System Design

Underfloor Heating Design

The process of designing an Envirofloor underfloor heating system is similar to that of any other heating system; but due to the nature of underfloor heating will ultimately lead to lower heat losses. This results in lower fuel costs for the homeowner and reduced carbon emissions which benefit the environment.

Over 50% of the heat output from an Envirofloor underfloor heating system is radiant heat, with the remainder made up by convective heating and a small proportion of the balance via conductive heat transfer. As the elevated temperature of the floor increases the rooms' mean radiant temperature, it is possible to reduce the air temperature while still creating a more comfortable environment for the occupants. When designing underfloor heating systems it is normal practice to use a 1-2°C lower design temperature.

The only exception to this is in bathrooms and ensuites where it is standard practice to use the same design temperature. This is due to higher ventilation rates, a lower available active floor area and the room usage. The use of towel rails is therefore recommended to supplement the underfloor heating.

Heat Loss Calculations

Building heat loss calculations should follow the conventional heat loss method but take into consideration the following minor variations:

- The lower design temperatures will mean the temperature difference between the external and internal temperature will be lower, hence lower heat losses.
- Since the floor is the heat emitter, the floor needs to be at a higher temperature than the internal environment. For this reason downward losses are not included in the heat loss calculations.

However the downward losses need to be considered when sizing heating plant and circuit flow rates. Downward losses should be minimised to below 10%.

Determining Heat Output

The nature of the radiant heat transfer will also mean lower convective currents and lower stratification, although this isn't evident in most heat loss calculations. The exception to this rule however is when a high ceiling is used. When designing a conventional system if the ceiling height is greater than 4.5m an additional factor should be added to the basic heat loss calculation with the percentage addition dependant on the ceiling height. With underfloor heating systems this is not necessary due to the absence of strong convective currents.

Floor Output

The output of an underfloor heating system is determined by the difference in floor surface to air temperature.

Maximum outputs are as follows:

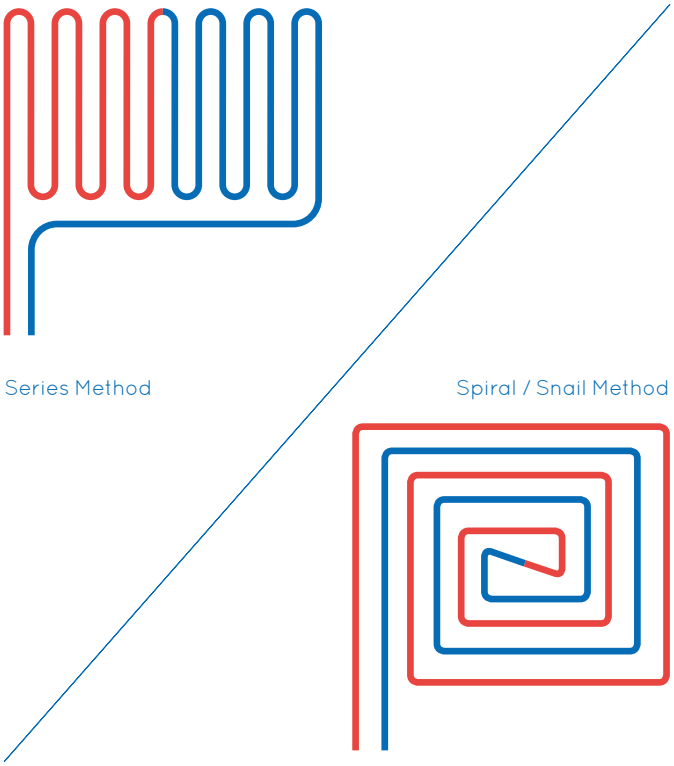
Underfloor Heating Manifold Locations

Manifolds should be located centrally in the building if possible. It is important to ensure that there is good access for maintenance or in the event of a problem. In domestic applications good locations would be underneath stairs, at the back of a kitchen cupboard, or in an airing cupboard on the first floor. If there is a requirement to conceal them, then manifolds can be located inside stud walls, behind an access hatch, or inside a dedicated cabinet.

When determining the location of a manifold, consideration needs to be given to minimise the amount of uncontrolled heating from pipes.

Underfloor Heating Pipe Layout

Typically two pipe layouts are used when installing pipe for underfloor heating:



Series Method

Spiral / Snail Method

The spiral method gives a slightly more even heat distribution in a room, however the series method is easier to plan and lay. The series method is more common in the UK.

Thermostat Locations

As thermostats operate by sensing the air temperature it is important to ensure that they are located in a position that is representative of the room overall. Areas to avoid include the following:

- Room corners
- Behind furniture units
- Behind curtains
- Close proximity to heat generating devices such as TVs, computer equipment, wall lights
- In direct sunlight
- On outside wall
- In line of draughts

Please note that this information is for guidance purposes only. For exact quotations and advice on system design please contact the Firebird Technical Hub on **01752 691177** or **technicalhub@firebird.uk.com**.

