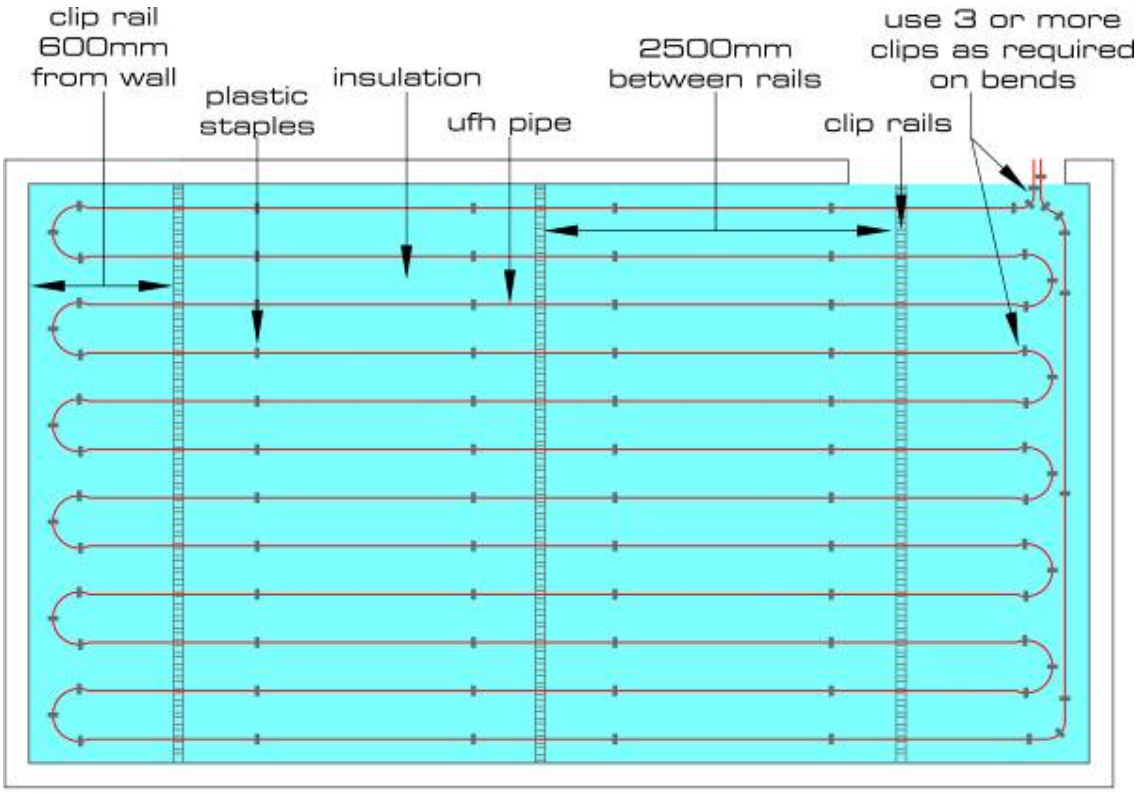
Tools Required:

Pipe Uncoiler
Staple Gun
Ratchet Pipe Cutters
Spray-Paint/Self-Adhesive Tape

In a screed floor construction, self-adhesive fixing rails and plastic tacker clips (40mm or 60mm depending on the depth of insulation) are used. It is recommended that an extruded polystyrene insulation is used when fixing the underfloor heating pipes directly to the insulation as it provides much better grip for the tacker clips compared to extruded polyurethane or expanded type insulations.



When fixing rails are being used it is helpful to loos lay these out first to ensure you have enough for the whole floor area. See diagram below-



It is important to remember to leave a 100mm gap from all walls/partitions to minimize the risk of any them being damaged by any joinery/building work. Optimum always recommends that internal stud partitions are bonded to the screed as opposed to drilling and fixing.

Typically, fixings rails are laid in strips the width of the room at approximately 2.5m intervals. It is best to start and finish laying rails 600mm from the wall to allow space for pipe 'loop-ends'. Fixing rails are supplied in 1 metre lengths with male and female connections on alternate ends to allow them to be connected in rows.

Once the rails have been laid you are now ready to install pipe as per the CAD pipe layout drawing . To do this you will need to load the tacker gun with tacker clips, make sure not to remove the backing tape as this helps to prevent any tacker clips becoming jammed in the gun.

Start from one end of the manifold and either work left or right. This ensures you don't end up crossing the pipe. Refer to "connecting the pipe to the manifold"

Start by treading the pipe into the fixing rail clip points and use the tacker clips to secure the pipe runs between rails. All installations are different but as a rough guide expect to use approximately 2 tacker clips per metre for straight runs of pipe and 4 for tight bends. Usually it is easiest to work the pipe with the uncoiler positioned away from the circuit you are installing. If you also try to keep the pipe behind your body it prevents it from trying to coil itself up again.

When forming 'loop-ends', special care should be taken to avoid kinking the pipe. Pipe loops shouldn't be any tighter than 100mm and should be a 'bulb' shape. In the instance that a kink begins to form but does not fully crease then the pipe may in some cases be returned to its original shape by submerging it in 80˚C+ water or by using a thermostatically controlled heat gun to bring the tubing back to its original shape. Failing this, the section of pipe should be cut out and a repair coupling should be installed (available from Optimum UFH Ltd.).

