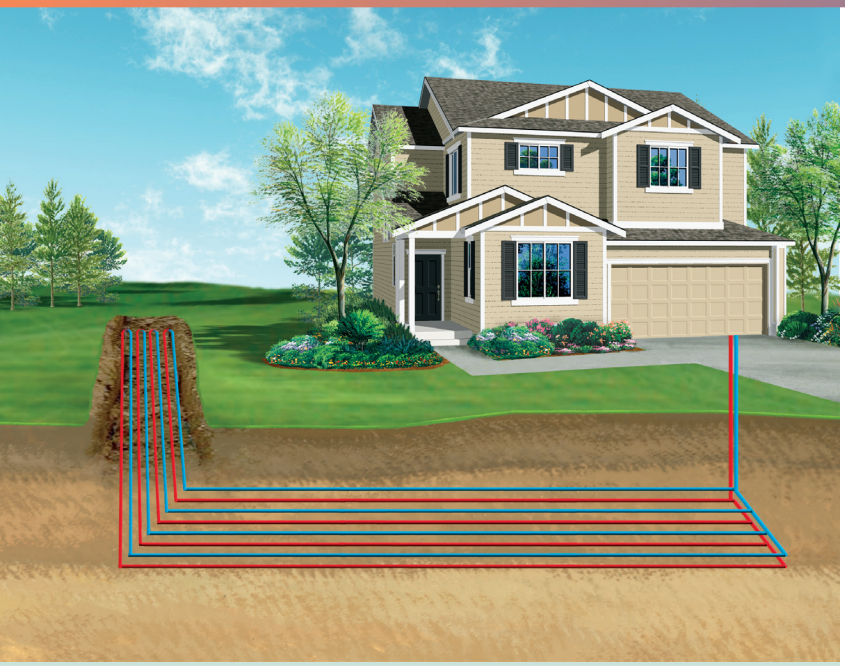
Geothermal Heat Pumps

Tapping Renewable Energy Beneath Our Feet



Geothermal heat and cooling systems work in harmony with the environment by capturing the renewable solar energy stored beneath the earth's surface. They can make significant contributions to a cleaner environment by saving energy consumption, cutting the use of fossil fuels, slashing air pollution and reducing our impacts to climate change.

A Comfortable Green Energy Solution

- Geothermal heating and cooling saves energy, reduces fossil fuel use, and slashes carbon emissions.
- Geothermal heat pumps are truly a "50-State" renewable energy technology. Geothermal systems harness on-site renewable energy available across America, providing energy savings for new construction and retrofits.
- Geothermal systems are a source of reliable energy that doesn't need new power plants or transmission lines.
- Geothermal heat pumps are "Made in the USA" by an innovative industry that is creating thousands of local, skilled jobs across America. From manufacturing through system design, distribution and installation, the geothermal heat pump industry is an engine of our economy.
- The CO_2 reduction benefits of geothermal heat pump systems are substantial compared to traditional air-to-air heat pumps or natural gas heating systems with electric air conditioning. They shrink the carbon footprint of a typical American home by nearly 50%.
- Higher first cost is associated with excavation or drilling to install ground loops. With federal 30% residential / 10% commercial tax credits — plus various state and utility rebates around the country — payback for the higher cost of typical installations compared to standard heating and air conditioning equipment is typically 5 to 8 years.

Geothermal heat pumps systems effectively address one of the most hungry consumers of U.S. energy. Buildings dominate the nation's energy use, devouring over half of our electricity and natural gas. More than 70% of average energy demand for a typical single family home is to meet heating and cooling (thermal) needs. With a geothermal heat pump, that energy use can be cut by 40% to 70%, reaping huge savings on your utility energy bill. And geothermal heat pumps are a renewable, clean energy source that we can all use without the need for additional expensive, fossil-fueled power plants and intrusive electric transmission lines.

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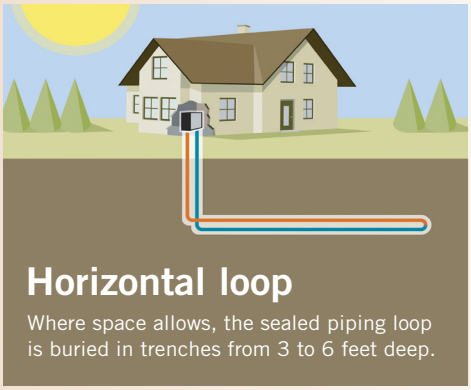
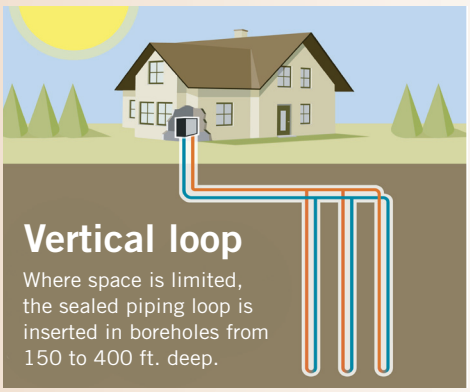


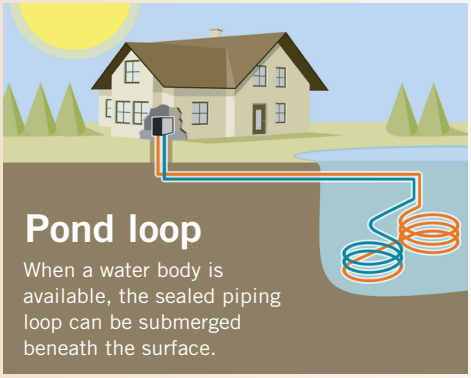
Horizontal loop

Where space allows, the sealed piping loop is buried in trenches from 3 to 6 feet deep.



