

Radiant Energy and Energy Savings

by Don Mordal

Increasing your comfort and, at the same time, saving money on your heating bill is a winning combination. Multiple zoning, thermal mass, off-peak rates, even heat distribution and lower temperature settings are just some of the strategies that reduce energy bills with radiant heating. Multiple zoning allows you to turn down thermostats in rooms not be used. Even heat distribution addresses heat loss more effectively. And, you will feel greater comfort at lower temperatures, which means you no longer have to force yourself to turn down the thermostat to save money, you will do it automatically to be comfortable.

Heat loss from any building is driven by the temperature difference between the inside of the structure and the outside. Conventional systems locate registers along outside walls, under windows and in front of sliding glass doors to compensate for all those cold surfaces. That hot air goes up those cold outside walls, across the ceiling and down to the cold air return. This is a great setup for wasting energy. Radiant panels direct the heat to the interior of the space and reduce or eliminate the excessive temperatures on outside walls and ceilings. This can result in energy savings of 10 percent to 40 percent in most residences and up to 60 percent or more in shops, hangars and warehouses.

Beside comfort, safety is another major factor to be considered. Radiant floor and ceiling heat is clean and healthy. Drafts, dust and airborne contaminants are greatly reduced compared forced air heating systems. Radiant floor heat is child friendly: there are no hot surfaces for children to touch, and no hot floor vents for them to touch or fill with toys or crayons.

Where are radiant systems located?

A radiant system can be effectively mounted on any flat surface. Typically a radiant heating systems is either in or below the floor or in the ceiling. The only requirement is that the surface be large enough. The larger the surface, the lower the actual surface temperature required. A wall radiator may have a surface temperature of 180° degrees F while an 81 degree F floor will do the same job, only more effectively.

Radiant energy will heat the surfaces of all objects which are in direct line of sight from the panel; that means all walls, floors, ceilings, chairs, tables, or people which can be "seen" by the radiant panel. Therefore, a heated ceiling will raise the surface temperature of floors and walls, while heated floors will raise the temperature of ceilings and walls. Air coming in contact with these surfaces is also gently heated.

How does Radiant Energy work?

"What exactly is Radiant energy?" Hold your hand over a hot cup of coffee and feel the heat. The logical conclusion is that heat rises. Logical maybe, but incorrect! "Hot air" rises but "heat" can travel in any direction. That is why you can feel the heat of the cup when you place your hand to the side of it. Radiant energy transfer is caused by a warm surface giving up its heat to a cooler surface.

Whenever there is a temperature difference between two surfaces, both surfaces will attempt to equalize. Radiant energy travels through space without heating the space itself. It only turns into heat when it contacts a cooler surface. Our human comfort relies just as much on radiant heat transfer as it does on air temperature, yet the majority of

heating and air-conditioning professionals think only in terms of air temperature. As a result, Americans are missing out on a truly comfortable living environment in their own homes or places of business. By controlling both the air temperature and the radiant transfer, radiant heating systems deliver a comfort that is unsurpassed.

Radiant Heating is not about the heat loss of the room; it's about the Heat Loss of the person in the room. If you can control the Heat Loss of the individual, then you will feel comfortable.

Your body loses heat naturally in three different ways: Evaporation(20%), Convection(30%), and radiation(50%).

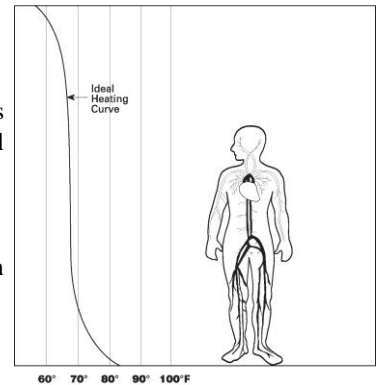
Evaporation (20%): Sweat and Moisture - Whenever a liquid turns to a vapor Heat goes with it.

Convection (30%): When air passes over your body you lose heat, the faster the air movement the more heat you lose.