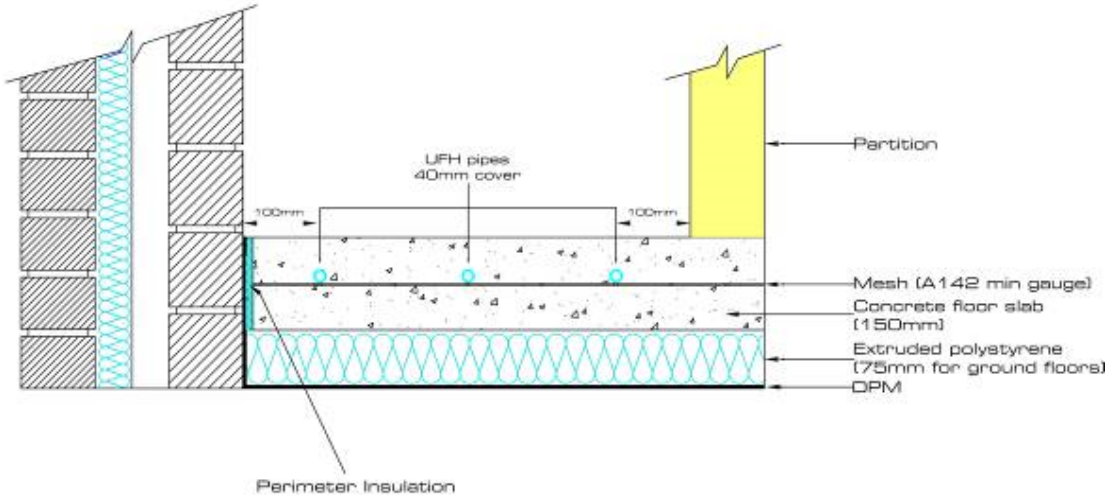
Note: If a self-levelling pouring screed is being used the floor has to be prepared for this specific type of screed and extra fixings will need to be used.

Installing Pipe – Structural Slab

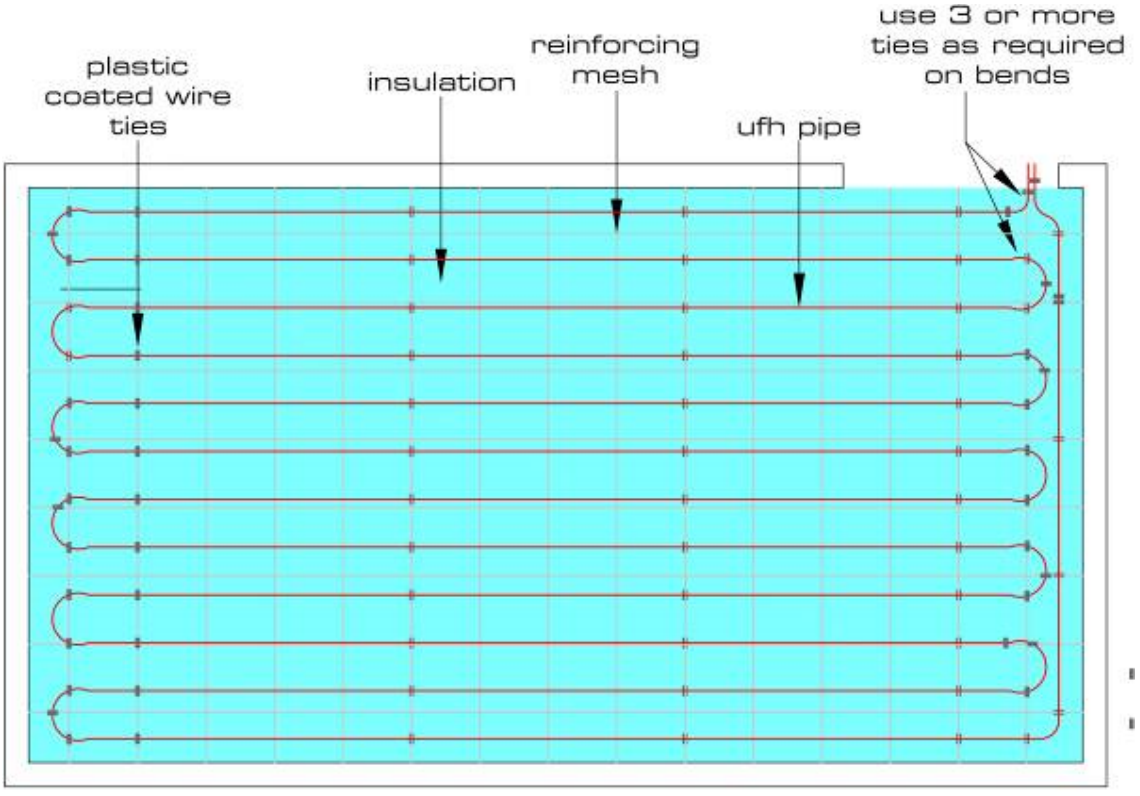
Tools Required:

Pipe Uncoiler
Tie-wire Puller or Rebar Gun
Ratchet Pipe Cutters
Protective Gloves
Spray-Paint

In a structural slab floor construction, rubber coated tie wires are used to fix the underfloor heating pipes to a steel mesh which is then raised to sit in the middle of the finished slab ensuring that there is a minimum of 40mm coverage over the pipes.



Prior to installing any underfloor heating circuits all steel mesh sections should be tightly secured to each other to prevent any unwanted movement.



Installation should be carried out before the mesh is raised, spray-paint can be used to mark out the pipe layout. It is important to remember to leave a 100mm gap from all walls and pipe to minimize the risk of any them being damaged by any joinery/building work.

Once you have marked out the floor, connect the first coil of pipe as per previous instruction sheet. Usually it is easiest to work the pipe with the uncoiler positioned a few metres away from the circuit you are installing. If you also try to keep the pipe behind your body it prevents it from trying to coil itself up again.

To fasten down a section of pipe loop one end of the tie wire underneath the mesh and around the pipe so that both 'lugs' are together directly above the pipe. Next hook the end of the tie-wire puller through these 'lugs' and pull the handle to twist the two wires together tightly. Once the tie-wire is fastened push it down to the side to prevent it from appearing above the finished slab level.

All installations are different but as a rough guide expect to use approximately 2 tie wires per metre for straight runs of pipe and 4 for tight bends.

