TUBING LAYOUT

A tubing layout is an orderly plan for the arrangement and distribution of the tubing. A proper tubing layout will be easy to install and will result in a comfortable and efficient heated space. Radiantec Company will provide all the help that you want in coming up with a good layout for your project.

We want you to be aware of choices that you have. Often there are two or more satisfactory ways to do the work, and yet some choices may be a lot easier to install. Radiantec cannot always tell you exactly what to do.

The time you spend on your layout will help the installation go smoother.

The goal of the tubing layout is to create an arrangement for the tubing so that when the pump comes on to deliver warm water throughout a heating zone, the flow will give the most comfort and efficiency. For the most part, we will want the flow throughout the system to be even, and not generate hot spots and cold spots. Another important factor is that we will not want the system to require an unreasonable amount of electricity in order for the pumps to operate. The two factors of tube length and flow rate are the most important. The most important part of tubing layout is that tube lengths and flow rates are within reasonable parameters. They need not be exact, but they should be reasonably close.

HINT: Cut a piece of wire to plan the length and then arrange it on your set of plans until a good layout is found (thermostat wire works very well).

Plan your tubing arrangement with wire.

TUBE LENGTH

Circuit lengths should be neither too long nor too short. If the tube length is too long, there will be tendency for the water to lose too much heat before it reaches the end of the tube. The result is tubing at the end of the circuit is exposed to water that has already lost much of its heat and the tubing is then "loafing". The circuit length for 1/2" tubing should be no longer than 300 ft.

FLOW RATE

When water is flowing slowly and smoothly through the tube, we say that it is in "laminar" flow. At higher flow rates, the fluid sloshes around more and we say that the flow is "turbulent". We want our flow in the heating tubes to be slightly turbulent , because the heat is exchanged more effectively, but we do not want the flow to become "very turbulent" because that would waste electricity and in extreme cases could cause what is called "erosion corrosion", or the actual wearing away of system components due to excessive fluid flow.

TUBE DIAMETER	MINIMUM LENGTH	MAXIMUM LENGTH	FLOW RATE
3/8"	N/A	150 ft.	.125 gpm/100 ft. of tube
1/2"	100 ft.	300 ft.	.25 gpm/100 ft. of tube
7/8"	200 ft.	400 ft.	.5 gpm/100 ft. of tube

STEP BY STEP

PRODUCE A TUBING LAYOUT FOR A HEATING ZONE

STEP ONE – Determine the area (number of square feet) of the heating zone. Measure from the plan or physically measure the area.

STEP TWO – Determine the amount of tubing that will go into the heating zone.

TUBE DIAMETER	RECOMMENDED SPACING
3/8"	6" - 8"
1/2"	8" - 12"
7/8"	12" - 16"

If the tubing will be spaced at 16" on center, multiply the floor area by .75

SPACING MULTIPLIER	
16" on center	.75
12" on center	1.00
8" on center	1.50
6" on center	2.00

EXAMPLE: A 1,900 square ft. area requires 750 ft. of tubing if spaced 16" on center (1,000 x .75)

STEP THREE – Determine how many circuits there should be and what their lengths should be.

Now we know that 1200 ft of tubing will be installed in the heating zone. But 1200 ft is too long to install in one long circuit. Either the water will lose all of its heat before it gets to the end, or the flow rate will have to be so high that the turbulent flow will be bad for the system and the electrical consumption will be unreasonable. **The solution is to break the 1200 ft up into several circuits.**

Here is where we have some choices. We can do these 3 things or anything in between.

6-200 ft circuits
4-300 ft circuits
3-400 ft circuits

If the project is a large commercial project, you may want to consider using 400 ft circuits in order to keep manifold costs reasonable.

Smaller projects may want to work with shorter circuits for ease of installation.

If you prefer, you can install one circuit in each room of the building.

In this case, the circuits will all have different lengths, and balancing valves will be needed to control flow. An advantage is that different temperature conditions can be manual selected for each room without going to the expense of individual zones.

In most cases, you will want flow to be even and temperature output to be even, but you can do things that will cause more heat to go to certain areas. For example, bathrooms are often designed to be warmer than other areas for comfort and moisture removal.

