

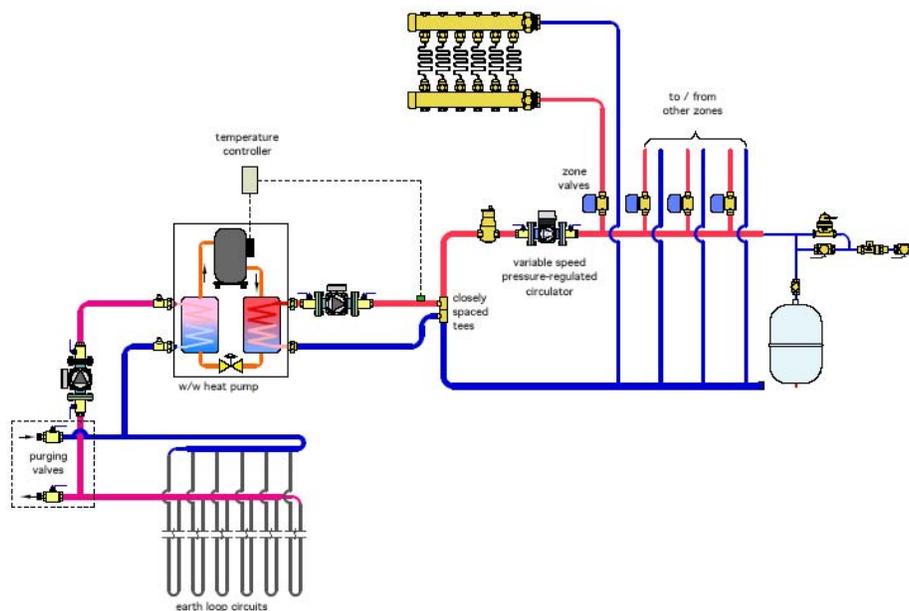
## Just Like A Boiler

### The Glitch

*Overview:* A customer, who originally agreed to install a zoned radiant floor heating system supplied by a modulating/condensing boiler, changes his mind after the system has been designed. He now wants the system to be supplied by a geothermal heat pump.

Since the radiant floor system used can operate on low water temperatures, the installer doesn't see this as a big deal. He decides to simply replace the boiler with the water-to-water heat pump using the same closely spaced tee detail as with a mod/con boiler. The piping he installs is shown below.

*Exercise:* Find at least five design omissions or other details that need changing.



## The Fix

One of the big differences between a mod/con boiler and the water-to-water heat pump is that the latter is an “on/off” device. There is no modulation of the heat pump. It’s either full output or nothing. There is also very little water and metal content in the heat exchangers used in a typical water-to-water heat pump. This means there is very little thermal mass to referee between the output of the heat source and the needs of the distribution system. The end result will be short cycling under partial load conditions. The solution is to add a properly sized buffer tank.

Other errors include:

- Lack of purging valves on the return side of the zone circuits.
- Lack of adequate valving to purge the earth loop.
- Locating the circulator on the right side of the heat pump such that it “pumps away” from what is typically a high head loss heat exchanger within the heat pump. This placement will encourage cavitation within the circulator.
- The supply temperature sensor providing input to the temperature controller operating the heat source should always be located downstream of the hydraulic separation point — in this case, the closely spaced tees. This allows control of the heat source based on the true supply temperature to the zone circuits.
- The expansion tank connected to the supply header as shown in the glitch drawing forces the distribution circulator to “suck,” rather than push, water through the zone circuits. Again, this sets the stage for cavitation and air removal problems in the distribution system.
- I also recommend an expansion tank on the earth loop circuit to minimize pressure variations over the range of temperatures the earth loop will experience in a typical year.

These omissions/details have been corrected in the drawing below.