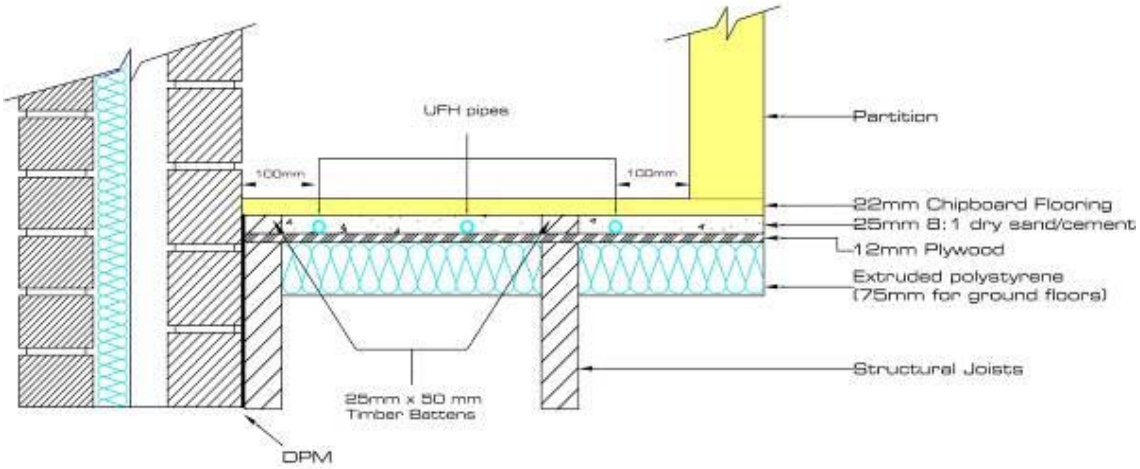
When forming 'loop-ends', special care should be taken to avoid kinking the pipe. Pipe loops shouldn't be any tighter than 100mm and should be a 'bulb' shape. In the instance that a kink begins to form but does not fully crease then the pipe may in some cases be returned to its original shape by submerging it in 80˚C+ water or by using a thermostatically controlled heat gun to bring the tubing back to its original shape. Failing this, the section of pipe should be cut out and a repair coupling should be installed (available from Optimum UFH Ltd.).

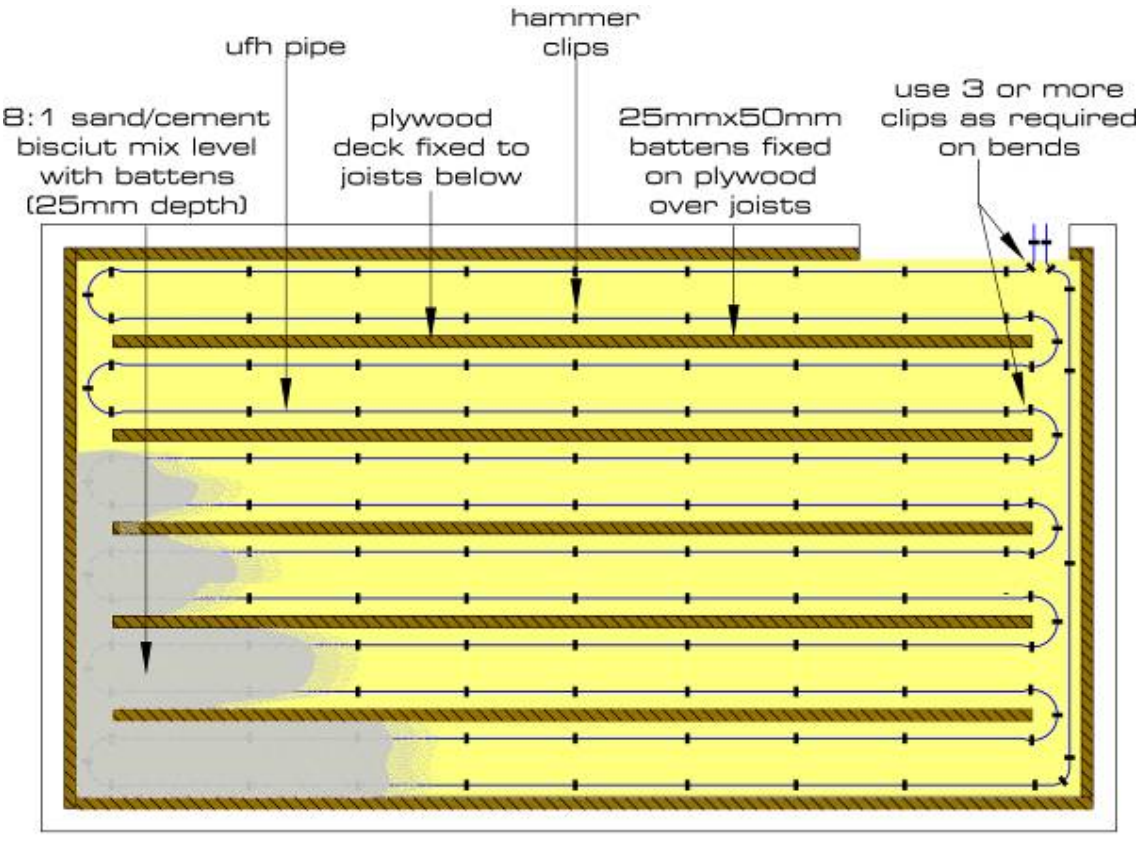
Installing Pipe – Timber Joist

Tools Required:

Pipe Uncoiler
Hammer
Ratchet Pipe Cutters
Spray-Paint/ Self Adhesive Tape

In a timber joist floor construction, 16mm hammer clips are used to fix the underfloor heating pipes to a plywood base. Once pressure tested this is then covered with a 25mm deep 8:1 sand & cement biscuit mix. Once all moisture has been removed from the biscuit mix the floor can then be topped with 22mm chipboard. It is vital to ensure that no air gap is left between the biscuit mix and chipboard as this will greatly reduce the performance of the heating system.





At the point of insulation and plywood being laid down you will then need to install the battens to which the chipboard will be secured. Please refer to the floor section that will have been provided. It is important that 25mm x 50mm battens are used to maintain the correct pipe clearances, for this reason, please do not to use 2” x 1” battens.

