

Geothermal Loop Options

The loop options for a geothermal heat pump can be the most confusing part of the decision process. First, it should be made known that each of the loop options, if they are designed and installed correctly, will work well and provide you with a significant savings on your heating and cooling bill.

There are two types of loops—open or closed. The main difference between an open or closed loop system is the method of heat transfer. With an open loop system you use water from a well to provide the transfer medium for the heat and then this water is disposed of into a return well, pond, river, or stock well.

A closed loop system uses plastic pipe to circulate a water/glycol mixture to transfer the heat. The different loops are connected together (closed loop) to move this mixture through the ground to the heat pump.

Proper design and installation of the loop system is the most important part of the geothermal heat pump. This is where the large amount of savings is generated. Special design software is used to design the loop system. The installing HVAC Contractor should do a heat loss/heat gain calculation for your home along with some soil or water testing. This information is very helpful in determining how large of a system you need. Over or under sizing of the system costs you money in installation costs or operating costs.

Open loop:

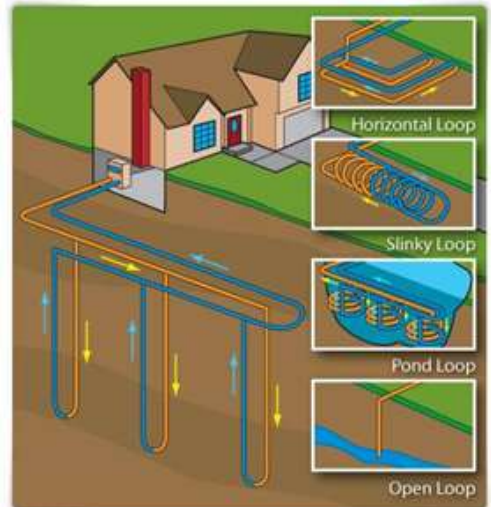
- Need source of good quality water—can be an existing well
- Your water should be tested to make sure it doesn't contain minerals that will damage the heat exchanger. Bad water can cause the equipment to fail too soon.
- Need to dispose of water properly into a return well, pond, stock tanks, river, etc.
- Need to have at least 1.5 gallons per minute per ton of heat pump capacity
- Open loop systems will require more scheduled maintenance
- Pumping costs are usually higher

Closed loop:

- Can be a vertical loop or horizontal loop
- Will have a water/glycol mixture circulating through plastic pipes in the ground
- Will have a higher installation cost than an open loop
- Most common heat transfer method for geothermal heat pumps
- The closed loop itself will have a life expectancy of more than 50 years if installed properly

Vertical closed loop:

- Vertical wells are bored to a depth of 200-300 feet depending on soil conditions
- Generally there is one vertical borehole for each ton of system capacity
- Usually require 150 to 300 square feet of land area per ton for a vertical borehole
- Vertical loops require less pipe than other closed loop options
- Requires the least amount of land area
- Seasonal soil temperature swings are not a concern
- Cost is usually higher for vertical loops than horizontal loops



There are three different types of horizontal loop systems that are being used today. The original design or standard horizontal loop, a slinky loop, and a horizontal bore.

Standard horizontal loop:

- Laid in a trench at a depth of 6-8 feet
- Trench lengths can be from 100 to 400 feet
- Can be from one to three loops in a trench
- Lower installation costs than vertical loops
- Require the largest amount of land
- Performance may be affected by the season, rainfall and burial depth
- Drought potential must be considered
- There are longer pipe lengths needed compared to a vertical loop



Slinky horizontal loop:

- The plastic pipe is coiled instead of straight
- The pipe is laid in a trench the same as the standard horizontal loop
- Requires 700 to 900 feet of pipe per system ton of capacity
- This design can accommodate 80 to 120 feet per 10 feet of trench
- Requires less land than standard horizontal loop, often 3 to 5 times less
- Greater pumping energy is needed because of the added length of pipe used
- Backfilling the trench is extremely important as no voids can exist around the pipe coils



Horizontal bore:

- Similar to vertical loop
- Great for retro fit situations
- Least amount of disturbance to ground or yard
- Usually takes 150 to 250 feet of loop length per ton of heat pump capacity
- Less expensive than vertical boring



There are pros and cons with each type or style of loop for your geothermal heat pump. Your HVAC contractor will help you decide which of the loop options will work best for you or you can contact Twin Valleys Public Power District and we will be glad to help.

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