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## The Interface of Ground Source Geothermal Heat Pumps and Warmboard

For many homes electricity is a feasible fuel source for hot water heating used in a radiant floor heating system. Investing in a ground source geothermal heat pump can be a practical solution for those who want low energy bills, low energy consumption and are attracted to the concept of using a renewable energy source.

The purpose of integrating a heat pump is to increase efficiencies. The heat pump has the ability to take one unit of heat, (one Kilowatt hour, 3413 btu's) and convert it to five units of heat (five Kilowatt hours, 17065 btu's). This example of a heat pump transferring one unit of heat and converting to five units of heat is referred to as a "Coefficient of Performance (COP) of five". A standard electric boiler or water heater has COP of one. The COP of a heat pump can vary from one to six.

When a heat pump is in operation the coefficient of performance (COP) will increase as the design water temperatures decrease.

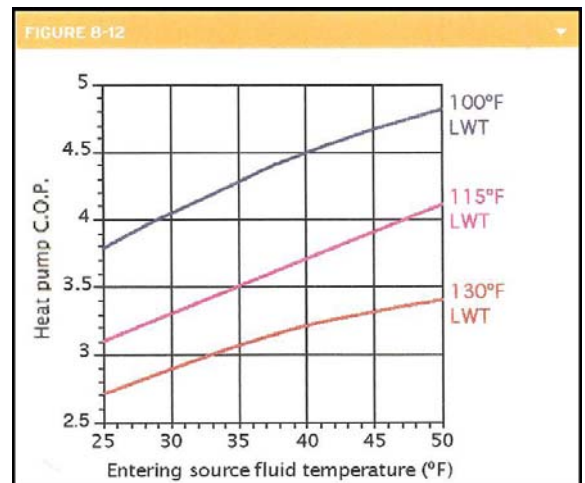
### A Typical Example:

An 80 gallon storage tank of water is heated by a ground source heat pump. The required water temperature for floor heating is 100 degrees. When this storage tank reaches its temperature set point of 100 degrees the heat pump will shut down. During this operational mode the heat pump will experience high efficiency ratings of COP's of 4.8.

See Figure 8.12 (Courtesy of John Siegenthaler "Radiant Precision 2007")

"Heat pump COP" = Coefficient of Performance  
"LWT" = load water temperatures.

"Entering source fluid temperature" = ground source loop of 50\* used in this example.



If the same 80 gallon storage tank is requiring 130 degree water temperatures instead of 100 degrees, the heat pump will keep running to attempt to reach a set point of 130 degrees. At this point in operation the heat pump efficiencies go down to 3.4 COP's. In some applications the heat pump will be unable to provide these higher water temperatures and an electric boiler or heating element will be required to supplement the heating demands.

In this common example above, the heat pump will use 29% less electricity when comparing the designing water temperatures of 100 degrees to design water temperatures of 130 degrees.

Warmboard radiant subfloor is the ideal heating panel to interface with a water to water ground source geo thermal heat pump. The low water temperatures of 100 degrees are common for many Warmboard projects, while many other radiant floor methods require water temperatures of 20 to 60 degrees higher. Warmboard is a proven product that has set the highest standards in the industry when evaluating efficiency, comfort and response time.