Before installing any pipework the pipe layouts should be marked out, either spray paint or self-adhesive tape can be used for this purpose. It is important to remember to leave a 100mm gap from all walls and pipe to minimize the risk of any them being damaged by any joinery/building work.

Once you have marked out the floor, connect the first coil of pipe as per previous instruction sheet. Usually it is easiest to work the pipe with the uncoiler positioned a few metres away from the circuit you are installing. If you also try to keep the pipe behind your body it prevents it from trying to coil itself up again.

To fix pipe to the plywood; position the pipe in line with your markings, push a hammer clip over the pipe and secure by driving the nail into the ply with a hammer. All installations are different but as a rough guide expect to use approximately 2 hammer clips per metre for straight runs of pipe and 4 for tight bends.

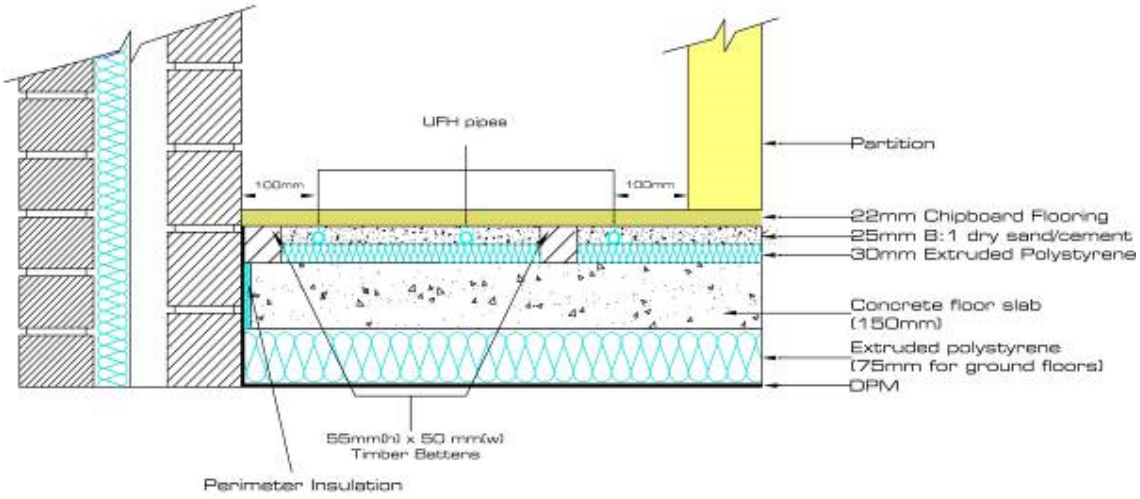
When forming ‘loop-ends’, special care should be taken to avoid kinking the pipe. Pipe loops shouldn’t be any tighter than 100mm and should be a ‘bulb’ shape. In the instance that a kink begins to form but does not fully crease then the pipe may in some cases be returned to its original shape by submerging it in 80˚C+ water or by using a thermostatically controlled heat gun to bring the tubing back to its original shape. Failing this, the section of pipe should be cut out and a repair coupling should be installed (available from Optimum UFH Ltd.).

Installing Pipe – Floating Floor

Tools Required:

Pipe Uncoiler
Staple Gun
Ratchet Pipe Cutters
Spray-Paint/Self-Adhesive Tape

In a floating floor construction a 150mm concrete slab is poured on top of which 50mm x 50mm battens are laid. The underfloor heating pipes are fixed onto 30mm deep extruded polystyrene insulation panels in between the battens by the use of self-adhesive fixing rails and 40mm plastic tacker clips. Once pressure tested this is then covered with a 25mm deep 8:1 sand & cement biscuit mix. Once all moisture has been removed from the biscuit mix the floor can then be topped with 22mm chipboard. It is vital to ensure that no air gap is left between the biscuit mix and chipboard as this will greatly reduce the performance of the heating system.



When fixing rails are being used it is helpful to lay these out first as the 50mm distance between the rails clip points provide a reference for measuring pipe spacings. The correct runs can then be marked out with spray-paint or self-adhesive tape. It is important to remember to leave a 100mm gap from all walls and pipe to minimize the risk of any them being damaged by any joinery/building work

Typically, fixings rails are laid in strips the width of the room at approximately 2.5m intervals. It is best to start and finish laying rails 600mm from the wall to allow space for pipe 'loop-ends'. Fixing rails are supplied in 1 metre lengths with male and female connections on alternate ends to allow them to be connected in rows. With this floor construction it will be necessary to cut rails fit between the battens.

Once the rails have been laid you are now ready to install pipe along the first run you previously marked out. To do this you will need to load the tacker gun with tacker clips, make sure not to remove the backing tape as this helps to prevent any tacker clips becoming jammed in the gun. Start by treading the pipe into the fixing rail clip points and use the tacker clips to secure the pipe runs between rails. All installations are different but as a rough guide expect to use approximately 2 tacker clips per metre for straight runs of pipe and 4 for tight bends. Usually it is easiest to work the pipe with the uncoiler positioned a few metres away from the circuit you are installing. If you also try to keep the pipe behind your body it prevents it from trying to coil itself up again.

When forming 'loop-ends', special care should be taken to avoid kinking the pipe. Pipe loops shouldn't be any tighter than 100mm and should be a 'bulb' shape. In the instance that a kink begins to form but does not fully crease then the pipe may in some cases be returned to its original shape by submerging it in 80˚C+ water or by using a thermostatically controlled heat gun to bring the tubing back to its original shape. Failing this, the section of pipe should be cut out and a repair coupling should be installed (available from Optimum UFH Ltd.).

Connecting Pipe to the Manifold

It is important that the correct roll of pipe is used for the circuit you are installing. If you look at the AutoCAD pipe layout drawing you will notice a pipe-allocation table that will have these clearly indicated. Do **NOT** pre-cut pipes as the final pipe lengths on site may vary slightly from the calculated lengths.

