



What is GeoExchange?

Well Drilling • Pumps • Water Treatment

Homeowners in virtually every region of the United States are enjoying a high level of comfort and significantly reduced energy use today with GeoExchange (geothermal) heating and cooling.

This marvelous technology relies primarily on the Earth's natural thermal energy, a renewable resource, to heat or cool a house or multi-family dwelling. The only additional energy GeoExchange systems require is the small amount of electricity they employ to concentrate what Mother Nature provides and then circulate high-quality heating and cooling throughout the home.

Homeowners who use GeoExchange systems give them superior ratings because of the ability to deliver comfortably warm air, even on the coldest winter days, and because of the extraordinarily low operating costs. As an additional benefit, GeoExchange systems can provide inexpensive hot water, either to supplement or replace entirely the output of a conventional, domestic water heater.

GeoExchange heating and cooling is cost effective because it uses energy so efficiently. This makes it very environmentally friendly, too. Federal agencies such as the Environmental Protection Agency and the Department of Energy, as well as state agencies such as the California Energy Commission, endorse it.

Owners of GeoExchange systems can relax and enjoy high-quality heating and cooling year after year. GeoExchange systems work on a different principle than an ordinary furnace/air conditioning system, and require little maintenance or attention from homeowners. Furnaces must create heat by burning a fuel--typically natural gas, propane, or fuel oil. With GeoExchange

systems, there's no need to create heat, hence no need for chemical combustion. Instead, the Earth's natural heat is collected in winter through a series of pipes, called a loop, installed below the surface of the ground or submersed in a pond or lake. Fluid circulating in the loop carries this heat to the home. An indoor GeoExchange system then uses electrically-driven compressors and heat exchangers in a vapor compression cycle--the same principle employed in a refrigerator--to concentrate the Earth's energy and release it inside the home at a higher temperature. In typical systems, duct fans distribute the heat to various rooms.

In summer, the process is reversed in order to cool the home. Excess heat is drawn from the home, expelled to the loop, and absorbed by the Earth. GeoExchange systems provide cooling in the same way that a refrigerator keeps its contents cool--by drawing heat from the interior, not by injecting cold air.

GeoExchange systems do the work that ordinarily requires two appliances, a furnace and an air conditioner. They can be located indoors because there's no need to exchange heat with the outdoor air. They're so quiet homeowners don't even realize they're on. They are also compact. Typically, they are installed in a basement or attic, and some are small enough to fit atop a closet shelf. The indoor location also means the equipment is protected from mechanical breakdowns that could result from exposure to harsh weather.

GeoExchange works differently than conventional heat pumps that use the outdoor air as their heat source or heat sink. GeoExchange systems don't have to work as hard (which means they use less energy) because they draw heat from a source whose temperature is moderate. The temperature of the ground or groundwater a few feet beneath the Earth's surface remains relatively constant throughout the year, even though the outdoor air temperature may fluctuate greatly with the change of seasons. At a depth of approximately six feet, for example, the temperature of soil in our area of eastern Washington remains stable between 45° F. and 55° F. This is why well water drawn from below ground tastes so cool even on the hottest summer days.

In winter, it's much easier to capture heat from the soil at a moderate 50° F. than from the atmosphere when the air temperature is below zero. This is also why GeoExchange systems encounter no difficulty blowing comfortably warm air through a home's ventilation system, even when the outdoor air temperature is extremely cold. Conversely, in summer, the relatively cool ground absorbs a home's waste heat more readily than the warm outdoor air.

Studies show that approximately 70 percent of the energy used in a GeoExchange heating and cooling system is renewable energy from the ground. The remainder is clean, electrical energy which is employed to concentrate heat and transport it from one location to another. In winter, the ground soaks up solar energy and provides a barrier to cold air. In summer, the ground heats up more slowly than the outside air.

The Earth Connection

Once installed, the loop in a GeoExchange system remains out of sight beneath the Earth's surface while it works unobtrusively to tap the heating and cooling nature provides. The loop is made of a material that is extraordinarily durable but which allows heat to pass through efficiently. This is important so it doesn't retard the exchange of heat between the Earth and the fluid in the loop. Loop manufacturers typically use high-density polyethylene, a tough plastic. When installers connect sections of pipe, they heat fuse the joints. This makes the connections stronger than the pipe itself. Some loop manufacturers offer up to 50-year warranties. The fluid in the loop is water or an environmentally safe antifreeze solution that circulates through the pipes in a closed system.

To ensure good results, the piping should be installed by Fogle Pump & Supply, Inc. who follow procedures established by the International Ground Source Heat Pump Association (IGSHPA). Fogle Pump & Supply, Inc. are certified by IGSHPA to install GeoExchange systems. *continued*

Fogle Pump & Supply, Inc. is a certified
International Group Source
Heat Pump Association Member

What is GeoExchange?

