

Radiant Revisited

- By Richard Trethewey -

The most popular question I seem to get is Does that radiant heating really work? I have been advocating the use of radiant heating since 1986 since I installed it in my own kitchen. In what once was the coldest room of the house, is now our family oasis of comfort. Frankly, there is no better heating method.

Today, sadly, the majority of American homes are heated or cooled using ductwork in a forced hot air system. In the post WWII era, this decision has been driven by a lower first cost for the homebuilder and the desire, or demand, for air conditioning in the hotter climates. The trade off is one of comfort. In one recent survey I read, 7 out of 10 Americans were totally unhappy with their heating systems. They complained of them being too noisy, too dusty or just plain uncomfortable. This is not the case with radiant heating.

Radiant is not some new thing. The ancient Romans built elaborate public baths, gymnasiums and meeting halls that needed heat. These early radiant systems called Hypocausts had a false floor over fire chambers and ductwork. This system would gently heat the stone floors in these soaring halls. When we did the *This Old House* project in London England in 1992, I got a chance to visit and film the ruins of one such bathing hall that dated to 40 AD. What a treat for me, and our viewers!

This same principle was used as late as the 19th century in Korean Royal Palaces and to a much lesser extent in residences. In the 20th century, one of America's most famous architects, Frank Lloyd Wright, was a strong believer in radiant heating for pragmatic reasons it was more comfortable and it didn't visually contaminate his simple clean spaces. In the Greater New York area, William Levitt created the Levittown housing tracts, which changed how homes were constructed, beginning in the late 40s. Like Henry Ford, Levitt was first in his approach to automating the building process. This packaged approach meant that all the house parts were dropped to the curb, all the houses had the same basic footprint and homes were built in a matter of days versus weeks. Also revolutionary was the use of radiant heat in almost every home. This comfortable heat was installed before the concrete slab floor was

poured by using copper or steel pipe through which warm water ran. Levitt homeowners loved the heat until they discovered that in many cases, the lime in the concrete or installation error led to widespread failure within 15 to 20 years.

From these failures, radiant sat in a dormant state until the invention of a new type of plastic piping called cross-linked polyethylene, also known as PEX, that wouldn't become brittle over time or be affected by aggressive concrete or additives. The European countries like Germany, Austria and the Scandinavian countries began doing radiant in the 1970s.

When I first went to Europe in the early 1980s, I found a radiant industry that was flourishing and clearly ahead of the US. Since then I have shown radiant on the show every chance I can and I have taught its use throughout the country to contractors, engineers, architects and homeowners

There are a number of ways to install the tubing into a building.

Installation Methods

Below a concrete slab, before pouring a concrete basement floor, PEX tubing is attached to wire mesh or clipped onto rigid styrofoam insulation. Use plastic zip ties to hold tubing onto mesh during the pour. Any basement that will *ever* be used as a family room, workshop or billiards room should have radiant.

From above attached to subfloor, covered with lightweight concrete or gypsum underlayment. If you have a family room addition going on, add the height of a 2 x 4 on the flat at every door opening to allow for the underlayment. No tubing should go under cabinets

From above, in sandwich between subfloor and finish floor There are a variety of new products that both hold the tubing in place and incorporate an aluminum transfer plate in improve performance. The height of the sandwich will raise the finished floor grade by one half to three quarters of an inch.

From below, attached to subfloor Tubing can be attached to the underside of a floor from the basement or garage. This means

that the existing floor can remain. Tubing should be attached with an aluminum transfer plate or trak for improved performance in cold weather climates.

Frequently asked questions:

Can I use radiant with hardwood floors? Some important rules apply. Use a solid hardwood like oak, ash, cherry or maple the narrower the plank, the better. Let wood become acclimated to the humidity level of the building. In larger areas always use a weather responsive control so that the water temperature that goes through the tubing changes according to how cold it is outside.

Can I use carpet with radiant? The short answer is yes. The long is answer is that you have to be careful with carpet. The heavier the rug and pad, the more insulation over your radiator. The combined insulating value (measured in R) for the carpet and pad should be less than 2.5 R. Carpet dealers or radiant heat contractors have a list of carpet R values.

I have a cold kitchen. What can I do? If the basement joists are open, you can attach tubing and reflectors to the underside of the sub floor. It is important to insulate below so the heat will go up

How long will radiant tubing last?

PEX tubing, the only tubing I recommend has been under long term testing since 1970. It projects to last

I have a hot air system. Can I get radiant in my kitchen? If you have a hot water source like a small boiler or a stand-alone water heater, you could attach tubing to the underside of the kitchen floor and insulate below the tubing. For this floorwarming system, you would need a thermostat, a circulator pump, a mixing valve and a manifold to connect the tubing to. In colder climates, use aluminum heat transfer plates to increase output.

Will I save money with radiant heating?

Because you are using lower water temperatures to heat the building, less energy is needed. Typical residential savings for a good radiant system is 15 to 30%. Most important is that you

get these savings while still being comfortable. The alternative is setback thermostats where you freeze to save. Commercial projects like warehouse, fire stations and churches will have even higher savings.

Richard s Rules of Radiant:

- 1.) Always use a PEX (cross linked polyethylene) tubing for radiant heat.
- 2.) Design the heating system so that maximum water temperature is 140 F
- 3.) In cold climates, when attaching tubing from below a subfloor be sure to use some sort of heat transfer plate to increase heat output and always insulate the joist bay below the tubing. (Heat will go towards cold in any direction!)
- 4.) Limit the insulating value of floor coverings as much as possible. Tile marble gives up its heat readily; wood and carpet are better insulators.
- 5.) Use weather responsive controls on radiant floor heating systems, particularly those with wood floors