American Icon’s Retail Pavilion Goes Geothermal
Residential Flexibility

Products and solutions for all of your residential geothermal projects

Geo-Flo's complete line of flow centers are perfect for all of your residential ground loop pumping needs. These foam insulated modules feature Grundfos’ whisper quiet wet rotor circulators and Geo-Flo’s unique full-flow flushing and service valves. From single pump GPM-1 modules with 1” valves to our SuperBrute XL and VersaFlo modules with 2” valves, Geo-Flo provides solutions for all of your residential installations.

Geo-Flo Products Corporation - (800) 784-8069
CONTENTS

DEPARTMENTS
4 Geo Outlook Staff
6 Directors’ Forum
8 Industry Leaders
40 Product Showcase
42 Earth Insights

FEATURES
10 Cover Story: American Icon’s Retail Pavilion Goes Geothermal
   By Janet F. Reeder
18 From Sick House to Green House
   By Linda Allen
24 Eureka Lodge Capitalizes On Mine Shaft For Geothermal
   By Kendra Mann
30 Victoria’s Langley Building Touts Geothermal
   By Davod Nematpour
Geo Outlook is published quarterly by Oklahoma State University and the International Ground Source Heat Pump Association (IGSHPA), 374 Cordell South, Stillwater, OK 74078-8018. Geo Outlook is a joint venture of the Geothermal Exchange Organization (GEO) and IGSHPA. Send questions, story ideas, photos and comments to igshpa@okstate.edu, Geo Outlook, c/o IGSHPA, or call 800-626-4747. Visit our Web site at www.igshpa.okstate.edu.

Copyright 2010 by the Board of Regents for the Oklahoma State University Agricultural and Mechanical College, IGSHPA and GEO all rights reserved.

Articles written by third parties reflect the opinions of the writer and are not necessarily the opinions or views held by GEO, IGSHPA or Oklahoma State University (OSU). GEO, IGSHPA and OSU make no claims to the accuracy of statements made in such articles.

A great idea that works!

Developed by installers, the Geo-Solar Header replaces conventional reverse return systems – a nightmare to installers everywhere. Say goodbye to human error, excessive joints, wasted pipe and wasted time. Visit our website for more information.

• No more reverse return issues
• Maximizes balanced flow
• Minimizes joints
• Easier on site installation
• Reduces human error
• Limited lifetime warranty
• North American made
• Commercial and residential applications
• Multiple configurations available
• 3-, 4-, 5- and 6-zone Headers are available
• Multi-header coupling system for larger projects

The Geo-Solar Header is priced right and ready out of the box, making your life easier.
Innovative systems with profit built in.

DEALER TRAINING • MARKETING SUPPORT • INDUSTRY LEADERSHIP

You work hard to build your business. ClimateMaster, the leader in geothermal heating and air conditioning systems, gives you a clear path to profits. Geothermal systems are one of the fastest growing product lines around, and with ClimateMaster’s unmatched dealer training, multimillion-dollar national marketing support and broad array of innovative products, you don’t have to dig very deep to make the sale.

Call 800-299-9747 or visit climatemaster.com and join other successful dealers today.
The market has changed – a few years ago, new construction represented a majority of the installations of ground source heat pump (GSHP) systems. But the prolonged downturn in the U.S. economy has shifted that balance, and the majority of GSHP installations are now retrofits of existing properties. This trend makes sense when you consider that there are over 100 million existing homes and business buildings in the U.S., and more and more building owners are discovering the economic and environmental benefits of replacing aging conventional equipment with GSHPs.

Another factor that promotes the switch to GSHPs is that many existing buildings are being retrofitted with air-conditioning, and GSHP systems provide A/C without additional equipment. A bonus for building owners and tenants is that GSHP systems require less maintenance than conventional A/C and cost less to operate. As computer systems and other internal heat-producing equipment become more prevalent, A/C is becoming a necessity instead of a luxury. Building owners rely on their architects and engineers to evaluate the costs and benefits of alternative heating and cooling solutions, and those professionals are discovering that GSHP systems address many design and operation challenges. Meeting these challenges can be well worth the effort, since GSHP systems provide added comfort as well as demonstrated savings on utility bills. And a GSHP system can be expected to operate efficiently longer than a conventional system, with heat pump life over 20 years and the ground heat exchanger projected to last 50 years or more.
Geo-Trio™ multi-position geothermal heating and cooling system.