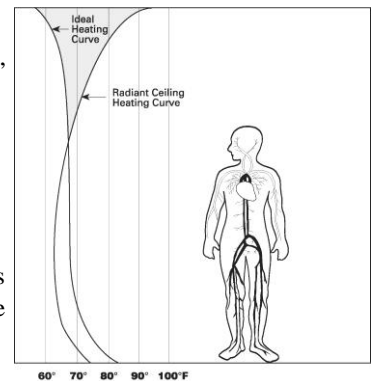
Radiation (50%): Your body loses heat by radiating the heat to colder surfaces.

Radiant Floor or Ceiling heating delivers personal comfort by controlling the radiation heat loss of a body. When surrounded by surfaces (floors and walls) that are roughly the same temperature as the body surface, that part of natural heat loss is controlled.

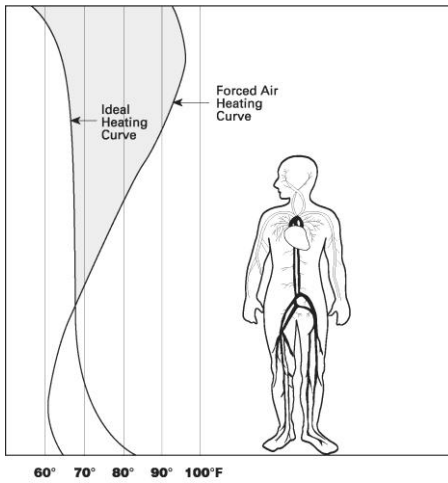
The diagram shows the Ideal Heating Curve as it relates to the natural heat loss of the human body. The temperatures on the curve illustrate the ideal temperatures for optimum personal comfort. The lower the temperature at the ceiling, the less the heat is lost through the ceiling and the lower the operating cost.



Radiant Ceiling Heating - Radiates heat to the occupants, walls, floors and furnishings, the same way the sun radiates heat to the earth. The space between the sun and the earth is unchanged, but the surfaces that the radiant waves contact are warm. The warmed objects in turn warm the air and create very low convective air currents. Radiant Ceiling Systems very effectively address the natural heat loss of the body as long as the ceilings are not too high or too low.

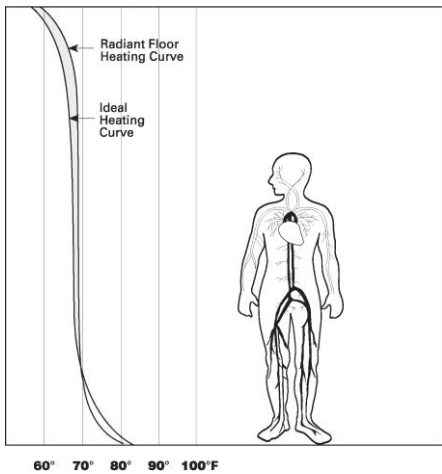


Energy Savings and Radiant Energy – ‘Continued’



Forced-Air - Since hot air rises, the air temperature at head level and above is higher than ideal, and the closer to the ceiling you go, the warmer the air. Hot air systems do not distribute heat to the extremities where the body needs it most. In order to meet those needs, the air must be heated to a level that is much too hot and uncomfortable for the upper body. The choice is either cold feet or hot heads. The temperature at floor level never reaches the desired level, and the temperature of the ceiling is too hot. Add to this equation unnatural convection, or air movement, that can alter the heat loss balance of the human body.

Note: The area between the Forced-Air curve and the Ideal Curve represents wasted energy and higher fuel bills.



Radiant Floor Heating System – Radiant floor heating comes the closest to controlling body’s natural heat loss. The entire floor surface area is a low temperature radiator and directly warms the individuals and other surfaces in the room.

- ✓ Heat is delivered at floor level - Where the people are.
- ✓ Greater comfort at lower temperature and lower cost.
- ✓ Less convective currents
- ✓ Less Heat Lost at the ceiling.
- ✓ Less Ex-filtration and Less In-filtration
- ✓ Silent, Invisible, and Motionless
- ✓ Less dust and airborne contaminants
- ✓ Low Maintenance - No moving parts
- ✓ Increased property values and livable space
- ✓ Energy Savings of the Radiant Floor Systems vs. Forced Air Systems can be 10%-60% or even more depending on the application.

For More Information:

Therma-Ray USA / Don Mordal (612) 229-2836

donm@thermaray-usa.com

www.thermaray-usa.com