It is usual good practice to start at one end of the manifold and work your way along to avoid any confusion or crossing of pipes. Once you have chosen the correct coil, place it on the pipe uncoiler.

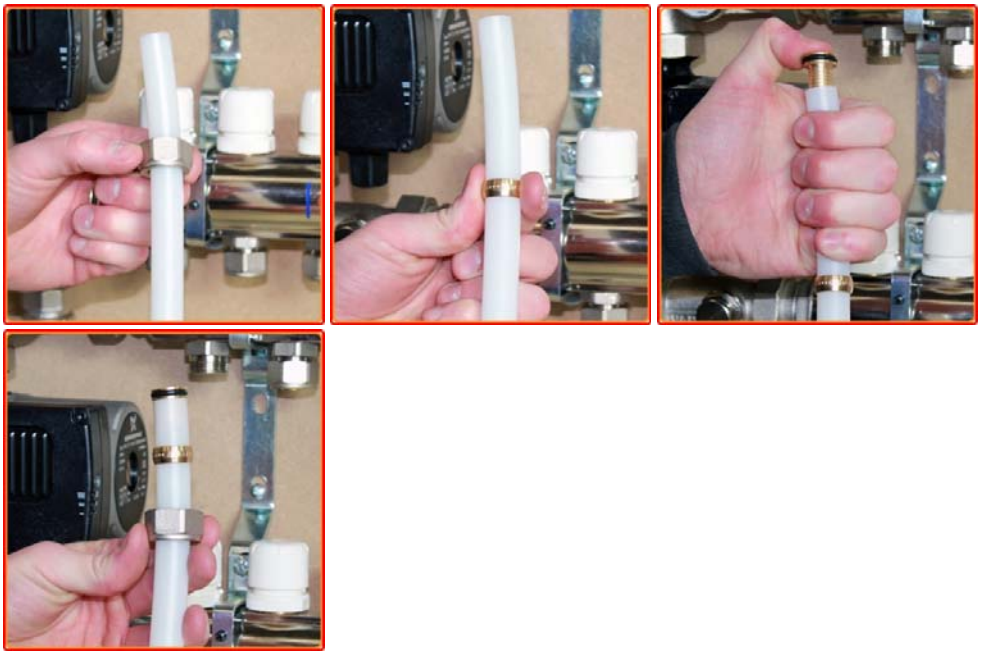
1. Unwind one end of the pipe up to the manifold and straighten it out by hand

2. Make a clean straight cut on the end of the pipe with a set of ratchet pipe cutters.

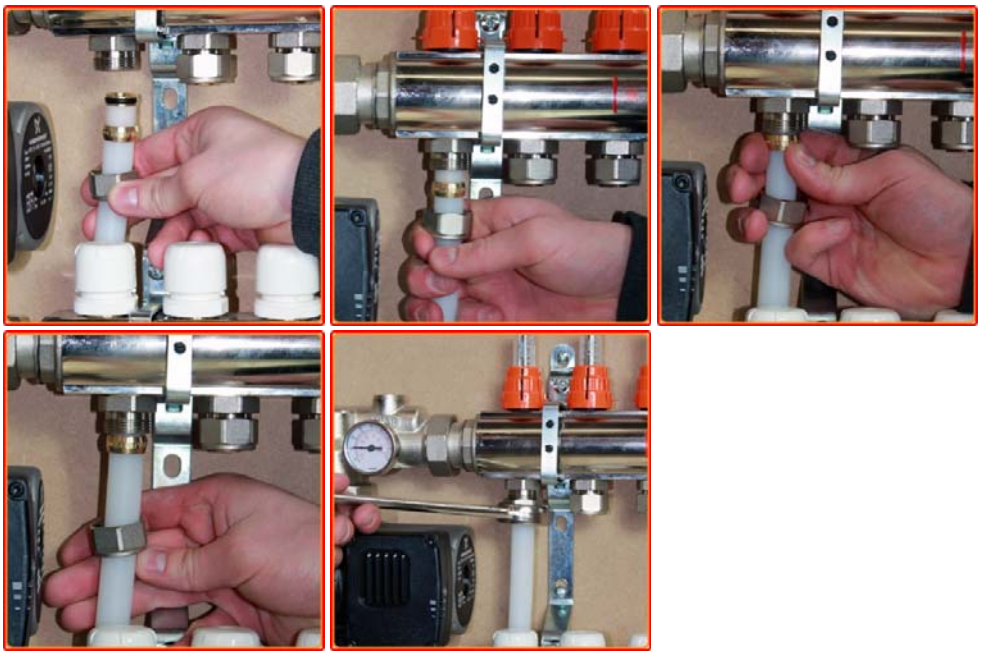
3. Cut an appropriate length of pipe sleeving (usually 1.5m) and slide over the pipe.

4. Remove the nut ring and insert from the manifold

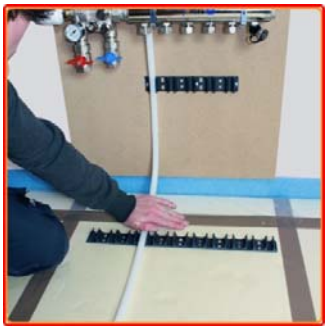
5. Slide the nut and ring over the end of the pipe and push the insert firmly inside the pipe.



6. Push the pipe end firmly into place and slide the ring and nut up and hand tighten.



7. To keep the pipework between the manifold and floor neat the pipe should be kept as close to the board as possible with a smooth but reasonably tight bend where it will be entering the finished floor level. This in turn maximises the floor space available where the manifold is situated i.e. hallway cupboard and reduces the likelihood of the pipes being damaged.

