Homeowner's Guide to

GEOTHERMAL

The *Best Option* in heating and cooling your home: for you, your family and the environment!

GeoComfort®
Geothermal Systems
Live comfortably.®

Home *Sweet* Home

GeoComfort®
Geothermal Systems
Live comfortably.®

As much as we love the great outdoors, the sound of birds chirping in the morning and the smell of fresh cut grass, most of our lives are spent indoors. In fact, the United States EPA found that the national average of time spent indoors was 87%. Increasing the comfort of what happens during the majority of your time can transform a house into a home.

Pillow fights. Dinner parties. Christmas morning. Baking cookies. Bubble baths. Snuggling on the couch. Let the unsurpassed comfort of a GeoComfort™ geothermal system make all of your best moments even better. Innovative, highly efficient and earth-friendly geothermal technology can help you do just that.

Your house isn't just a dwelling structure, it's the backdrop for a lifetime of memories, a "staycation" destination and a place your kids will always call "home".

get the FACTS about GEOTHERMAL Heating & Cooling

Is geothermal heating and cooling technology new?

Actually, the basic "modern" technology has been around for more than 50 years and improved upon ever since. To date, over one million installations in the United States alone have allowed a significant amount of homeowners and businesses to enjoy the benefits of geothermal systems. In fact, consumers rank their comfort and satisfaction with geothermal systems higher than any other type of system.

How much can I really save by installing a geothermal system?

Your exact savings will be determined by many variables, such as your climate, thermostat setting and electric rate, among others. Most homeowners will see a reduction of 30 to 70 percent in their heating and cooling costs.

A study by the U.S. Environmental Protection Agency showed that geothermal systems have the lowest life-cycle cost of all heating and cooling systems currently on the market. Lower maintenance costs and longer life expectancy of geothermal units should certainly be taken into consideration when determining true savings.

To see how much a GeoComfort geothermal system can save you, please visit us at www.geocomfort.com/calculator. Our proprietary savings calculator allows you to enter your home's information along with your existing utility and fossil fuel pricing to determine just how much an efficient GeoComfort geothermal system can save you versus alternative heating and cooling systems.

GeoComfort®
Geothermal Systems
Live comfortably.®

get the FACTS

What is the *real* environmental impact?

The U.S. Department of Energy supplied data noting that nearly 40% of all emissions of carbon dioxide (CO_2) in the United States are a result of using energy to heat, cool and provide hot water for buildings.* This is the largest contributor of CO_2 and can be equated to the amount contributed by the transportation sector. Clearly this is a large-scale problem with significant opportunity for emissions reduction.

While studies have not yet been done to determine the impact of newer, more efficient geothermal systems, a study completed in the 1990s demonstrated the environmental equivalent of installing a geothermal system and is widely noted. This research detailed the carbon dioxide emissions of a standard 3-ton residential geothermal system versus that of a conventional fossil fuel system. The results demonstrated that the geothermal system produced approximately one less pound of carbon dioxide per hour of use. This data expanded over 20 years of use would equate to the environmental impact of planting 120,000 acres of trees or converting approximately 58,000 cars to zero emission vehicles.**

Is geothermal heating and cooling effective in my climate?

Yes! Geothermal technology works in cold climates, hot climates and everywhere in between. Geothermal technology transfers heat to and from the earth, versus the air. While air temperatures fluctuate greatly from climate to climate, the earth maintains a fairly constant temperature. This constancy is what makes ground source applications (geothermal) more efficient than air source in virtually any outdoor environment.

What is the difference between Geothermal Heating and Cooling and Geothermal Energy?

Geothermal heating and cooling is different than geothermal energy. The word geothermal comes from the Greek words "geo" (meaning earth), and "thermos" (meaning heat). Earth heat describes both geothermal energy and geothermal heating, but each utilizes heat created by a different source. Geothermal energy is a natural energy source derived from the heat found in the earth's core. An example of this is the magma, or liquid rock that comes from the earth's center through geological openings and flows from volcanoes. Hot springs and geysers are examples of warmth created with this kind of energy.

Geothermal heating and cooling does not use geothermal energy, but rather ground source energy. (For that reason, you may hear geothermal heat pumps called ground source heat pumps.) Geothermal heat pump technology relies on the sun to heat the ground at the earth's surface, rather than the earth's core to heat it from below. Geothermal energy use is not widespread due to the complications of geology. Because geothermal heat pumps use the sun's energy, which is much more accessible, their application is viable virtually everywhere.