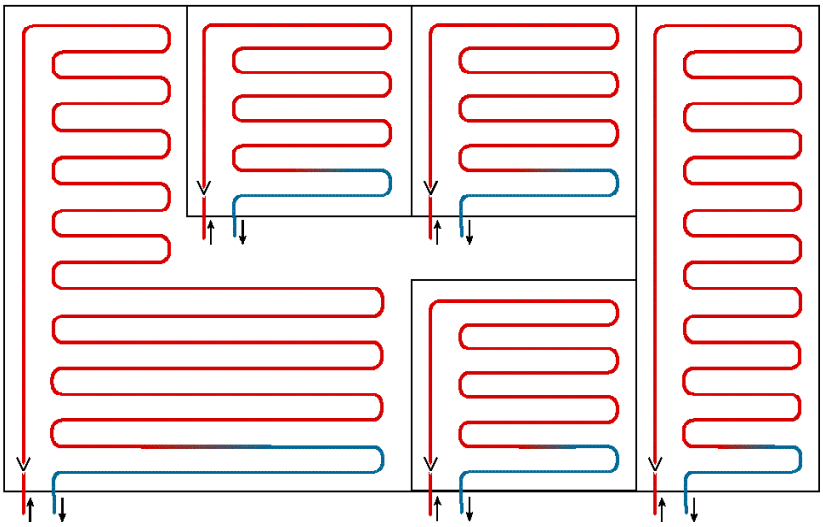
ARRANGEMENTS

HERE ARE SOME IDEAS ON HOW TO DETERMINE THE TUBING ARRANGEMENT RIGHT FOR YOU

BALANCING VALVES

For efficient usage of multiple circuits, each circuit should have its own balancing valve so that the flow can be adjusted if needed. This valve will make it easier to get the air out of the system upon initial startup.

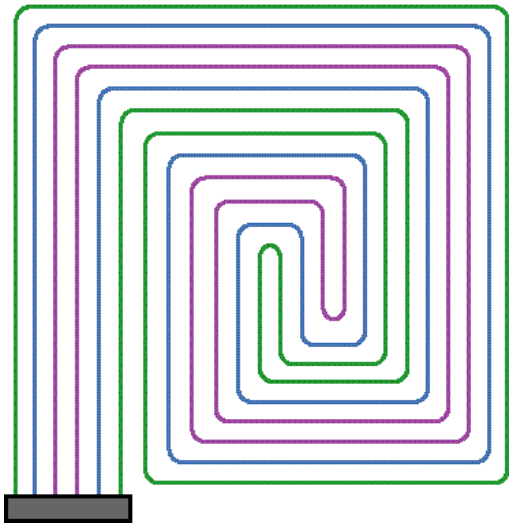
Room by Room with Balancing Valves



REVERSE SPIRAL RETURN

The reverse return spiral is often the easiest and best way to place tubing **within a slab**. Place the manifold at any convenient place along the perimeter of the slab. Start by running the tubing around the perimeter of the proposed slab and then inward towards the center. At the center, turn 180 degrees and spiral back to the manifold. The spiral is **flexible and convenient**. If there is too much tubing left over when you get back to the manifold, simply tighten up the spiral and the excess tubing will be taken up. If you have the opposite problem and you cannot get back to the manifold, simply relax the spiral and more tubing will be freed up.

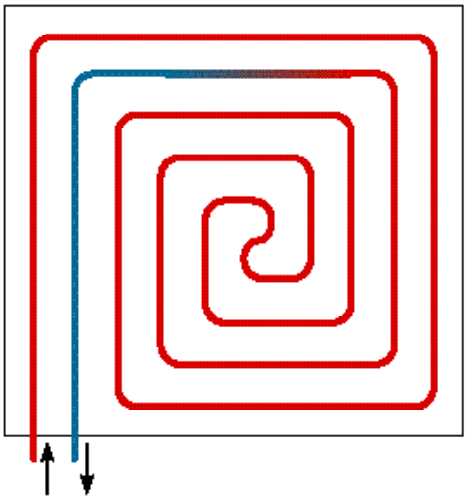
Reverse Spiral Return



COUNTER FLOW SPIRAL

A simplified version of the reverse spiral using a single tubing path to center of room and a single return path. This pattern is also designed for areas needing evenly distributed heat but more applicable to non-slab areas which don't demand such a concentrated heat flow. The average temperature between the loops is approximately the same at any point between two corresponding loops, making the floor surface temperature approximately even.