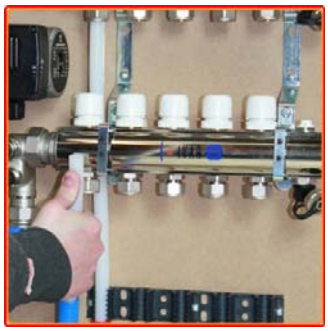


8. When the circuit has been installed and you are ready to finish by connecting back to the manifold the above steps are all the same except that special care needs to be taken to cut the pipe to the appropriate length.

9. Hold the pipe in front of the manifold

10. Form the bend from the floor up to the manifold.

11. Make a clean straight cut level with the base of the manifold block you are connecting to




12. Connect to manifold as with nut, ring and insert as before.


Filling & Pressure Testing

(Manifold **with** water temperature control)

Once the underfloor heating pipe-work and manifold are installed and connected, the next step is to fill and pressure test the system. This is vital as it proves that the installation can achieve and hold the running pressure of an underfloor heating system, typically 1.5 bar, and also highlights any problems such as kinked pipe or leaks. This test should be carried out prior to connecting any of the electrical components to the manifold.

There are two ways of filling and pressurising the system: directly from the mains water supply or using a filling pump and water vessel. Optimum strongly advises adding antifreeze/inhibitor at this point, the method of filling directly from the mains supply does not allow this to be done.

Filling from Filling Pump and Water Vessel

For this method you will need a filling pump kit (preferably with a pressure output of approximately 3 bar or more) and suitable water vessel/container as well as a garden hose with threaded ¾" BSP female tap connections. Follow the step-by-step instructions below.

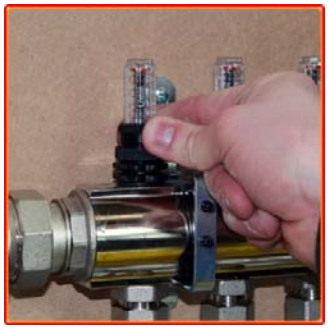
1. Open the fill/drain point valves on the manifold (turn square head anti-clockwise, a key for this is built into the cap).

2. Shut off both red and blue handled isolation valves.

3. Close pump isolation valve.

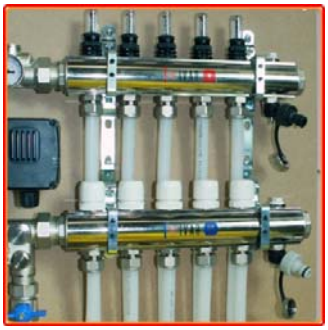
4. Close (turn clockwise) all flow meter valves on the flow manifold (top manifold block). This is done by removing the orange plastic locking sleeve situated on the flow meter base and turning the black ring at the base of the clear plastic tube.

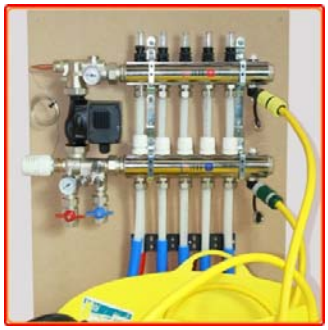




5. Close (turn clockwise) all white plastic manual valves on the return manifold (bottom manifold block).

6. Connect filling pump supply hose to fill point on flow manifold and another hose from the drain point on the return manifold back into the filling bucket. Put filling pump feed hose into filling bucket and fill bucket with antifreeze/water mix.






7. Starting with the furthest left circuit open the corresponding flow meter valve and white plastic manual valve.

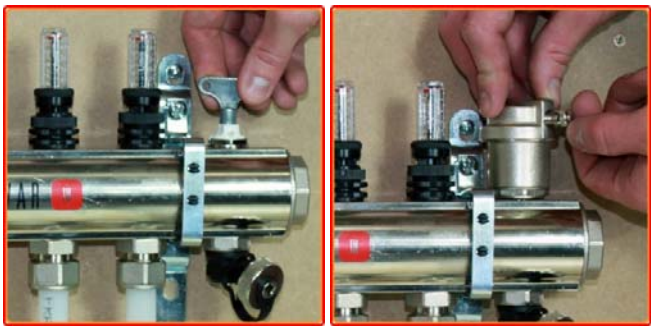
8. Prior to switching on filling pump ensure that the pump is primed and ready for use.

9. Once all of the above steps have been taken, start the filling pump to allow the antifreeze/water mix to go round the circuit you have opened until it comes out of the drain point on the return manifold. Please bear in mind that a little water will come out of the drain point straight away, but not until a good flow of water comes out of the drain point has the circuit been filled.

10. Let this antifreeze/water run out for 4/5 minutes to get rid of any air.

11. Close the valves for the circuit you were filling and repeat this process for each circuit until they are all filled, topping up the antifreeze/water mix in filling bucket when necessary.

12. With the filling pump still circulating, go back along the manifold opening all the flow and return valves and pump isolation valve then let the mix circulate for 15-20 minutes to encourage the antifreeze/water to be evenly mixed throughout the circuits. During this period use the manual air bleed valve to remove as much air from the system as possible (please ensure manual air bleed valve is fully closed before moving on to next step).



13. Close (turn clockwise) drain point valve on return manifold and pump isolation valve. Keep filling pump running to allow system pressure to be built, once the pressure on the manifold gauge reads approx. 3 bar close the fill point valve on the flow manifold.

Now that the manifold and pipe-work have been filled and pressurised turn off the filling pump and disconnect the hoses at the fill point and drain point of the manifolds. All pipe-work should be checked for any kinks and/or leaks at the manifold. On occasion it may be necessary to slightly tighten one of the nuts that secure the pipe to the bottom of the manifold to stop any small leaks/drips.

Take a reading from the pressure gauge on the manifold. The pressure will fluctuate with ambient temperature, but if the pressure reaches or nears zero, this indicates that there is a leak which must be rectified. Once you are satisfied the test pressure is stable, you can then go ahead and lay the rest of the floor, while continuing to monitor the pressure at the manifold.

