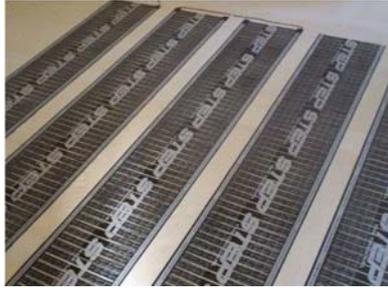


Radiant Heating Systems Offer a Range of Efficiencies



WHITE PAPER





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With the options of radiant heating systems on the market it is important to know their differences in heating comfort and energy efficiency. Homeowners often think “radiant heat is radiant heat” whether it is hot water tubing, heating cables or a mat. But there are considerable differences in the manner each heat a home.

One way to look at it is by imagining boiling two pots of water. The pots are identical, as is the amount of water. Both use 1000 watts of power. One is placed on a heating coil that fits the pot perfectly. The other is much smaller than the pot’s bottom surface. Which boils first? As we have all likely experienced the pot on the larger heating element will boil first, with the same amount of power.

As this example shows, a major consideration of efficiency is heat distribution. Water tubing and heating cables only cover a fraction of the floor surface, much like the small heating element trying to boil water. But the mat option provided by STEP Warmfloor® covers over 60 percent of the floor surface. The heat distribution methodology is a vital aspect to efficiency.

The actual components also encompass an important aspect of energy efficiency. Hot water tubing and heating cables require a lot of energy to radiate heat. The radiant heating element from STEP Warmfloor is a patented, self-regulating mat based on nanotechnology. It is an electrically conductive unique, flexible, homogeneous polymer blend. The nano-material modifies its behavior of conduction when electrically charged. When the ambient temperature increases, the electrical resistance increases and the consumption of electricity decreases. For this reason, the element cannot overheat.

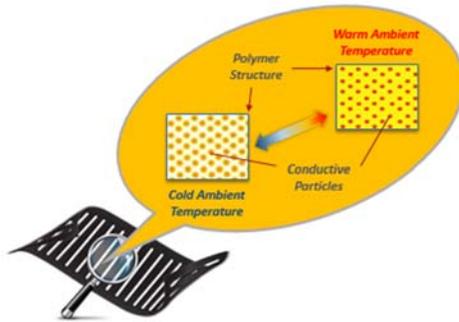
As the ambient temperature increases, the morphology of the polymer structure expands and the nano-particles separate reducing the points of contact between each other. As the electrical resistance increases less current can pass and the emission of heat decreases. On the other hand, when the ambient temperature is low, these particles are closer to one another permitting a greater passage of electrical current and thereby generating more calorific power.

Typically, a heating system with electric cables is installed with 12 watts per square foot. In comparison, STEP Warmfloor® is typically installed with only 4.5 watts per square foot to have the same heat output. And as the STEP Warmfloor element heats up, it further reduces the wattage need to approximately three watts per square foot.

It is scientifically proven that STEP Warmfloor® is significantly more efficient than heating-cables and water tubing systems. The flat radiant heating element can be installed directly under the floor covering and holds self-regulating properties that enhances the efficiency even further. To get the same heat output, STEP Warmfloor® will require substantially less current. And as a result of a more efficient heat distribution, energy consumption will be reduced by 40-60% compared to other radiant heating options. To give the same heat output, electric cables require 2.5 times more energy while a water tubing system (hydronic) consumes 2.08 times more energy.

When operating a cable heating system continuously, a thermostat with a floor sensor to control the temperature is needed. STEP Warmfloor® does not require a floor sensor due to the self-regulating ability of the element. And while STEP Warmfloor® does not require a floor sensor, it is recommended

to use a thermostat to control the preferred ambient temperature per area. Cable heating systems require a floor heating sensor and recommend the use of a thermostat, relying on the on/off functionality of the thermostat to reduce the floor temperature, making it less energy efficient.



Self-regulating technology

Depending on the thermal insulation and the floor covering, the floor surface temperature with the STEP® Residential elements will not raise above 78-82°F, which is more than sufficient to heat most rooms. Actually, a floor temperature over 82°F is not recommended for health considerations in Europe. In the US the maximum floor temperature is 85°F. Hardwood requires an even low temperature normally between 78-82°F, just within the temperature range of STEP® Residential elements. To accurately calculate efficiency, the home's location, type of construction, thermal insulation and type of flooring needs to be considered.

STEP Warmfloor® is a strong, thin, plastic mat, 3/64 inch (1.2 mm) thick. It comes in a roll, in different widths, and can be cut to the desired length and field-wired on site. Its low voltage system can be placed safely closer to the floor surface than any other heating system. With less mass to heat, the radiant heating system reacts fast to its regulated temperature. This eliminates the disadvantage of a large thermo-bed heating the house when the ambient temperature does not require additional heat.

STEP Warmfloor® radiant heating systems can run on alternating current (AC) or direct current (DC) and consists of a power supply and heating elements. It can also be connected to solar and wind power without an inverter. The radiant heating elements are 100% efficient. This means that all the energy used is converted to heat. The radiant heating elements are connected to a power supply which is 96% efficient. The remaining 4% still goes to heat in the building.

Heat is kept where it is needed – at the floor, keeping you more comfortable (even at a lower temperature setting) because when your feet are warm, you feel warmer. Heat is kept where it is needed – at the floor, keeping you more comfortable (even at a lower temperature setting) because when your feet are warm, you feel warmer.