The length of the loop depends upon a number of factors, including the type of loop configuration used; a home's heating and air conditioning load; soil conditions; local climate; and landscaping. Larger homes with larger space conditioning requirements generally need larger loops than smaller homes. Homes in climates where temperatures are extreme also generally require larger loops. A heat loss/heat gain analysis should be conducted before the loop is installed.

Types of Loops

Most loops for residential GeoExchange systems are installed either horizontally or vertically in the ground, or submersed in water in a pond or lake. In most cases, the fluid runs through the loop in a closed system, but open-loop systems may be used where local codes permit. Each type of loop configuration has its own, unique advantages and disadvantages, as explained below:

Vertical Ground Closed Loops. This type of loop configuration is ideal for homes where yard space is insufficient to permit horizontal ground closed loops, buildings with large heating and cooling loads, when the Earth is rocky close to the surface, or for retrofit applications where minimum disruption of the landscaping is desired. Fogle Pump & Supply's licensed drillers bore vertical holes in the ground 150 to 450 feet deep. Each hole contains a single loop of pipe with a U-bend at the bottom. After the pipe is inserted, the hole is grouted. Each vertical pipe is then connected to a horizontal pipe, which is also concealed underground. The horizontal pipe then carries fluid in a closed system to and from the GeoExchange system. Vertical loops are generally more expensive to install, but require less piping than horizontal loops because the Earth deeper down is cooler in summer and warmer in winter.

Horizontal Ground Closed Loops. This configuration is usually the most cost effective when adequate yard space is available and trenches are easy to dig. Fogle Pump technicians use trenchers or backhoes to dig the trenches below the ground, then lay a series of parallel plastic pipes. They backfill the trench, taking care not to allow

sharp rocks or debris to damage the pipes. Fluid runs through the pipe in a closed system. A typical horizontal loop will be 400 to 600 feet long per ton of heating and cooling capacity. The pipe may be curled into a slinky shape in order to fit more of it into shorter trenches, but while this reduces the amount of land space needed it may require more pipe. Horizontal ground loops are easiest to install while a home is under construction.

Pond Closed Loops. If a home is near a body of surface water, such as a pond or lake, this type of loop design may be the most economical. The fluid circulates through polyethylene piping in a closed system, just as it does in the ground loops. Typically, workers run the pipe to the water, then submerge long sections under water. The pipe may be coiled in a slinky shape to fit more of it into a given amount of space. GeoExchange experts recommend using a pond loop only if the water level never drops below six to eight feet at its lowest level to assure sufficient heat-transfer capability. Pond loops used in a closed system result in no adverse impacts on the aquatic system.

Open Loop System. This type of loop configuration is used less frequently, but may be employed cost-effectively if ground water is plentiful. Open loop systems, in fact, are the simplest to install and have been used successfully for decades in areas where local codes permit. In this type of system, ground water from an aquifer is piped directly from the well to the building, where it transfers its heat to a heat pump. After it leaves the building, the water is pumped back into the same aquifer via a second well--called a discharge well--located a suitable distance from the first. Local environmental officials should be consulted whenever an open loop system is being considered. These systems are also referred to as a pump & dump system.

Sound Investment

GeoExchange is becoming the system of choice in many parts of the United States as consumers learn more about its aesthetic advantages and long-term value, and as it becomes more widely available.

GeoExchange is no longer just for the affluent, a reputation it once held because typical early buyers were owners of upscale homes. They wanted the quiet comfort GeoExchange systems provide, and they were more than willing--and could afford--to pay the cost premium associated with early systems. This is because the extraordinarily low operating costs of GeoExchange systems more than make up for any higher installation costs within a few years. According to the U.S. Environmental Protection Agency, GeoExchange systems save homeowners 30% - 70% in heating costs, and 20% - 50% in cooling costs, compared to conventional systems. GeoExchange systems also save money in other ways. They are highly reliable, require little maintenance, and are built to last for decades. They add considerably to the value of homes.

Today, homeowners in all income brackets can take advantage of the benefits of GeoExchange heating and cooling. Initial costs have declined substantially as many more builders and heating and cooling contractors nationwide make GeoExchange the system of choice.

What's more, some electric utilities around the nation now have incentive programs and low-interest financing programs which can make GeoExchange even more affordable. Many financial institutions also now allow home buyers to qualify for larger mortgages if they purchase a house that utilizes a GeoExchange system. The reduction in monthly energy bills more than offsets the slightly higher mortgage payment. With such mortgages, homeowners with GeoExchange systems can begin saving money from day one, then go on saving year after year!

Today, the major barrier to wider use of this marvelous technology is the fact that many consumers simply aren't aware it's there.

A Wise Choice

GeoExchange is a smart investment for consumers who want a system that provides a high level of comfort and low monthly energy bills for as long as they own their homes.

1-800-533-6518

www.foglepump.com

- Colville
- Spokane
- Republic