

## The Glitch & The Fix — October 2007

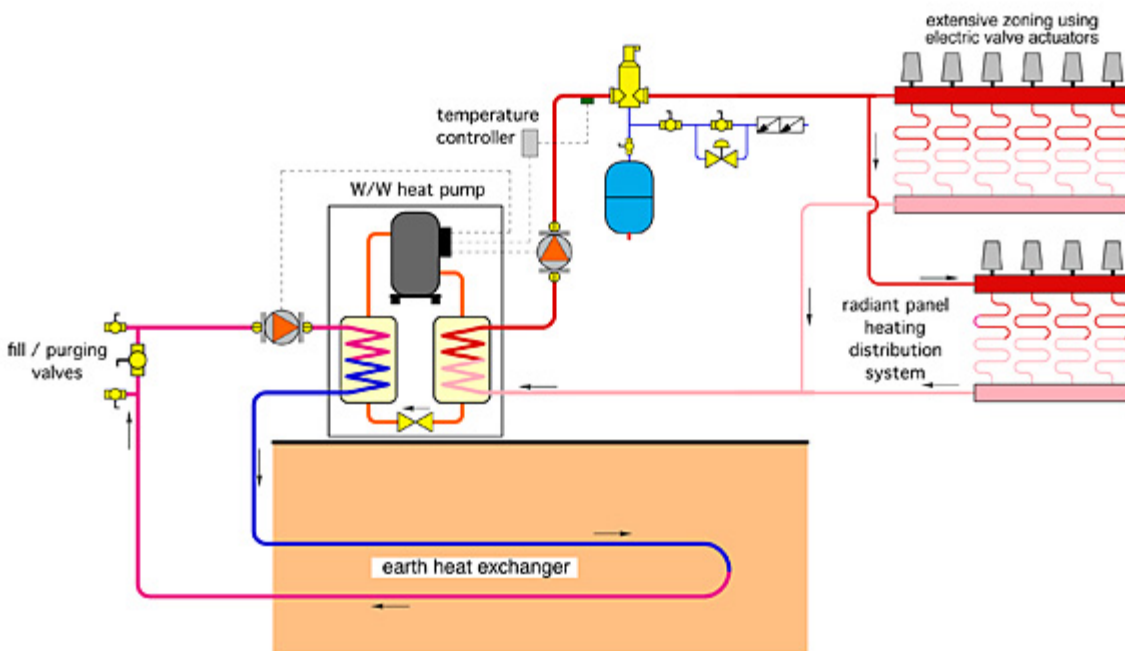
### Designing With Geothermal

#### The Glitch

**Overview:** An installer is asked if a geothermal heat pump can be combined with radiant floor heating. He responds with, “Of course, it’s just a matter of substituting the heat pump for a boiler.” The system he creates is shown below.

It’s meant to supply several independently controlled zones of floor heating. The geothermal water-to-water heat pump is a single-speed unit with a rated output of 60,000 Btu/hr. It has plenty of capacity to meet the design heating load of the building.

**Exercise:** So what’s wrong with this system design?



#### The Fix

The heat pump will respond just like a fixed capacity boiler. Whenever there is a call for heat from a zone, it will turn on. In many cases it will generate heat at a rate far greater than the rate of heat dissipation by the active zone(s). Since there is very little thermal mass in the system, it will short cycle.

This is especially hard on the compressor. The starting amperage of a compressor this large will also tend to momentarily dim the lights (even with a 200 amp service entrance).

The system needs thermal mass in the form of a well-insulated buffer tank. It also should have an expansion tank and air eliminator on the earth loop.

Because of the extensive zoning using valve actuators the distribution system should have a differential pressure bypass valve, or even better, a variable speed pressure regulated circulator. The temperature in the buffer tank can be regulated with outdoor reset control in response to outdoor temperature. This allows the heat pump to operate with the lowest possible supply water temperature and thus the highest possible efficiency.

