

Geothermal Facts & Considerations

A Geothermal system (GTS) moves the earth's energy to heat and cool a home. The transfer of energy occurs when heat transfer fluid (antifreeze) or water is traveling in polyethylene tubing buried in the ground or submerged in water. Systems are classified as closed or open loops. Closed loops are buried in the ground horizontally in a trench, vertically like a well, or submerged in lake water. Open loops use well water to physically move the earth's temperature (energy) through the system. Closed loop systems (because of well water's general unpredictability) often require less maintenance. The closed or open loop liquid next passes through a self contained heat pump that operates under the principles of an air conditioner and assists with raising or lowering the temperature depending on the time of year. Ductwork is used to move conditioned air throughout the home. These are considered "water to air" systems. There is also a "water to water" system used in in-floor radiant heat applications.

Facts

- A properly sized system requires numerous measurements and calculations:
 - a. A Manual J (heat loss/heat gain) calculation is done to obtain an accurate BTU requirement.
 - b. The home's square footage, the walls, windows, doors, and ceilings also need to be measured.
 - c. The wall and attic insulation are measured.
 - d. Soil conditions, the heating and cooling loads, the number of occupants, and a host of other variables are entered into specialized software to obtain accurate equipment and loop size demands.
 - e. A Geothermal system incorporates a backup heat source. This backup heat source may/will play a part in the overall sizing of the system. Determining the type and size of a backup heat source is beyond the scope of this newsletter, and one of many reasons hiring an experienced contractor is extremely critical. Excessive undersizing will also result in higher operating costs.
- Geothermal systems are efficiency rated by a Coefficient of Performance (COP). The higher the COP rating (5 for example), the more efficient the system.
- Inadequate and/or leaky supply and return ducting will decrease system performance. The home may be draftier, noisier and have less flow. The lifespan of the system may also be shortened.
- Closed loop heat transfer fluid/antifreeze (methanol, ethanol, & propylene) each have advantages, disadvantages & limitations. The antifreezes are self contained. They do not need replenishment.
 - a. Methanol has the best heat transfer properties but is not approved for vertical applications.
 - b. Propylene is approved but has poor heat transfer properties and is thicker and requires larger pumps.
 - c. Ethanol (*Environal used with WaterFurnace*) is approved, is not thick and has good heat transfer properties.
- The underground polyethylene tubing has a warranty of 50 years (for legal purposes) but is expected to last much longer. The tubing is sensitive to ultraviolet (sunlight) light which will deteriorate/damage the tubing.
- Sandy type soils hold less heat and may require larger horizontal loop fields or more vertical wells.

Considerations

- Energy Efficiency Upgrades such as improving/replacing doors, windows, insulation and weather-stripping should be considered
- How many years of operational savings will it take for the system to pay for itself? These systems are expensive. Depending on your particular fuel heating cost (oil, propane and electric are usually higher than natural gas) the payback time will vary. Electric company rebates, electric company dual fuel programs, and tax credits may/will assist with reducing installation costs. There may/will be other variables not listed here too.
- Geothermal systems can also be used to help heat your domestic hot water.
- Are the contractor and his installers IGSHPA certified? (International Ground Source Heat Pump Association) or members of a professional organization? Membership in professional organizations often indicates a level of professionalism, commitment to continuing education, and a higher level of competency.
- How many geothermal systems has the contractor designed and installed?
- Check references. What are past customers saying about, operating costs, comfort levels and contractor support?
- Does the contractor/installer have the workers compensation insurance?