* US Department of Energy, Buildings Energy Data Book
**Study completed by Geothermal Heat Pump Consortium, reported by GeoExchange.org

Geothermal Benefits

Safe

Flammable fossil fuels are not used to operate geothermal units. Because there is no combustion, there is no chance of explosion, hazardous fumes or risk of carbon monoxide poisoning.

Lower Operational Costs

Geothermal systems have efficiency ratings of 400 to 500 percent. An efficiency rating is the ratio of heat actually generated versus the amount of energy used to produce the heat. A rating of less than 100 percent means you are losing heat that you are paying for. This loss is typically caused by energy consumption required for the combustion process of a fossil fuel furnace. The most efficient natural gas furnaces cannot compete at a rating of only 95 percent.

Green

Geothermal systems have a positive impact on the environment since they burn no fossil fuels and operate on a modest amount of electricity. According to the United States Department of Energy and the Environmental Protection Agency, geothermal systems are the most environmentally friendly way to heat and cool your home. They do not emit greenhouse gasses, which are known to contribute to environmental air pollution.

Peacefully Quiet

Conventional air conditioners and heat pumps require noisy outdoor equipment. Geothermal systems do not. In fact, GeoComfort Compass Series™ units feature a unique cabinet design that isolates the unit's compressor, all but eliminating any rattling or vibration caused by system operation.

Unmatched Comfort

Geothermal systems provide superior air comfort. They demonstrate increased air purification and dehumidification versus conventional systems. In addition to improved air quality, geothermal systems keep indoor air temperatures at consistent levels, eliminating hot and cold spots that are typical of all traditional/conventional systems. For ultimate comfort, zoning allows for distinctive temperature adjustments in different areas of your home.

Bonus Hot Water

Geothermal systems have the capability of capturing reclaimed heat during heating and cooling modes and using it to heat domestic water. This application can reduce the water heating cost of a four-person household by up to 50 percent. You may hear this referred to as "hot water assist", or "hybrid hot water" and is a function of the units desuperheater component option.

Longer Life Cycle

You can expect your geothermal system to provide an average of 20 to 24 years of reliable comfort and savings. The loop field has an indefinite life expectancy. In comparison, the average life cycle of a conventional system is 13 to 15 years.

Flexibility

A geothermal installation is an excellent heating and cooling solution for nearly any situation. Geothermal systems perform well in cool northern climates as well as warm southern conditions, in homes small, large, new, existing and every home in between.

As well as being *unique* in the way that they heat and cool, *geothermal systems* also provide distinctive benefits *unparalleled* by their conventional counterparts.

Geothermal: A Sound Investment

A geothermal system is an investment in the future:
the future of your family, the environment and your home.

The notion that geothermal systems are for the affluent and are priced out of the average person's reach is a misconception. In fact, the economical advantages to selecting a geothermal system over a conventional system are numerous.

Pricing

While there is no accurate rule of thumb for determining the purchase price of a geothermal system for your home, your local GeoComfort dealer can assist you in selecting a system model to meet your requirements and a loop type to fit your needs. Innovations in geothermal technology and installation techniques make it more affordable than ever to experience the best heating and cooling solution on the market today.

Incentives

As part of the American Reinvestment and Recovery Act, **the United States federal government allows a 30% tax credit for ENERGY STAR® qualified geothermal equipment installed before December 31, 2016.** Additionally, many states/provinces and utilities have programs supporting the installation of geothermal systems. Available state incentives may be located in the Database of State Incentives for Renewables and Efficiency at www.dsireusa.org. Contact your local utility company to inquire about any incentives that they may offer as well. Many Canadian provinces also offer geothermal incentives. Contact your local dealer for more information.

Monthly Cost of Home Ownership

When considering any new heating and cooling system, it is important to put in perspective of the cost of home ownership. Similar to the cost of doing business, it is the amount of money that you know you will pay each month to run your home. This would include your mortgage payment, electricity, heating, cooling and hot water costs. In a new construction situation, the cost of the heating and cooling system would typically be included in the mortgage payment. While selecting a geothermal system may increase your monthly mortgage payment, the savings you experience on your monthly heating and cooling bills will actually be more than that nominal increase thus providing positive cash flow. By opting to capture residual heat to warm household water, you will save even more on your monthly expenses.

