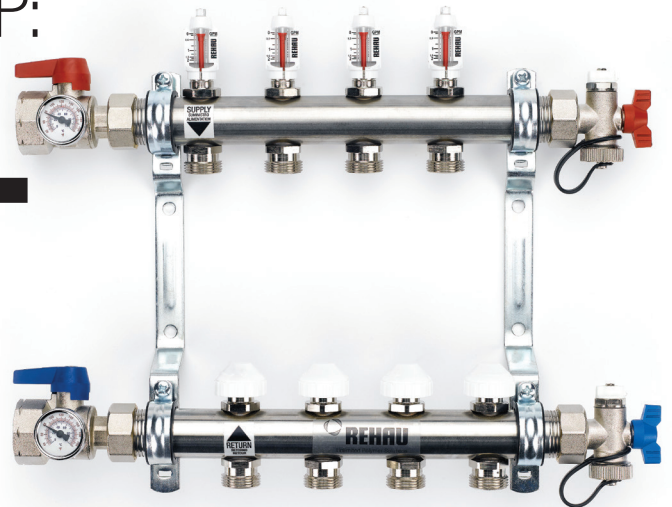




The Canadian Hydronics Council, a council within CIPH, is a great resource for any tech wishing to expand their knowledge. Visit the CHC page at ciph.com to check out the full range of available hydronics publications and training courses.

STAYING IN THE LOOP: **SIZING RADIANT PIPE**

Installing a hydronic system that meets a client's expectations is vital for a business that wants to secure – and possibly grow – its share of the radiant pie. To this end, selecting the correct size of pipe is critical to ensuring a happy and comfortable customer.



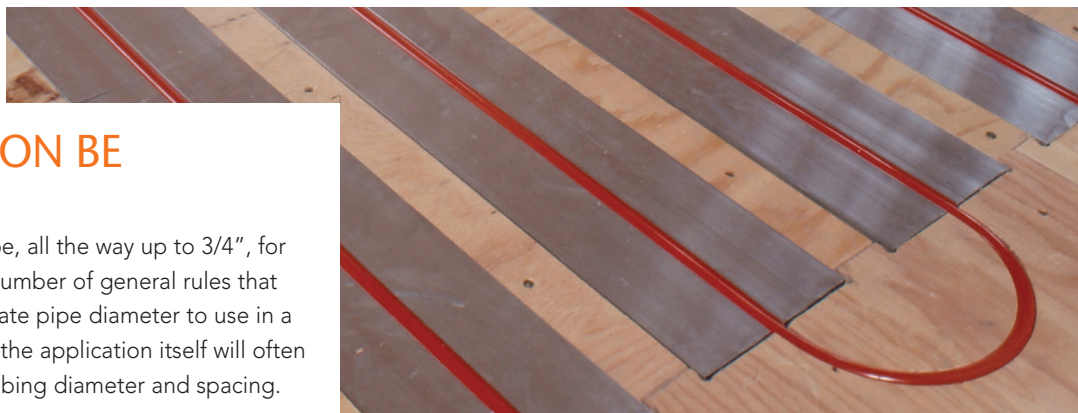
CALCULATE THE BUILDING LOAD

When it comes to any heating system, hydronic or otherwise, one of the first things that a tech needs to know is the building load – how much energy needs to be put back into the building every hour to maintain a comfortable setpoint.

That's usually question number one. For a residence, it can be anywhere from five to 30 BTUHs per square foot. This can go even higher if you have rooms that have lots of glazing and vaulted ceilings, and applications like commercial snowmelt can take that well beyond residential requirements.

Radiant systems are typically designed to handle the full load, however, there are instances where the hydronics may need to pair up with a secondary heat source.

Take, for example, a nine-square-metre breakfast nook that is all glass and vaulted ceilings. That's a room with a really high heat loss, and there may not be enough surface area to handle the full load with the hydronic loop. Here, you would want to use that secondary heat source to top up the heat on the coldest days of the year.



LET THE APPLICATION BE YOUR GUIDE

We typically see the use of 3/8" pipe, all the way up to 3/4", for radiant heating. While there are a number of general rules that can help with selecting an appropriate pipe diameter to use in a particular hydronic heating system, the application itself will often be one of the main influences on tubing diameter and spacing.