The Geo-Trio’s A-Coil, Blower, and Compressor are each self contained allowing for multiple configurations.

- Fewer SKU’s with more product offering
- Ideal for retrofitting air to air systems
- Backed by a tradition of Bard reliability

The advantages of the Geo-Trio just stack up. Visit www.bardhvac.com to learn more!
Garen Ewbank conducted the first in situ thermal conductivity test for the ground source industry in 1995, and works with his Test Providers throughout the U.S., Canada and Europe. He installed his first ground source system in 1978, and, in addition to his extensive HVAC/R experience, is licensed to drill water wells, monitoring wells and ground source boreholes.

Garen is a member of the IGSHPA Training and Marketing/Membership committees, a past Advisory Council member, and an IGSHPA Accredited Installer and Trainer for IGSHPA Installer, Driller and Certified GeoExchange Designer programs. He is a full Member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and an editorial writer for the World Wide Drilling Resource published internationally.

Garen has B.S. in Industrial Engineering and Management from OSU, and has served on numerous association, industry commercial and non-profit boards, as well as testifying as an industry expert before the U.S. Congress. He has been married to Victoria since 1968, and has two sons and eight grandchildren.

Charles R. Landis serves as Technical Director for Baroid Industrial Drilling Products located in Houston, TX. A Ph.D. in clay mineralogy, he leads the product development, field service and technical training functions. He is broadly involved with the range of research and development opportunities in the industry from drilling best practices to fluid optimization to borehole stabilization. This work has extended to the realm of thermally enhanced grouts, both with carbonaceous additives and grouts that are carbon-free. In addition, he supervises the newly installed capability at IDP to measure thermal conductivity of bentonite-based grouts according to ASTM standards. Landis has also recently been involved with IGSHPA’s horizontal bore research project in Stillwater with Bill Holloway, senior research engineer with the electrical engineering technology electronics lab, and Rick Beier, associate professor in the mechanical engineering technology department, both with Oklahoma State University. That work is focused on studying the effects of different types of grout and drilling fluids on the thermal response of horizontal ground loops.
The EarthPro Geothermal Drills feature a single operator setup providing ease of use and solid job profitability.

These features ensure the toughest jobs are tackled with ease:

• Automated pipelader system allows a single operator to drill and trip out up to 600 ft (183 m) of pipe without assistance.

• Central ergonomic controls include a dual multi-function joystick that is console mounted and adjustable for height and angle to reduce operator fatigue. LCD display provides data on drill operation in easy-to-understand terms.

• Dual rack and pinion design with three-speed drive motors that allow quick trip times with 45,000lbs. pullup and 22,000lbs. pulldown. There are no chains, cables or hydraulic cylinders to replace.

When you need dependable productivity and profitability, look no further than Astec. For more information on EarthPro Geothermal Drills and other Astec products, go to astecunderground.com or call (800) 527-6020.

astecunderground.com

ASTEC UNDERGROUND an Astec Industries Company
9600 CORPORATE PARK DR • LOUDON, TN 37774 • 800.527.6020 FAX 865.458.8575 • astecunderground.com
Enlightening the world may just be taking on a whole new twist, as the Statue of Liberty’s Retail Pavillon has succeeded in going geothermal. A touch screen setup being developed will soon explain to the statue’s visitors what that means for energy and environmental concerns.

Brad Hill, a third generation concessionaire for Liberty Island, has been working toward a more sustainable and environmentally responsible operation on Liberty Island for years. Hill first tried to convince the National Park Service that a geothermal system
would be the ticket on the island ten years ago. He says the systems were not yet popular then.

“We did a study for Brad starting in 1999 or 2000, I guess. And at that time the National Park Service had basically said that there would never be a geothermal well on Liberty Island,” says Andrew Collins, of P.A. Collins, P.E. Consulting Engineers. Collins said that Hill, a savvy businessman who is also intensely interested in the environment, spent a decade convincing the National Park Service of the merits of geothermal.