Compare to Conventional Systems

In some respects, comparing the investment of a geothermal system to the cost of a conventional system is comparing apples to oranges. What may appear at first glance as a "good deal" on a conventional system may not in reality be the most economical choice.

1. Geothermal systems will reduce monthly heating and cooling bills by up to 70% over conventional systems. Operating costs are not subject to the volatile swings associated with fossil fuel pricing.

2. The average life expectancy of a geothermal unit is nearly 25 years compared to the 13 year average life expectancy of conventional systems. Most loop fields have an indefinite life expectancy!

3. Geothermal systems have less maintenance costs. This is primarily due to geothermal equipment being indoors where it is not exposed to the elements. Geothermal systems also have fewer moving parts, which provides for less opportunity for malfunction.

4. Geothermal allows the opportunity for "hybrid" hot water, reducing monthly cost of hot water as well as heating and cooling.

5. Geothermal systems provide long term value to a home and are becoming attractive selling points in the real estate market.

Fuel Source Comparison

	Electric Technologies			Fossil Fuel Technologies			
	Geothermal	air-to-air heat pump	electric resistance	propane	natural gas	fuel oil	wood burner
heating and cooling all in one	✓	✗					
no outdoor equipment	✓						
uses the earth's free heat	✓						
no combusion	✓	✗	✗				
environmentally friendly	✓		✗**				
radiant floor application	✓		✗	✗	✗	✗	✗
capable of zoning	✓	✗	✗	✗	✗	✗	
volatile operating/fuel costs				✗	✗	✗	✗
highest efficiency	500%*	250%*	100%	95%	95%	83%	***
requires electricity to operate	✓	✗	✗	✗	✗	✗	✗**
requires fuel storage tank				✗		✗	
30% US tax credit	✓						

* Ground loop conditions up to 5.0 COP/ 17°F outdoor air temperature for air-to-air heat pumps

** Dependant on generation source

*** Varies depending on:
wood type
type of fireplace
method of operation

Going green is not just about restoring the rain forests or saving endangered species; *it is about making the earth healthier for you and for future generations.*

green LIVING

Green is the new black. You've probably noticed that going green is being talked about everywhere these days. It is in the news, fashion, politics, technology and entire television shows are devoted to being eco-friendly.

Actions that once seemed tedious and demanding, such as recycling and carrying canvas grocery bags have now become second nature. As we become more aware of globalization and how our actions can affect people half way across the world, we discover the importance of our everyday choices. The simple truth is that everything we do has an impact on our planet, good or bad. It is all about choices.

Being eco-friendly does not necessitate changing your entire lifestyle or sacrificing personal comfort. You can purchase products that use recycled packaging over those that do not. You can turn off the water while you brush your teeth or use old newspapers to clean your windows and mirrors instead of paper towels.

Every little bit helps.

Geothermal heating and cooling provides many benefits, one of them environmental. The fact that the energy it uses comes from nature makes it very appealing from an economic as well as an environmental perspective. Because it uses a renewable source that will never go out of supply, it incurs less operational costs compared to any other type of heating and cooling system on the market today. It is not known to have any negative environmental impact. Geothermal systems emit no fumes because they do not burn fossil fuels. That means there are no greenhouse gasses impacting the ozone or our air quality.

Unlike some other practices, going green by installing a geothermal system requires no sacrifice. In fact, the only lifestyle changes you will have to make is to stop wearing socks to bed and to leave the thermostat set to the most comfortable setting, regardless of the time of year or time of day. The choice is yours.

Geothermal for Replacement: Your Home Made Better

Having an older home does not preclude installing a geothermal system. This is often called a retrofit application, and these installations are becoming increasingly popular.

If your furnace or boiler is nearing 20 years old, it is likely a good investment to replace it soon with a geothermal system. If your current system has a pilot light, it was likely installed prior to 1992 and has an efficiency of roughly 65%. Geothermal systems are 400 to 500% efficient, so your operational costs will be significantly reduced.

If your furnace is over ten years old and you are dissatisfied with high utility and maintenance costs or are experiencing discomfort, you should call a qualified GeoComfort dealer/installer to evaluate your current system and provide you with a comparison to a new geothermal system.

