

Geothermal Systems - Heating and Cooling Using the Earth

How Do They Work, and How Much Do They Cost?

Homeowners looking to build greener are considering geothermal heat pump systems. What's the buzz all about? Here are answers to some of the top questions - including how much this type of heating and cooling system will cost, and how it works, and whether you should install one.

What is a Geothermal Heating and Cooling System?

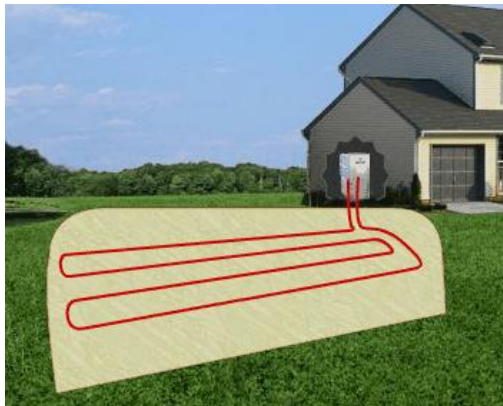
A series of pipes, or loops, are buried in the ground near the building or home that is to be heated and cooled. These loops circulate a fluid that either absorbs heat from the surrounding soil, or dissipates heat into the ground. The fluid can be water, or a mixture of water and antifreeze, depending on the climate and the type of system.

How can the ground heat and cool air or water?

Have you ever been in a cave? You probably noticed that the air was nice and cool, no matter how hard the sun was blazing up above ground. A geothermal heat pump system takes advantage of the natural temperature stability underneath the earth. The ground underneath the frost line (usually about 4 feet deep) stays a constant 50-55 degrees, no matter what the weather up above is like.

How does the geothermal system heat the air?

It's similar to a traditional system - but in this case, the earth's temperature has done most of the work. A geothermal heat pump works with the fluid from the loops, removing the heat. It then concentrates that heat, and transfers it to the home's standard duct system. When cool air is needed, the process is reversed.



How much space is needed for the geothermal loops?

The loops needed for a geothermal system can be buried either vertically or horizontally. The horizontal method is preferred if enough suitable land is available.

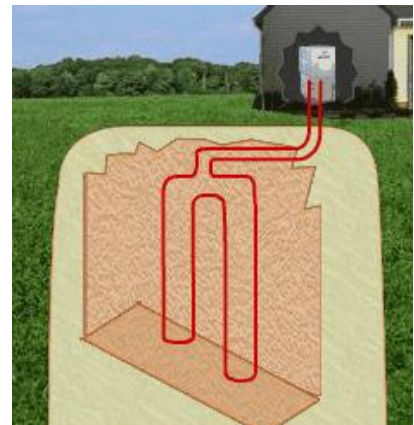
Horizontal Loop System

Horizontal installation of geothermal system loops is probably most common. Several different methods and layouts are available. The most common: two pipes (one of which is buried 6 feet deep while the other is buried 4 feet deep), or two pipes (placed

side by side in a two foot wide trench, at a 5 foot depth). There is also the "Slinky" method, in which pipes are looped in a spiral pattern, allowing more pipe in a shorter trench.

Vertical Loop System

Vertical loops require drilling equipment. Four-inch diameter holes are drilled about 20 feet apart and 100 to 400 feet deep. Two pipes are inserted into each hole and connected at the bottom with a "U-bend" to form the required loop. The vertical loops are connected near the surface with a horizontal pipe system, which is then connected to the heat pump in the home.



What is a Geexchange system?

A geothermal system is called many different things, including geexchange, ground water, ground water source, ground water assisted, and water furnace heating and cooling. All refer to some type of "loop" system that harnesses a constant underground temperature and uses it for heating and cooling.

How can I install a geothermal system into my Raleigh new home?

If you are considering installing a geothermal heat pump system, you'll want to make your decision before the foundation is completed, if possible. There will be some cost savings if the trenching work can be done at the same time as other lot and foundation preparation work. Also, once the framing is completed, most home builders will have already ordered a conventional HVAC system.

What home builders in the Raleigh area will install a geothermal system?

Even though geothermal systems have been used since the 1940s, they are not a typical feature of most homes. Look for a custom home builder who is willing to work with nonconventional building methods and materials.

How much does a geothermal system cost in the Raleigh/Triangle area?

Like any heating and cooling system, the total cost depends on several factors. How large is the home? What is the climate like? And in this case, what are the soil conditions? Is there enough room for a horizontal loop system? At what point was the decision to install made?

In general, your heating and cooling equipment and installation costs will be at least double or triple a conventional system - depending on the type of system, the excavation needed, and the size of home. Several recent quotes in the Raleigh area gave a price tag of \$20-30K more than a conventional system, for a new home.

Do I save any money by having a geothermal system?

According to Energy Star and the US Department of Energy, a geothermal heating and cooling system will save you about 30% on the cost of heating and cooling energy each month.

There are other benefits too.

A reduced use of energy reduces air pollution.

Most geothermal systems have a 25 year manufacturer's warranty. On the flip side, Westinghouse and Trane warranty their heating and cooling products for up to 10 years. So a higher cost upfront may lead to lower replacement and repair costs later.

There are aesthetic features as well - a geothermal system has a smaller indoor-only unit, so there's no big air conditioning unit sitting outside the home. Homeowners say these systems are quieter and offer more uniform heating and cooling.

Should I install a geothermal system?

A conventional and geothermal heating and cooling system each have attractive features. The lower cost on a conventional system attracts many homebuyers, but the potential long term savings and healthier environmental impact influence others to choose a geothermal system. Work with your home builder to determine which system is better for your needs.

Quick Fact: Iceland gets 99% of its electricity using geothermal sources!