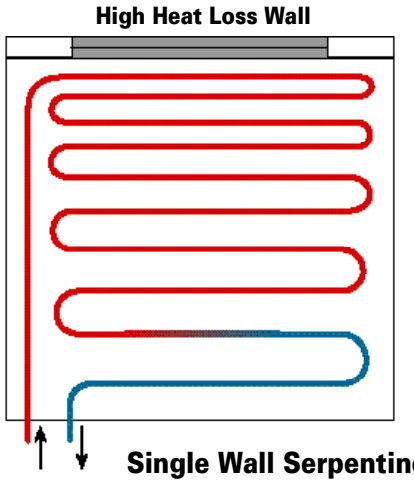
Counter Flow Spiral



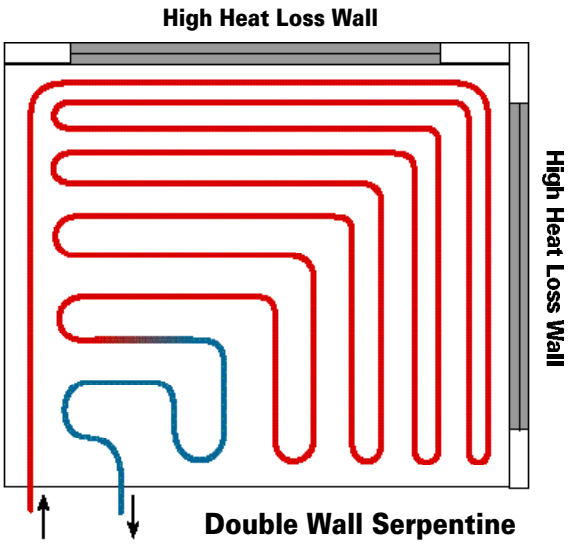
Here are a few ideas about how the flow can be designed so that the warmest part of the tube is placed in the part of a room that needs the most heat. On the other hand energy conservation theory may find fault with putting the heat where it is most likely to be lost.

SINGLE & DOUBLE WALL SERPENTINE

These arrangements will place more heat alongside a cold exterior wall or one that has a higher heat loss because of a window wall or picture window. The tubing can be spaced closer together along the cold wall and the warmest water will go along the cold wall first.



Single Wall Serpentine



Double Wall Serpentine

HINT: Vary the tube spacing – you can place tubing closer together where you want more heat (such as in bathrooms and entryways).

An exact perfect arrangement is usually not very important. Here is what is important.

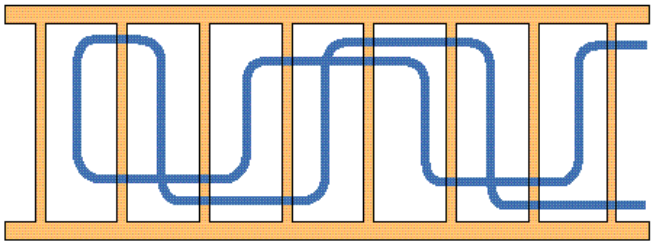
1. **Put in most of the tubing that was provided.**
2. **Do not kink the tubing.**
3. **Space the tubing out reasonably well.**

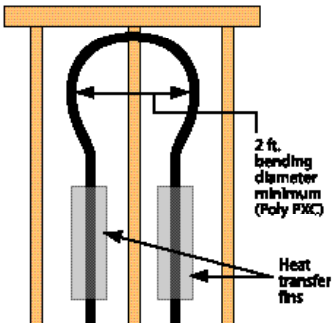
HINT: It is best to avoid the water closet when installing radiant heating tubes. There is a wax ring that connects the WC to the rest of the waste disposal system, and it should not be allowed to melt. If it is difficult to avoid the WC area with the tubing, you can insulate the tubing within 12 inches of the wax connection.

WITHIN JOISTS

Pull the tubing through the joist—Twist the tubing as you pull it back so that the bend is not too tight.

Skip space—Skip every other joist space at first. Then, at the end of the run, come back using the joists that were skipped (advantage—no need for a return pipe).





HINT: You may vary the spacing of the heat emission fins for greater or lesser heat output. Heat fins can be spaced closer together where you want more heat. Do not space the fins farther apart than 2 feet because they also serve to support the ubing.

Important notice *- These design and installation suggestions are of a general nature and they are based upon our 25 years of experience. It is important to understand that every project is a little different. It is the role of the designer to incorporate all available information into the project. Radiantec makes no representation that these general suggestions are applicable to any particular project. Radiantec takes no responsibility for the design of any heating project. Radiantec makes no representation about the completeness of the information provided. It is important to comply with all building codes.*

Revised on
1/18/04