If you have a newer conventional heating and cooling system but would like increased efficiency, a geothermal split system can be added to assist your existing furnace in essence creating a *hybrid* **heating system.** The geothermal system would provide the first stage of heating for your home, and in extreme temperatures the existing furnace would supplement it. While this system will not eliminate the need for fossil fuels such as natural gas, propane or fuel oil, it will reduce your home's carbon footprint and decrease your monthly utility bills. Another benefit of this type of system is a reduced cost versus a complete geothermal package system.

The installation of a new geothermal system in an existing home can range from simple to complex, depending on existing ductwork and type of loop field required for your particular situation. Your geothermal specialist will be able to determine the viability of the installation after determining your specific heating and cooling needs.

There are financing options available such as equity line mortgages or financing programs may be available through your participating GeoComfort dealer. Typically, your energy savings will be enough to justify installing the system, particularly if you also want to replace your water heater. Most geothermal systems are installed with a "desuperheater" that uses excess heat to heat water for no added cost during both heating and cooling modes. A retrofit geothermal application is eligible for all federal/Provincial tax rebates and local incentives.

It is important to remember that while a new efficient geothermal system will certainly improve your situation it may not solve all of your concerns if your home has other deficiencies such as high air infiltration or poor insulation.

Radiant floor Heating

The Ultimate in Comfort!

Radiant floor heating, also called hydronic heating, is increasing in popularity because of its superior comfort and elimination of nuisance issues associated with many heating and cooling systems. Radiant systems are truly imperceptible systems. There is no noise from clanking radiators or blowing air. There is no ductwork or registers to detract from your home's aesthetic. In essence, radiant floor heating eliminates the noise, dust and draft issues associated with conventional forced air. What's more, radiant heating is a highly efficient way to heat your home, increasing your comfort while reducing energy costs.

With a radiant system, warm water is circulated through tubes installed under the floor. As the water circulates, the heat radiates, warming the floor from below. In a conventional forced air system, hot air blows from the registers, rises to the top of the room and drops down as it cools. The temperature difference between the ceiling and where you are sitting can vary greatly, often resulting in cold feet. Cycling of forced air systems can create other problems. Quickly heating a room and shutting off can create the phenomenon of being cold when the blower shuts off, even if the thermostat is reading 70 degrees. These uncomfortable up and down temperature swings are not present with radiant floor heating.

Radiant heat warms objects in the space, not the air. Because the heat emanates from the floor instead of being blown into the room, the cooler air is actually at the ceiling and the warmth is located more practically

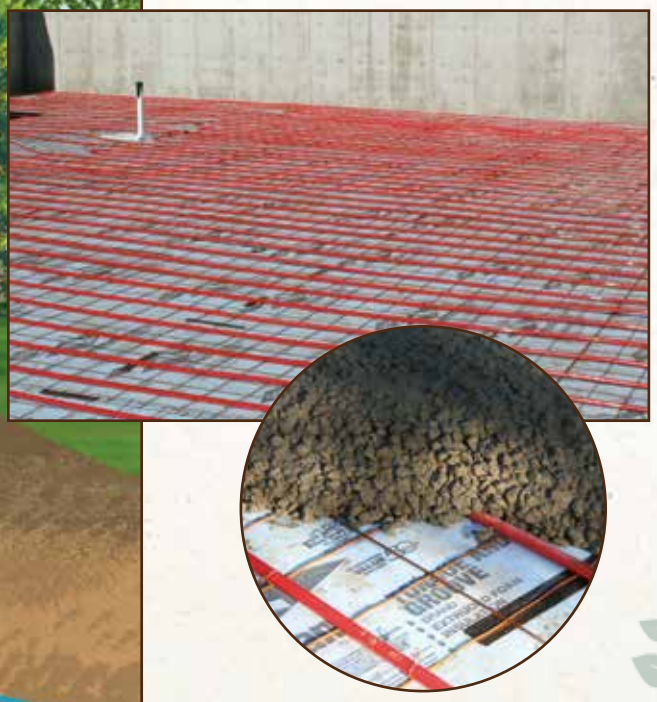
in the livable space below. The gentle, even warmth of radiant heat is spread throughout your floor, so there are no hot and cold spots that can develop when only one or two registers supply a room. In fact, the unique manner of heat distribution makes radiant heat feel more comfortable at a lower temperature than forced air heat. This even heat disbursement equates to lower heating bills.

