OPEN VS CLOSED LOOP SYSTEMS

Making the Right Choice

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With Canadians increasingly seeking cost-effective and environmentally friendly alternatives for heating and cooling their homes, geothermal technology is quickly moving to the forefront as the alternative of choice.

Once consumers or business owners make the momentous decision to switch, it's up to savvy and knowledgeable HVAC dealers and contractors to help their customers select the most efficient and effective geothermal system to meet their needs. That includes installing the right loop system.

High density geothermal pipe is buried underground in a loop system and uses environmentally friendly antifreeze solution from a ground source (closed loop) or pure water from a well (open loop) to carry energy into the heat pump inside the house or building. In the winter, the heat pump acts as a furnace, distributing the heat throughout the structure using the system's heat exchanger and compressor. In the summer, it acts as an air conditioner, collecting the heat from the building and distributing it into a domestic hot water tank or back into the earth through the loop system.

So what's the difference between open and closed loop systems?

CLOSED LOOP SYSTEM:

The cost effective choice

The most common loop system available for geothermal installations is the closed loop system. It's extremely reliable, requires little maintenance and generates low operating costs.

It also offers three options for installation – horizontal, vertical or pond/lake loops.

Horizontal Loop – This is the most common type of closed loop system and is most often used in rural and new construction areas owing to the land space needed for installation. A continuous loop of high density geothermal pipe is buried in five to six foot deep trenches. The amount of pipe used is dependent upon building load, but a typical installation would require about 600 linear feet of 3/4" pipe per nominal ton. The trenches are then backfilled with soil.

PROJECT ONE

Bi-Level House in Baynes Lake, British Columbia

Location: Rural, existing home

Size of Home: 1,200 square feet

Geothermal Equipment: Premium forced air unit, five ton capacity

Loop Type: Horizontal closed loop system, 3/4" PE100 geothermal pipe, 3,200 feet of looped pipe in yard.

Replaced: Combination oil/wood gas furnace

Estimated Costs: Average costs per month over a year to run geothermal system for heating and cooling and supplementary hot water is approximately $38/month.

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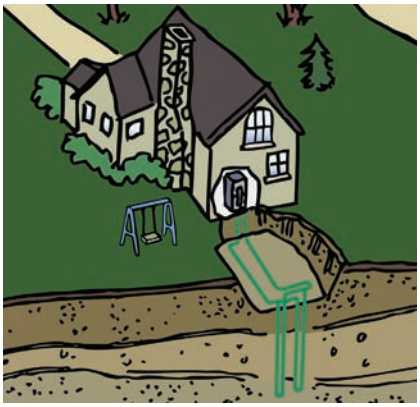
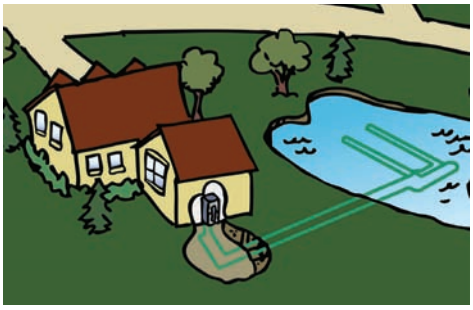
Vertical Loop – This approach is typically used in urban areas because it requires little land space for installation. A specially designed geothermal driller is used to bore vertical holes in the ground ranging from 180 to 540 feet deep. A typical installation would require about 360 linear feet of 1-1/4" high-density geothermal pipe per nominal ton. The pipe is looped within the holes and the holes are then filled with bentonite grout. Vertical installation costs tend to be higher than horizontal and pond/lake installations, but they generally require less pipe.



Pond/Lake Loop – Similar in costs to horizontal loop systems, this approach can be used on properties that have a nearby lake or pond that is appropriate in size and eight feet deep. A series of 200 to 250 linear feet of 1-1/4" high-density geothermal pipe loops per nominal ton are submerged at the bottom of the body of water. Two pipes are then buried in the ground to carry energy from the lake or pond to the house or commercial building.



By design, all three closed loop systems offer the same efficiency. The vertical and pond/lake systems will disturb the least amount of land area. Horizontal and pond/lake systems can be installed in one to two days while vertical systems typically take a week or more to install depending upon drilling conditions.

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OPEN LOOP SYSTEM:
The efficient choice

Open loop systems are typically used on rural properties that have two existing high capacity water wells and are considered to be the most efficient of the loop systems. These wells should be approximately 100 feet apart. Ground water is withdrawn from an aquifer through a supply well and pumped into the ground source heat pump. Once the heat pump has removed the energy from the water, the discharged water is redirected into a second well and back into the aquifer.

The water from the supply well is used as a heat source in the winter and as a heat sink in the summer. Typically, an open loop system will use two U.S. gallons of ground water per minute per nominal ton of equipment installed.

This system allows for maximum efficiency in the heat pump because it absorbs energy directly from water pumped out of the well, rather than relying on a water solution re-circulating through a series of underground looped pipes.

On the other hand, while extremely reliable, open loop systems can face consequences down the road if there is a change in the water supply. Water quality can also be an issue as it can lead to mineral build-up inside the heat pump exchanger and require periodic cleaning.

PROJECT TWO

Large Bungalow Cottage
on Rice Lake, Peterborough, Ontario

Location: Rural, new construction

Size of Cottage: 10,000 square feet of total floor space

Geothermal Equipment: Three heat pumps installed to support a combination of infloor heating throughout the home with forced air cooling.

Loop Type: Open loop system, pumping 24 gallons per minute from a supply well and discharging 24 gallons per minute back into a discharge well after heat pump has extracted energy from it.

Estimated Savings: This is a large home that would have been on a propane system if geothermal had not been installed. Estimated energy cost savings are 75 per cent compared to the conventional system. Dollar savings approximately $5,000/year.