



SEQUENCE OF OPERATION PRIMARY BUILDING LOOP & SECONDARY GROUND LOOP

This sequence is for a two pump system similar to a radiant injection system. The same principle applies.

Components, Source Water Supply (Building Loop) to Heat Pumps in Building

- VFD pressure controlled pump for building loop
- Motorized 2 way zone valves on each heat pump, zone body must be full opening (we have found Belimo products to have a wider selection with high reliability); the valve should employ end switches to indicate when the zone valve is open 100%

Components for Ground Loop Pumping & Control, Injection into Building Loop

- VFD temperature controlled pump, used to inject into the building when the building loop requires tempering

Sequence of Operation, Building Loop:

The building source side pump is controlled by a pressure transducer that is sensing pressure of the building loop on the return side of the building loop. All heat pumps require a set amount of GPM in order to prevent lockouts, and to maintain high COP and EER efficiencies. In this sequence we have a thermostat (DDC, wall thermostat) that calls for heating or cooling; this energizes the zone valve to open and sends a signal to the heat pump to start in heat or cooling mode once the valve is open all the way.

The end switch prevents the heat pump from operating until the zone valve allows maximum water flow. This prevents nuisance lockouts by permitting sufficient flow to the heat pump's water-to-refrigerant coil, otherwise if the valve is delayed in opening or is not open completely, the unit will lock out as the internal safety switches within the heat pump will trip due to low or no flow.

Once the valve starts opening the pressure transducer will sense a drop in pressure and start ramping up the pump to compensate for a drop in pressure. Using a relatively slow opening zone valve allows sufficient time for the VFD to increase water flow to meet the requirements of the heat pump, providing full water flow to allow the refrigerant circuit in the heat pump to function smoothly.

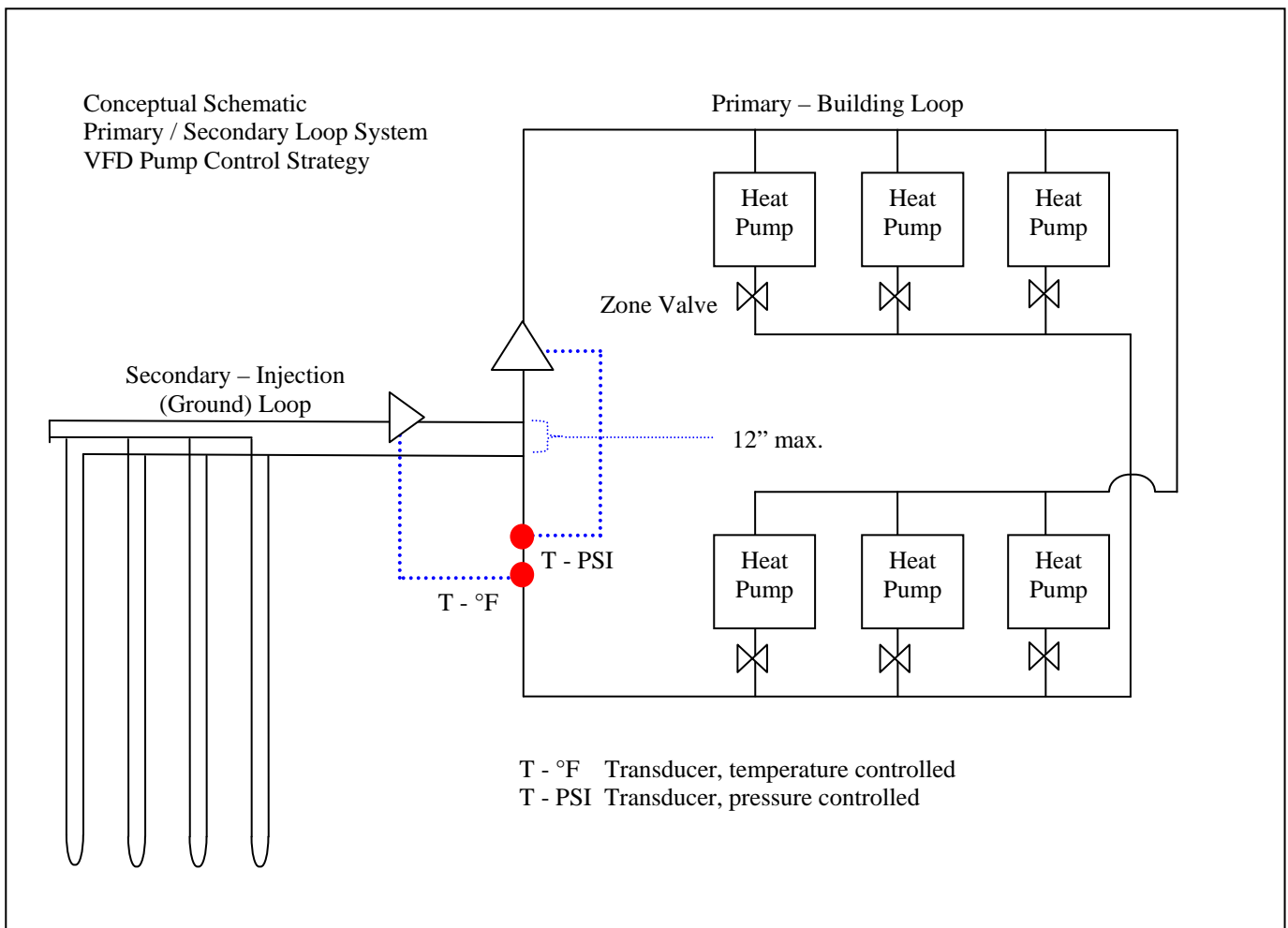
Sequence of Operation, Loop Field:

The loop field pump is controlled by a temperature transducer which is located at a point in the building loop piping just prior to feeding the building loop pump intake, but far enough back to not be in excessive turbulence. This transducer needs to have an adjustable temperature differential to allow for ease of tuning.

We have found that if the transducer is installed in the discharge side of the building loop pump it will be subjected to greater turbulence, and after the injection point of the loop field, the temperature controlled pump will ‘hunt’. This type of operation reduces performance and creates service issues.

The objective is to have the temperature transducer “see” the return water temperature from the building loop before it feeds back to the primary (building) loop pump. The injection of ground loop water should be into the piping feeding the building loop pump, with the temperature transducer located earlier in the piping to sense only the building loop return water temperature.

Set the temperature transducer in the temperature range that you wish to see being delivered to your heat pumps. After the building is up and operational this will require some adjusting to reach the ultimate temperature range required. Depending upon the application, occupancy, load durations, efficiency of the heat pumps used, level of load sharing anticipated, etc., we have found a good low temperature starting range to be in the 35°F to 45°F range, and a high temperature range to start with to be 80°F to 90°F, which would equate to a bandwidth range of 45°F for a single temperature transducer.



* * * * *



Terry Proffer, CGD

Major Geothermal

Geologist

IGSHPA Accredited Installer #12131-994

IGSHPA/NATE Certified Installation Instructor #T1063-496

AEE Certified GeoExchange Designer #16

AEE/IGSHPA Certified GeoExchange Designer Instructor

Colorado Division of Water Resources Closed Loop Certification #GT-13

ClimateMaster Certified Installation Instructor

L:\SEQUENCE OF OPERATION\Seq_of_Operation_PrimarySecondaryGSHP_System_2010-01-21.docx