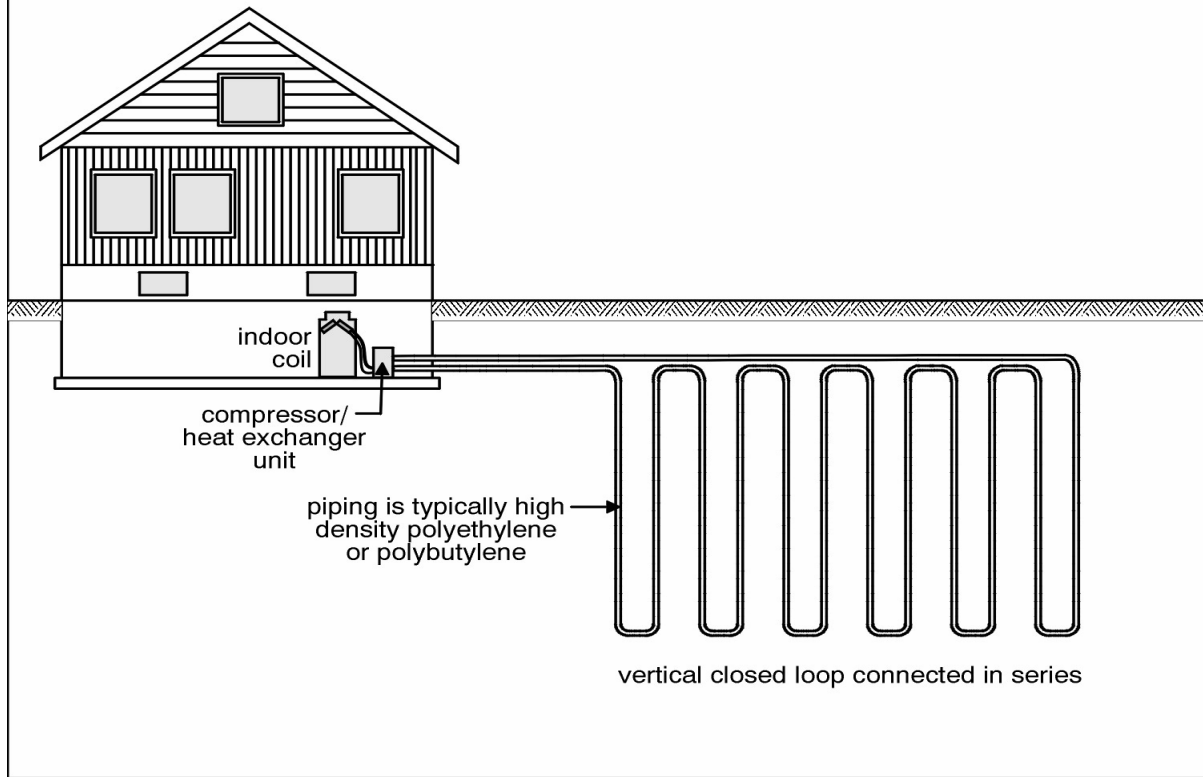
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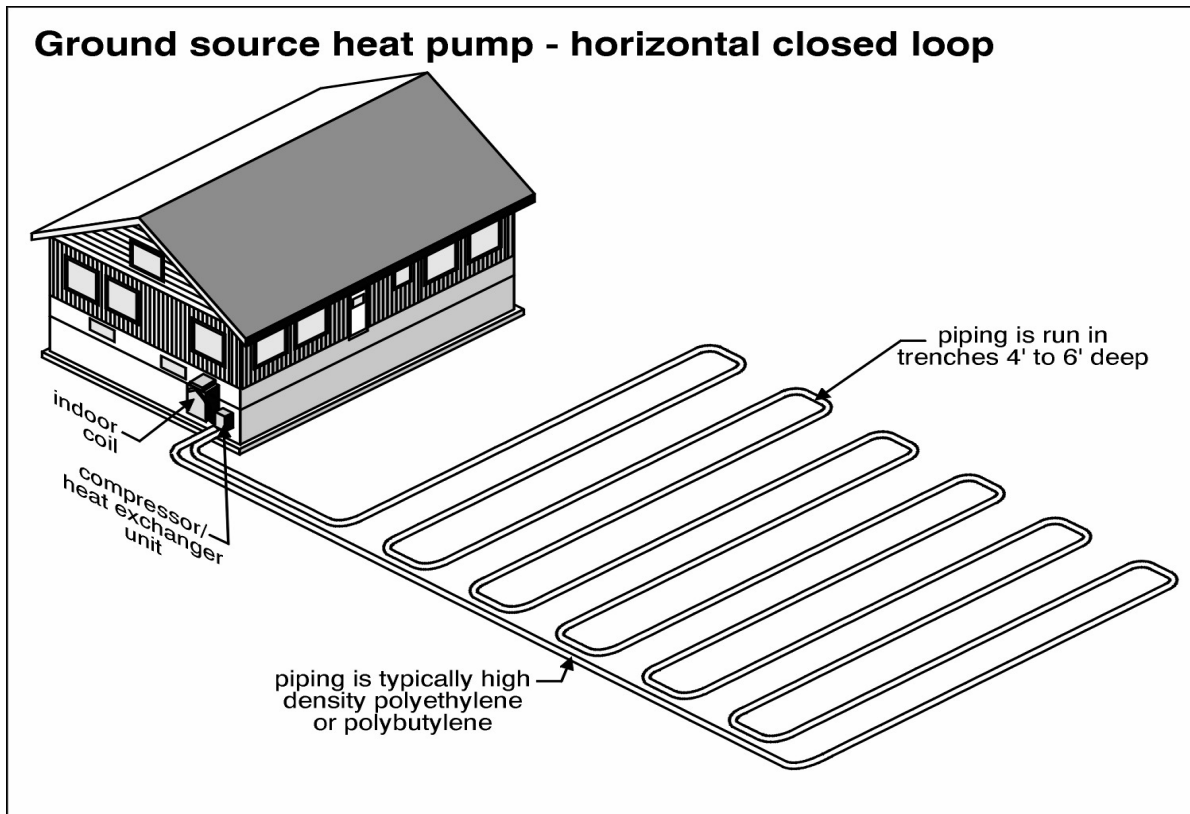
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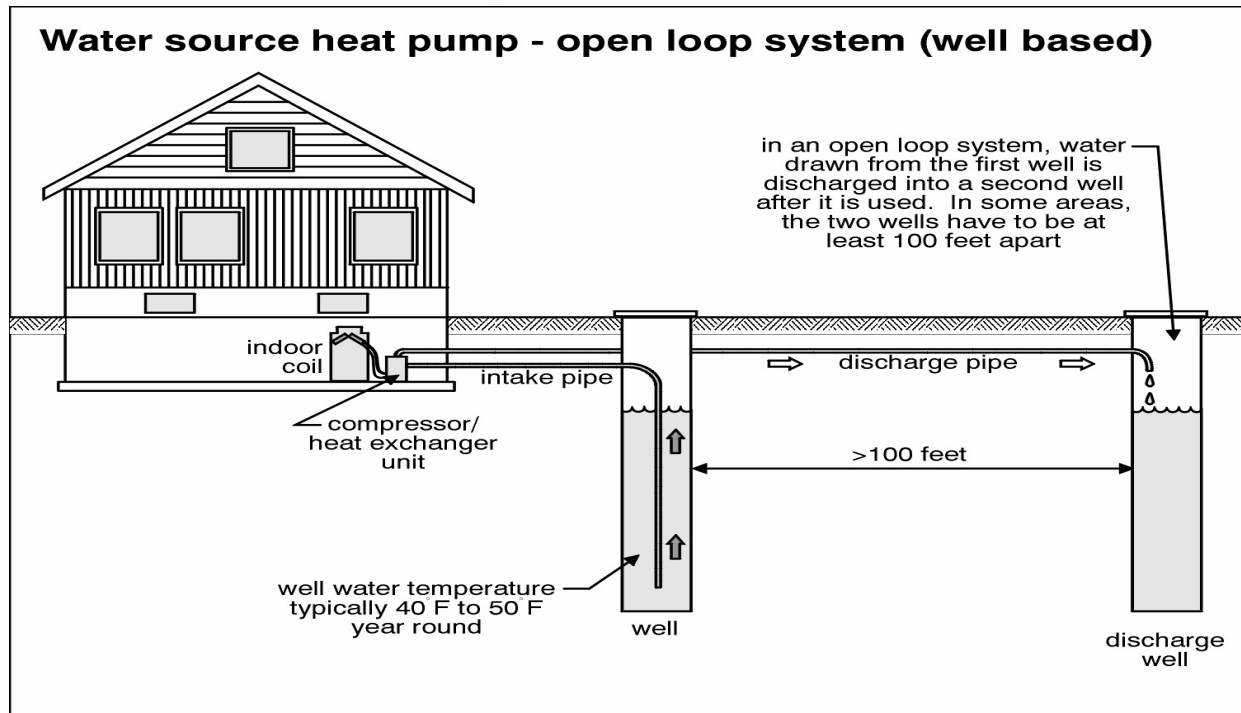
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Ground source heat pump - vertical closed loop



Ground source heat pump - horizontal closed loop





Geothermal Indoor Components

Geothermal heat pump (left side-blue) insulated tubing, a standard forced air high efficiency furnace-used as a backup heat source, (far right), ductwork, and two white pumps (mounted on wood post) used to move the heat transfer liquid. This particular home was primarily heated with propane.

Not pictured this system is also pre-heating the hot water system.

Based on the price of propane (Sept 2010) and the system's efficiency, this system will pay for itself in 8-10 years.