Radiant floor tubing can be installed multiple ways for different applications. It can be embedded in poured concrete during the building process. In existing homes or in a second story floor, tubing can be laid on top of specialized subfloors or it can be installed on the underside of the floor. Once the tubing is in place, you can use most any floor covering, tile and hardwood being the most popular choices. Carpeting is an option, but because it acts as an insulator, it will slow or reduce the heat trying to enter the space from the radiant system. The circulating water would need to be hotter in order to produce the same amount of heat and the system's overall efficiency would be reduced.

There are multiple choices when choosing a geothermal system capable of radiant heating. Your local GeoComfort dealer can help you compare and decide which system is best for your needs.

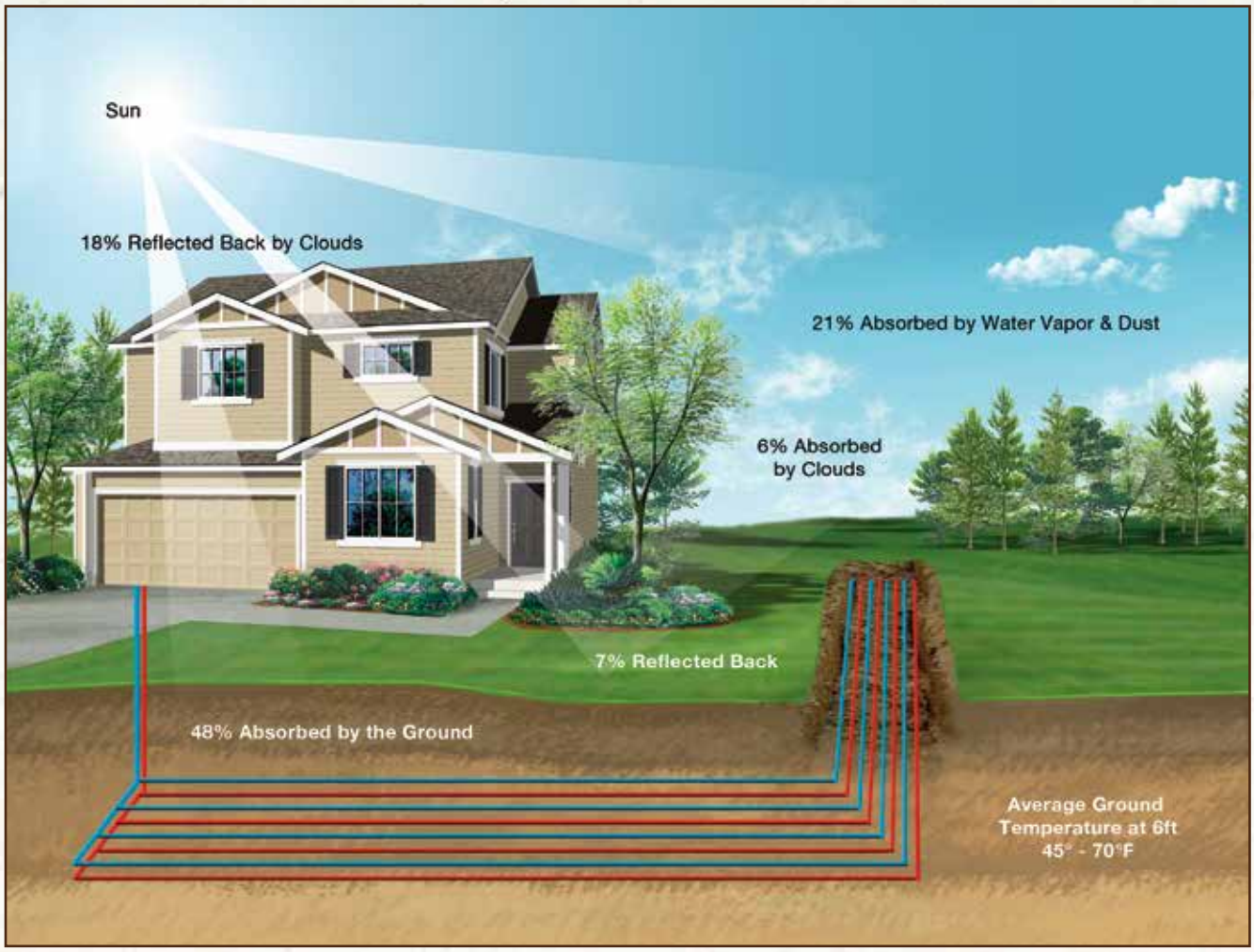
There is **no comparison** when it comes to comfort. Radiant floor heating **eliminates the discomfort** of cold floors and **reduces energy bills**.