Key Components

Pipes

Firebird PE-RT (Polyethylene Raised Temperature Resistance) pipe is a key component of Enviroair underfloor heating systems. Developed in the 1990's, PE-RT pipe is used extensively across Europe and is particularly suited to solid floor constructions. A fully recyclable material, PE-RT derives its strength at high temperatures from its unique molecular structure.

Firebird PE-RT pipe is made up of 5 layers which are extruded together to produce a multilayer structure. This creates a homogeneous and very stable material bond.

The outer layer is made from PE-RT which serves as a protective layer for the EVOH (Ethylene Vinyl Alcohol) oxygen barrier. The smooth inner pipe is made from PE-RT to prevent pressure loss and pipe murmur.

- Oxygen barrier complies with the requirements of DIN 4726
- Installation protected from corrosion
- Resistant to chemicals
- Extremely flexible and easy to work with even at low temperatures
- High tensile strength
- Easily recycled

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Underfloor Heating Manifolds

The manifold allows for every loop of underfloor heating pipe in a building to be connected to and from the manifold, in a single continuous length, with no fittings in between. This completely removes the potential for any joint leaks. If there is a fault with an individual circuit, or maintenance is required then the relevant circuit can simply be turned off.

Underfloor heating manifolds are supplied complete with flowmeters for ease of commissioning. Also included within the manifold arrangement are fill and drain ports, automatic air vents and fixing brackets.

Water Temperature Controls

Firebird offer a wide range of products to control the water flow and temperature which include control packs, thermostatic mixing valves and weather compensators.

Air Temperature Controls

Room temperatures can be individually controlled using a wide range of wired and radio controlled systems, including app enabled technology. This allows the homeowner maximum flexibility, whilst increasing the energy efficiency of the building.

Envirofloor Underfloor Heating Kits

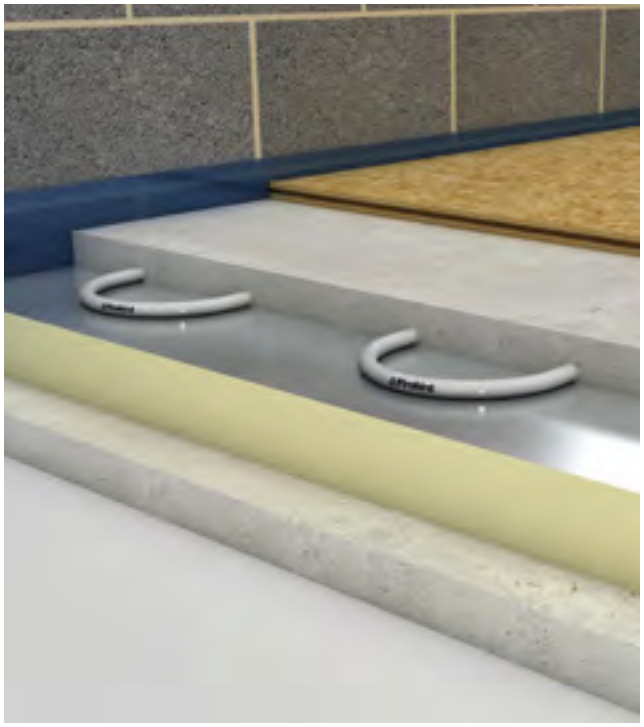
Envirofloor underfloor heating kits containing all the components required for use with an Enviroair air source heat pump are available for the following floor constructions.

Solid Floors

This type of construction is typically used on ground floors or block and beam floors. The Envirofloor underfloor heating pipes are laid on top of insulation board placed over a solid concrete base. Screed is then over the top of the pipes.

Envirofloor Underfloor Heating Kits for solid floor constructions include:

- Envirofloor underfloor heating pipe
- Pipe staples & clamp track
- Edge insulation
- Manifold including actuators, pipe connectors & isolating ball valves
- Circulating pump
- Wiring centre
- Programmable room thermostats
- Thermostatic mixing valve



Suspended Floors

This type of construction is typically used on suspended timber floors. Envirofloor underfloor heating pipes are fitted into grooves in aluminium heat emission plates. Supported by the joists at 400mm centres the plates diffuse the heat, distributing it evenly across the floor.

Envirofloor Underfloor Heating Kits for suspended floor constructions include:

- Envirofloor underfloor heating pipe
- Heat emission plates
- Manifold including actuators, pipe connectors & isolating ball valves
- Circulating pump
- Wiring centre
- Programmable room thermostats
- Thermostatic mixing valve