Filling & Pressure Testing

(Manifold **without** water temperature control)

Once the underfloor heating pipe-work and manifold are installed and connected, the next step is to fill and pressure test the system. This is vital as it proves that the installation can achieve and hold the running pressure of an underfloor heating system, typically 1.5 bar, and also highlights any problems such as kinked pipe or leaks. This test should be carried out prior to connecting any of the electrical components to the manifold.

There are two ways of filling and pressurising the system: directly from the mains water supply or using a filling pump and water vessel. Optimum strongly advises adding antifreeze/inhibitor at this point, the method of filling directly from the mains supply does not allow this to be done.

Filling from Filling Pump and Water Vessel

For this method you will need a filling pump kit (preferably with a pressure output of approximately 3 bar or more) and suitable water vessel/container as well as a garden hose with threaded ¾" BSP female tap connections. Follow the step-by-step instructions below.

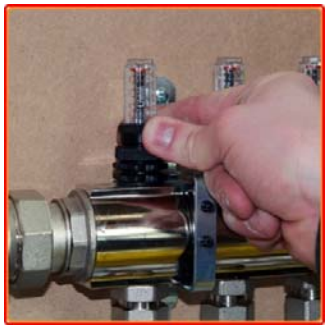
1. Open the fill/drain point valves on the manifold (turn square head anti-clockwise, a key for this is built into the cap).



2. Shut off both red and blue handled isolation valves.

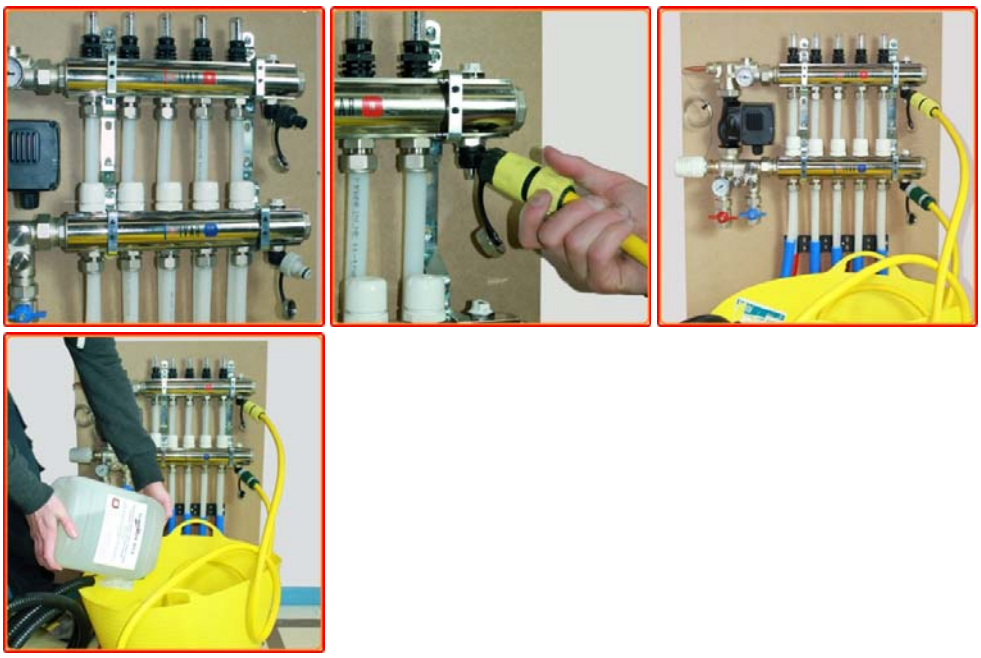
3. Close (turn clockwise) all flow meter valves on the flow manifold (bottom manifold block). This is done by removing the orange plastic locking sleeve situated on the flow meter base and turning the black ring at the base of the clear plastic tube.





4. Close (turn clockwise) all white plastic manual valves on the return manifold (top manifold block).

5. Connect filling pump supply hose to fill point on flow manifold and another hose from the drain point on the return manifold back into the filling bucket. Put filling pump feed hose into filling bucket and fill bucket with antifreeze/water mix.



6. Starting with the furthest left circuit open the corresponding flow meter valve and white plastic manual valve.

7. Prior to switching on filling pump ensure that the pump is primed and ready for use.

8. Once all of the above steps have been taken, start the filling pump to allow the antifreeze/water mix to go round the group you have opened until it comes out the drain point on the return manifold. Please bear in mind that a little water will come out of the drain point straight away, but not until a good flow of water comes out of the drain point has the circuit been filled.

9. Let this antifreeze/water run out for 4/5 minutes to get rid of any air.

10. Close the valves for the circuit you were filling and repeat this process for all groups until they are all filled, topping up antifreeze/water mix in filling bucket when necessary.

11. With the pump still circulating, go back along the manifold opening all the flow and return valves and let the mix circulate for 15-20 minutes to encourage the antifreeze/water to be evenly mixed throughout the circuits.

12. Close (turn clockwise) drain point valve on return manifold and leave pump running to allow system pressure to be built, once the pressure on the manifold gauge reads approx. 3 bar close the fill point valve on the flow manifold.

Now that the manifold and pipe-work have been filled and pressurised turn off the filling pump and disconnect the hoses at the fill point and drain point of the manifolds. All pipe-work should be checked for any kinks and/or leaks at the manifold. On occasion it may be necessary to slightly tighten one of the nuts that secure the pipe to the bottom of the manifold to stop any small leaks/drips.

Take a reading from the pressure gauge on the manifold. The pressure will fluctuate with ambient temperature, but if the pressure reaches or nears zero, this indicates that there is a leak which must be rectified. Once you are satisfied the test pressure is stable, you can then go ahead and lay the rest of the floor, while continuing to monitor the pressure at the manifold.

Pre-Start Up Checks

(To be carried out by electrician/plumber)

Before your underfloor heating system can be switched on it is important that all points of the system are checked thoroughly to ensure no components are damaged by means of incorrect wiring or plumbing. Many of these checks will have already been done during the installation stages however it is still highly recommended that the on-site plumber & electrician read through and confirm the following points.

