

Electric Radiant Heating

BY ALAN CARSON, ACI, CARSON, DUNLOP & ASSOCIATES LTD.

RADIANT HEATING SYSTEMS ARE

typically located in ceilings and in floors. They are rarely located on the walls. Some wall systems are raised moveable systems. Some are made to look like paintings and others, especially those found in bathrooms, appear to be large plates of dimpled glass.

> Ceiling Systems

Ceiling-mounted systems can be set up in any number of ways.

- Some are wires that are plastered into place using special plaster. The wires are stapled onto a base coat and then embedded in a final coat. The wires are typically 1-1/2" apart and are often, but not always, installed in an "S" pattern. After years of service, sections of plasterboard have been known to pull away from the framing where these systems are installed. In some cases sections have fallen. The separation between the plasterboard and framing can be difficult to recognize unless you can access the plasterboard from above. By pulling back the insulation in an attic and exposing the connection between the plasterboard and framing you can look for evidence of separation or prior repairs.
- There are pre-wired ceiling panels.
- Although it is considered less desirable than plaster, the wires can also be embedded between two layers of drywall. Cracking drywall is common in this situation. Although plaster can also crack, the problem doesn't seem to be as pronounced.

Product Recall — Fire Hazard

- There are also panels that can be laid in on top of ceilings in a retrofit system, for example. These should be laid under the insulation, directly on the ceiling. These very flat heating elements are typically encased in a plastic or fiberglass coating. Some of these panels (e.g., Flex Heat) have been recalled and some electrical utilities recommend removal of these systems because of a fire hazard.

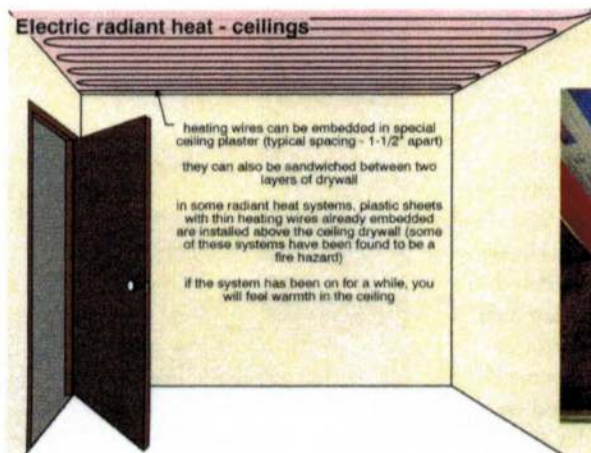
Pros And Cons

Radiant heating has some advantages:

- It doesn't take up any space in the house.
- It can produce very even heat.
- Each room can be heated individually.

The disadvantages include:

- It is easy to damage the system by adding lights or hanging fixtures from the ceiling. Once the system is damaged, it is very difficult to find and repair the problem. It is common to replace failed radiant panels with baseboard heating.



Below is a prewired ceiling panel installed above a hallway.



Locating the Wires

If screws, bolts or hangers are to be put into a ceiling with electric heat, or if it is suspected that areas are inoperative, a paint roller can be used to apply water to the cold ceiling. When the heat is turned on, the ceiling will dry first where it's warmest, revealing the location of heated wires.

Radiant systems generally have wall thermostats to control each room. It is typical for each room to be on a separate circuit. The circuits are typically 240-volt. The typical issue with these systems is that they can be inoperative during inspections.

Inoperative systems are usually the result of a broken wire or short in the loop. This can be caused by nails or screws, vibration or water leakage causing corrosion. The room with the failed system or zone may be uncomfortable. Prewired ceiling panels can also be inoperative if it has been damaged in the attic space.

Until hand-held infrared thermometers became inexpensive, inspecting radiant systems usually required a stepladder or a stool. Thermostats throughout the house should be turned up and left for approximately one-half hour. Note: Make sure that you mark down the setting of the thermostats before you turn them up so that you can return them to their original position. Note: Many thermostats are programmable and may have built-in GFCI protection.



A pre-wired ceiling panel that has cracked as a result of a person stepping on it in the attic.

air space below. Heat trapped between the floor and insulation radiates through the floor to the room above.

Primary or Secondary Heating

Many floor systems are rated at 10-12 watts per square foot or 35-40 BTU/hr./sq. ft. (One watt is about 3.4 BTU/hr.) Floor temperatures for normal operation should be 80-90 degrees Fahrenheit. These systems are considered secondary heat. Systems that are capable of 20 watts/sq.ft. are considered primary heat.

Testing for Warmth

After approximately one-half hour, the ceiling should be warm to the touch. The surface should be around 90°F. Using the back of your hand, you can test the ceiling in each room. Some inspectors test all four quadrants of a room looking for cold spots. Again, since most inspectors cannot easily reach an eight-foot ceiling, you may have to carry a ladder with you. As mentioned earlier, laser thermometers are also a good way to check out radiant heat. A quick shot at the ceiling before the heat is turned up and then 15 minutes or so afterwards will tell you if things are warming up. Some of the more accurate thermometers can record the differences between the areas where the wires are located and where they are not. After you have tested the system, return the thermostats to their original position.

Some systems put the wires in the actual underlayment to be installed beneath a floating floor system. Others systems place the individual wires or mat material on the sub-floor where a shallow coat of thin set or floor leveler is poured. Underlayment and floor planks are installed above it. Glue at the joints of the floor planks is recommended if the locking system alone cannot hold the floating floor in place. Nails can damage the wires and are not recommended.

Another system sold primarily for retrofit work puts the heating wires under the sub-floor with un-faced batt insulation or rigid insulation panels between the wires and the

Summary

We have introduced radiant heat as part of electric heating in this discussion. Electric heat is, for the most part, relatively straightforward to inspect. The big issues are electrical safety and adequacy of heat. More information can be found in the ASHI@HOME training program ■



Here's a typical thermostat in a bathroom with in-floor electric radiant heating.

Clamp-On Ammeters

You can also use a clamp-on ammeter to make sure that current is flowing to each system. However, this is not as positive a check as sensing the ceiling surface temperature.

> Floor Systems

Electric radiant heating is fairly common in bathroom floors, especially those with ceramic or marble tile. There are electric radiant products that can be installed below almost any floor, including hardwood and carpet. Wires can be laid in tracks that hold them in place until the concrete or mortar is poured. There are also pre-manufactured sheets, called matting, that can be laid on the floor before the mortar and tiles are laid.

