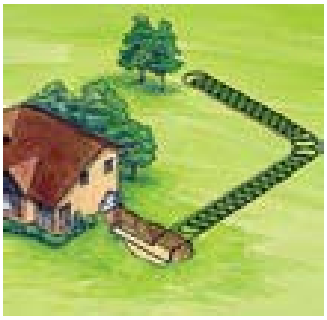
Geothermal Earth Loop Designs

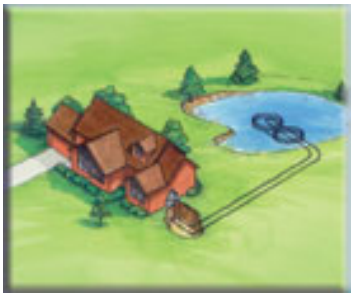
The earth loop transfers heat to and from the ground - eliminating the need for fossil fuels. It's the heart of a geothermal system, and its biggest advantage over ordinary heating and cooling technologies. Earth loops come in two basic types. Closed loops, made of durable, high-density polyethylene pipe, are buried in the earth or submerged in a lake or pond. They transfer heat by circulating a solution of water and environmentally safe antifreeze. Open loops use ground water pumped from a well as a heat source.

The type to use depends on the terrain, the cost of trenching or drilling, the availability of quality ground water, and available space. Your geothermal dealer will help you make the best choice.

Horizontal Trench Loops: If adequate land is available, horizontal loops can be installed. One or more trenches are dug using a backhoe or chain trencher. Polyethylene pipes are inserted and the trenches are backfilled. There are various designs of horizontal loops, using one, two or three circuits in a trench. The more pipe per foot of trench, the shorter the trench can be. Trenches normally range from 100 to 300 feet depending on the design. A typical home requires 1⁄4 to 3⁄4 of an acre for the trenches.



Horizontal Slinky Loops: Another type of horizontal loop is called the Slinky. In this installation, a trench is dug with a backhoe several feet deep, and about 3 feet wide. The coils are "layed off" and spaced evenly throughout the length of the trench. (Think of a flattened, stretched out slinky toy.) Slinkys can be designed as "compact" or "extended". Trench lengths are typically 100 to 150 feet long.



Pond Loops: If an adequately sized body of water is close to your home, a pond loop can be installed. A series of closed loops can be coiled and sunk to the bottom. A 1⁄2-acre, 8-foot-deep pond is usually sufficient for the average home. Ideally, the pond should be close to the home (less than 200 ft.). If the pond is farther from the home, the benefit of using a pond loop is reduced due to added trenching, materials and pumping costs. Pond loop coils are connected together on dry land, and then floated into location. Once filled with fluid, they will sink to the bottom and remain there. Generally, a 300 ft. coil is used for each ton of capacity. This is less pipe than is used in an earth loop because water is a better conductor of heat energy. Pond loops are a cost effective way to install a geothermal system, because trenching is limited to only the supply and return piping from the pond to the house.

Vertical Loops: Vertical loops are used where space is limited or where soil conditions are not conducive to horizontal loops. Installing vertical loops requires the use of a drilling rig. Multiple holes are bored about 10 feet apart. A double pipe connected with a U-bend is inserted into each hole. The hole is filled with grout to provide good contact around the pipe and to seal the hole. The vertical pipes are then connected to a header system horizontally a few feet below the surface. The depth of the holes is dependent upon soil/rock conditions and the size of the system. Although most holes are bored about 100 to 250 feet deep, there is no "magic depth" that needs to be reached. Capacity is not based on depth; rather how much pipe is in the ground and the overall thermal conductivity of the borehole.

Open Loop-Well System If an abundant supply of quality well water is available, an open loop system can be installed. A proper discharge site, such as a ditch, field tile, stream, or pond, must also be available. Be sure to check all local codes before selecting a discharge method. This installation usually costs less to install and delivers the same high efficiency. Care should be taken when considering using an open loop system. Depending on water quality, periodic cleaning of the heat exchanger inside the unit may be necessary. Well water containing too many contaminants may not be suitable for use with a geothermal system as it may cause the unit's performance to degrade over time. Proper testing of the water prior to installation is required.