Loop Flow Rates and Temperatures

Table 8 – Flow Rates vs. Temperature Range

System Flow US gpm/ton	Temperature Range in Cooling (°F)	Temperature Range in Heating (°F)
3.0	10	6
2.5	13	7-8
2.0	15	9

Heat pumps operating in cooling reject the heat collected from the space and another 25% of the heat from the compressor. For this reason, loop flow is more like chiller condenser flow than chilled water flow. Most geothermal systems are designed with 3.0 US gpm flow rates. Lower flow rates will reduce the pump and piping size, but they will also de-rate the performance of the heat pump.

☺ Tip: Most geothermal loop designs are based on 3.0 US gpm.

In heating, the heat absorbed from the loop is added to the compressor heat to meet the space requirements. Hence the temperature range is smaller. It is important to note that if 3.0 US gpm is used as a design flow rate and all of the heat pumps are in heating, the loop temperature will drop by 6°F. If only water is used, then the supply water temperature must not drop below 42°F to avoid freezing. If temperatures below 42°F are likely, then antifreeze should be added. Adding antifreeze may change the design flow rate requirement. See ***Fluid Properties,*** page 12.

Constant vs. Variable Flow Systems

For water source heat pumps, the flow rate is based on the *connected* tonnage. For constant flow systems, this means a high flow rate is required to operate every hour of the year. Pump work is significant. Variable flow rate systems will vary the flow based on the actual load at any given time. This can cut the pump work by as much as two thirds. While downsizing the pumps and piping