For example, in a warehouse with large open areas, you're typically going to use larger diameter pipe. In a residence, nine times out of 10, 1/2" pipe will suffice.

In residential applications, expect the centre-to-centre spacing to be tighter than those warehouse applications, since temperature variance across the floor is far more noticeable in sock feet rather than steel-toe boots.

When it comes to a radiant cooling application, we normally go with 5/8" pipe at 6" spacing, in order to accommodate the higher flow rates associated with cooling applications.

Loop lengths, flow rates and pipe diameters

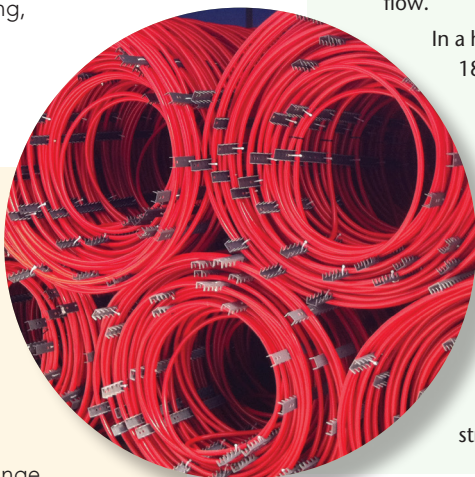
The diameter of pipe being used will often dictate the maximum length of the circuits or loops in a system. For example, circuit lengths will typically range between 250 feet and 330 feet with 1/2" pipe, whereas if you are using 5/8" or 3/4" pipe, lengths can be anywhere from 250 feet to 500 feet.

While you could gain more loop circuit distance with 1" pipe, it is rarely used for radiant because of its limited flexibility.

Many system designers prefer to avoid the theoretical maximum loop length limit since, generally speaking, the longer a circuit's length, the higher its head loss will be. This may require more pumping capacity, meaning larger, more expensive circulators.

When selecting an appropriate size of pipe, keep the design of the building in mind. Hiding manifolds and servicing smaller zones will all factor into tubing size selection.

The use of larger diameter pipe can often result in fewer manifold locations and fewer circuits, which can also make for a quicker installation, however, smaller diameter pipe may be easier to install in more complex rooms and layouts.



Get your spacing right

Consistent comfort comes from consistent pipe spacing. The CAD drawing never looks exactly like the as-built building, so do your best to navigate around obstacles and keep spacing as consistent as possible. There are cases where you may have tighter pipe spacing, near a large window, for example, but it is important to maintain pipe spacing.

Where loads vary, it is possible to accommodate to the loads by adjusting flow.

In a hydronic system, pipe spacing usually ranges from 6" to 18" on-centre. In a large warehouse, where the thermostat setpoint may be lower than it would be in a living room, it might be possible to get away with longer pipe lengths and wider pipe spacing.

Closer pipe spacing improves the uniformity of the floor surface temperature and lowers the heating water temperature, resulting in greater energy efficiency. It also increases the heat output of the radiant panel at a given heating water temperature and provides a faster response time.

Increasing pipe spacing requires a higher water temperature to achieve the same output and could result in striping (concentrated hot and cold spots).

MIXING IT UP

There are times when a combination of pipe diameters could be used within one system. For instance, a snow and ice melting system in a parking lot may use a larger diameter than the stairs leading into the building.

These snow and ice melting applications need higher flow rates than comfort heating, which makes larger diameter pipe beneficial. In areas such as a garage, which does not necessarily need to be kept at the same setpoint as the inside of the home, a larger pipe diameter and wider spacing can be a viable design choice.

In some cases, it may be helpful to run a larger diameter, pre-insulated pipe to a remote manifold, from which smaller diameter tubing can be run for each zone or loop.

In residential projects, it's not that common to see a mixture of pipe sizes. When a variety of diameters are used, it's typically due to the inclusion of a snow and ice melt system, or the use of a panel product that installs on top of a subfloor and only takes a set pipe size.



Where these panel systems are used, say in a master bathroom or kitchen, the pipes and the system flow will have to be sized to the panels, while the rest of the home may have pipe embedded in a slab, so size options are not as limited.

Skip Daugherty is the senior designer with the building solutions division at REHAU. He can be reached at skip.daugherty@rehau.com.