- Primary heat source(s), pumps etc. must be prepared/purged and ready for initializing
- Pump valves, isolation valves and by-pass valves are all open where necessary
- Check all connections to and from the underfloor heating system
- Ensure that there is continuity through all electrical connections and that wiring has been completed as per 2nd fix diagrams/installation instructions.
- All air has been bled from the system
- The floor structure has had the required time to naturally cure before heat is applied. This will be dictated by the type of floor structure and the environment it is in. Please ask if unsure.

Only once all of the above checks have been made and are confirmed by the electrician/plumber may the underfloor heating system be activated.
Upon activation, there are several steps to follow to ensure that the underfloor heating system operates as per its design. Please complete the following set of steps.

VERY IMPORTANT

- Set a very low flow temperature to underfloor heating circuits to comply with the parameters specified by the company supplying the screed, alternatively this may be specified by your structural engineer. (Manifolds with temperature control are set by adjusting thermostatic head on the manifold, manifolds without temperature control require flow temp. to be set at heat source or at point of temperature control within system). Optimum strongly advises that the temperature is set to 25 degrees for the first week of operation and then raised by 2 degrees every second day until you reach 40 degrees. Ensure that all areas are open and calling for heat during this process.

- Ramp temperature down by reversing the above steps

- The above can be carried out without thermostats being wired but you will need a temporary supply to manifold pump and heat source.

- Balance underfloor heating circuits as per AutoCAD drawing (unclip orange sleeve from flow meter as described at filling/testing stages, turn anti-clockwise to increase flow rate or clockwise to decrease flow rate. This should be carried out with all circuits open).

- Test the activation of each individual zone to ensure the thermostat opens the correct circuit. (Set all thermostats to their lowest value; now put the set-point of desired thermostat artificially high until corresponding actuator(s) opens. Return thermostat to lowest value then repeat for next zone.) Please note that actuators can take up to 4 minutes to either fully open or close. It is important that the correct thermostat switch wire is operating the correct actuator(s).

Floor Coverings - Guidelines

It is common knowledge that there are certain floor coverings which will reduce the efficiency of an underfloor heating system. The reason behind this is that all floor coverings create a level of insulation between the output of the underfloor heating pipes and the final output into the room. Ideally it is desirable to keep this effect to a minimum however, Optimum UFH Ltd. can alter design calculations to suit provided that we are notified prior to supply of materials.

It is important that no floor coverings are laid until all moisture has been expelled from the floor, this can take many months under normal conditions however this time can be greatly reduced to only several weeks by running the underfloor heating at a constant low temperature.

Before the floor coverings are laid the underfloor heating temperature should be decreased to prevent floor adhesives curing faster than specified and to avoid any distortion of coverings. Once the floor covering is in place the heating may then gradually be increased back to normal operating temperature's however the speed of this process will differ between coverings and should be specified by the supplier.

Solid Hardwood

Solid hardwoods work well in conjunction with underfloor heating providing certain criteria are met. Kiln dried boards with a moisture content of strictly <5% should be used. As some hardwoods are unsuitable it is vital that the supplier is consulted for advice on what types of board are recommended for use with underfloor heating.
Boards should be stored in the room that they shall be laid to allow them to acclimatise. If you are laying them on top of a screed/slab the moisture content of the concrete must be reduced to <1.8% and in all situations the air humidity should be <55%. If in doubt this can be checked by means of a moisture meter. As an approximate guide; 75mm of concrete will take 75+ days to cure under normal weather conditions. Boards should remain in their carton with the ends opened and should be laid on top of batons to allow air circulation beneath the boards. The boards should be a minimum of 300mm from the nearest wall and laid flat. The boards should be left to acclimatise over a period of approx.14 days prior to fitment. It is preferable that the boards are floated to allow potential expansion/contraction of the wood to take place; however, specially formulated adhesives are now available and may be used for a more secure fitment of the boards and to provide better heat conduction by eliminating small air gaps. If an adhesive is used, the slab should be reduced to approximately 20˚C during fitment of the boards and then slowly raised back to normal operating temperature once all boards are laid. **Note:** The floor temperature should NEVER exceed 27 ˚C. If you have any queries please contact Optimum UFH Ltd for further assistance.

Engineered Hardwood

Engineered hardwood follows the same principles as solid hardwood although kiln dried boards with a maximum of 8% moisture content can be used.

Laminate

Laminate wood flooring can be a cheaper alternative to hardwood boards but can also be preferably due to its characteristics. High water resistance, durability and low thermal expansion properties are all contributing factors to this. The steps taken with hardwood flooring should still be adhered to; this ensures that no problems arise during or after installation.

Tiles

Tiles are by far the most popular floor covering used with underfloor heating. This is due to their high thermal conductivity. It is advisable to let your supplier know that the tiles will be covering underfloor heating so that the most suitable tiles are recommended. If you are laying them on to a screed/slab the moisture content of the concrete should be <1.8%. Floor heating should be turned off at least two days before tiles are laid, once finished the heating can be gradually increased back to normal operating temperature.

Carpet

Carpets and underlays act as a layer of insulation between the floor surface and room. This insulating effect dictates whether or not a carpet/underlay is suitable for use with underfloor heating. To measure this insulating effect, 'tog' values are specified for all available carpets and underlays. The higher a tog value, the greater the insulating effect it has. Optimum UFH Ltd. recommends a maximum of 1.5 tog (combined carpet and underlay). Many suppliers now stock ranges of carpets and underlays that have been specifically designed for underfloor heating.

Vinyl

Vinyl flooring requires the concrete moisture level to be <1.8% as with hardwood floors, this is due to the fact that vinyl sheet is impermeable and will therefore begin to bubble or lift if there is any trapped moisture. Underfloor heating should be turned off at least 2 days before the vinyl is being laid and as with hardwood floors one the flooring is down the heating may be gradually increased back to normal operating temperature. An adhesive which was been specifically designed for use with underfloor heating is recommended.