Typical water-to-water system installation showing radiant floor in heating mode.



Example of radiant floor tubing installed in a basement. The tubing is placed over an insulation pad. Concrete is then poured over for the floor.

How Geothermal Works



In the purest sense, geothermal systems use solar energy. The earth absorbs an amazing 48% of the sun's energy, leaving a fairly constant underground temperature between 45 and 70° F.

A water solution flows through pipes buried in the ground (ground loop system) absorbing heat from the earth in the winter and moving it to the geothermal system inside the house. Once there, the heat is condensed and transferred to the air that is circulated throughout the home, providing warmth when needed.

In the summer, the process is reversed, absorbing heat from the air inside the home, similar to how a refrigerator extracts heat from food to make it cool, and transfers that heat into the ground through the same loop system.

GeoComfort®
Geothermal Systems
Live comfortably.®

ground LOOP FIELDS

The Science Behind the Magic

The heat exchanger, also known as the loop system, captures the stored solar energy in the ground and delivers it back to the geothermal system in the house. There are 4 different types of loops.

Your loop system is the heart of geothermal technology. **Regardless of the option you select, it will deliver over up to 500% efficient comfort and savings** for many years into the future. Your local geothermal dealer will help you select the proper loop system based on a site survey and by conducting a detailed energy analysis of your home. Installing a geothermal loop system is like getting a 70% discount on energy for the life of your home.

1 A vertical loop is used mainly when land area is limited and in retrofit applications of existing homes. A drilling rig is used to bore holes at of depth of 150 to 300 feet per ton. A U-shaped coil of high density pipe is inserted into the bore hole. The holes are then backfilled with a sealing solution.

2 Horizontal loops are commonly used when adequate land area is available. Loop installers use excavation equipment such as chain trenchers, backhoes and track hoes to dig trenches approximately 4-8 feet deep. Trench lengths range from 100 to 300 feet per ton, depending on the loop design and application.

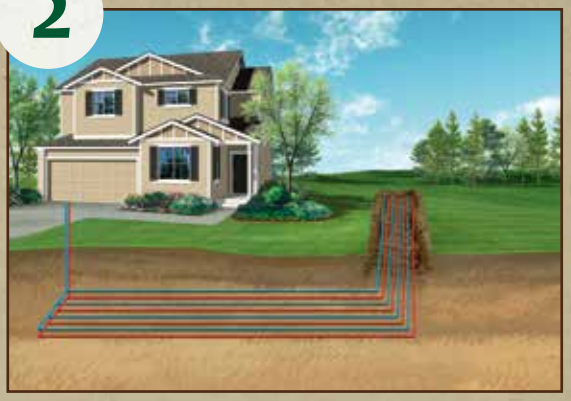
3 A pond loop is an option if a large body of water is available within approximately 200 feet of the home. A ½ acre, 10 to 12 foot deep body of water is usually adequate to support the average home. The system uses coils of pipe typically 300 to 500 feet in length. The coils are placed in and anchored at the bottom of the body of water.

4 Open loop systems can be installed if an abundant supply of high quality well water is available. A typical home will require 4 to 8 gallons of water per minute. A proper discharge area such as a river, drainage ditch, stream, pond, or lake must be present. *Check for local restrictions before selecting a specific discharge method.*

1

Vertical Loop

2



Horizontal Loop

3

Pond Loop

4

Open Loop

GeoComfort®

Geothermal Systems

Live comfortably.®

Greenville, IL • Mitchell, SD • Portland, OR
info@enertechgeo.com

See our full line of geothermal products at
www.geocomfort.com

ENERGY STAR PARTNER

www.GEOEXCHANGE.org MEMBER

AHRI MEMBER

INTERTEK ETL LISTED C US

Product specifications reflect available information at time of printing. Design and specifications may change without notice.

Rev.: 27 Apr 2012B