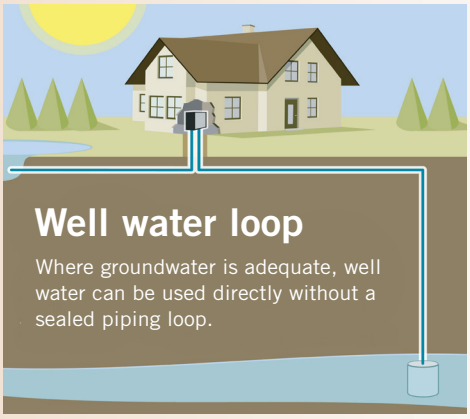
Vertical loop

Where space is limited, the sealed piping loop is inserted in boreholes from 150 to 400 ft. deep.



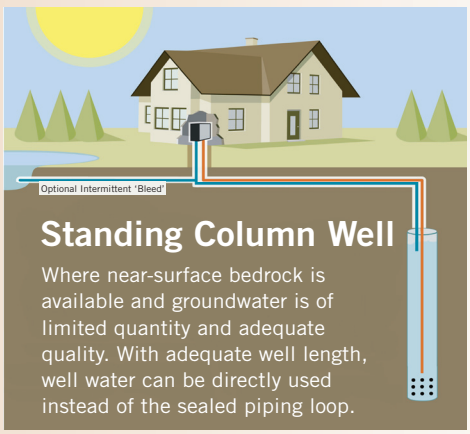
Pond loop

When a water body is available, the sealed piping loop can be submerged beneath the surface.



Well water loop

Where groundwater is adequate, well water can be used directly without a sealed piping loop.



Standing Column Well

Where near-surface bedrock is available and groundwater is of limited quantity and adequate quality. With adequate well length, well water can be directly used instead of the sealed piping loop.

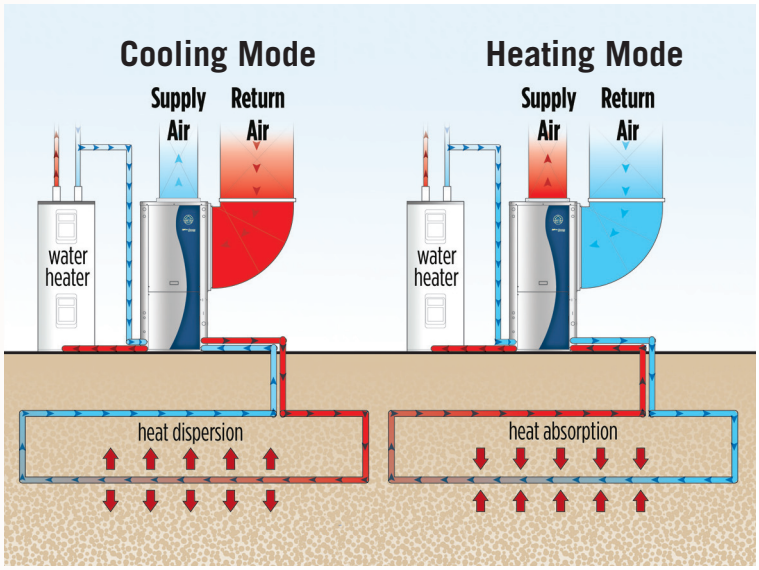
According to the U.S. Department of Energy and the U.S. Environmental Protection Agency, geothermal heating and cooling systems are the most environmentally friendly way to control the indoor environments of homes, businesses, and institutional spaces of all sizes. With additional equipment, they can be used for essentially free hot water — and even for heating floors and swimming pools.

How Do They Work?

Geothermal heat pump systems can be sized to heat and cool any building, large or small, in any climate.

A series of plastic pipes — called ground loops — are buried beneath the earth's surface where temperatures are constant from 40° to 80° F throughout the year depending upon where you live. The pipes are sealed tight, and connected to the geothermal heating and cooling system inside the building. Water circulates through the underground pipes. There are five types of ground loop installations, shown at left.

During the summer months in cooling mode, unwanted heat indoors is transferred outside through the water in the pipes for cooling by the earth. The cool water is then circulated to the geothermal system indoors to provide efficient air conditioning. During the winter months in heating mode, the process is reversed. The earth heats the water circulating through the pipes, which is transferred to the geothermal system indoors to provide comfortable space heating. Hot water can also be provided for little or no additional monthly energy cost.



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