“He told them it was a good idea because there is no huge cooling tower to mar the view—the area on the island is very small and there is not a lot of room to go hiding stuff,” Collins said. Changing from boilers also meant gas would no longer have to be delivered.

“Bringing anything to the island is an issue because of the transportation premium. You would have to pay extra for fuel oil. That also gives geothermal an advantage,” Collins said. He pointed out other benefits of geothermal he is certain Hill used in his proposal to the National Park Service. “Your footprint is smaller. You are maintaining one device, instead of many, because your heating and cooling is wrapped into one unit.”

Hill, the owner of Evelyn Hill Inc., federally authorized concessionaire to
The Liberty Island Retail Pavilion was designed to LEED® Platinum standards. If the goal is reached, it will be the National Park Services first LEED® Platinum project on the East Coast.

(Photograph provided by Matthew Barhydt, Acheson Doyle Partners Architects)

the National Park Service site on Liberty Island, seized the opportunity to have the idea reviewed when the ten year contract he was awarded by Congress came up again in 2009.

“When we had the opportunity to renew our contract, we also proposed an additional building for our food services,” Hill said. He had originally wanted to retrofit the older building ten years ago, he said.

“It never took off. All of the drawings were done for it. All of the specs were done. Of course technology has changed and some of the equipment now would be changed out. Hopefully the park service will want to do that someday. They have talked about it,” Hill said.

Hill is the third generation of the only concessionaire Liberty Island has ever had. His grandfather, Aaron Hill, began the business with a small souvenir stand in 1931. He says that his grandmother, Evelyn, who spoke nine languages fluently, worked at the Statue of Liberty until the week before she died at age 88.

Hill started recycling at Liberty Island 12 years ago and is the leader in the National Park Service’s recycling efforts.

To continue the tradition of sustainable practices Hill is known and recognized for, the pavilion features recycled tile flooring throughout along with waterless urinals and a rain harvesting system that supplies gray water for the toilets. Super low flush toilets, automatic sinks and special hand dryers are also used.

“We are up to recycling over 90 percent of the solid waste that we produce. My goal is to average in the neighborhood of 98 percent,” Hill said. Being on an island intensifies the necessity for minimizing waste in a business operation, especially one that involves food service and serves the massive number of people who visit the Statue of Liberty annually. “We are working very hard in that area,” Hill said.

Watt Stopper® daylighting systems are set to turn lights on and off depending on the amount of daylight coming in. Perimeter glass is low E, and Hill says that nearly 50 percent of the perimeter allows available daylighting to cut the electrical lighting usage.

Hill is very conscious of his energy consumption, his energy cost and by extension his carbon footprint. “He has been working for decades to minimize that. He is way ahead of us,” Collins said.

Mechanical cost for the system is estimated at $700,000, according to Collins, whose firm finally got to follow through on plans for a Liberty Island geothermal project. The 7,026-square-foot facility contains a large number of measures and equipment designed for the best possible energy efficiency. Two ClimateMaster roof top geothermal heat pumps provide 40 tons of heating and cooling for Liberty’s retail pavilion.

Energy recovery ventilators were used as well as air curtains on all doors.

An Aaon air-to-air unit serving the comfort station area also uses a heat wheel. “The heat wheel does some temperature exchange between intake air and exhaust air airstreams,” Collins said. “It adds comfort, but above all it is an energy saver.”

Collins expects energy savings compared to baseline, including lighting and everything, to be 35 percent overall. “A total of 35 percent is pretty impressive,” he says.

Matthew Barhydt, with Acheson Doyle Partners Architects, said the Liberty Island Retail Pavilion was designed to LEED® Platinum specifications. “The team remains confident that we are addressing USGBC’s concerns and that ultimately we will be successful in receiving the rating,” Barhydt said. If attained, the rating will be the first
LEED® Platinum project for the National Park Service on the East Coast, Barhydt said.

“It is the first opportunity that we have had to be involved in a potential LEED® certified project, so we were very excited about that,” Barhydt said.

“It is a challenging site, as you can imagine, to work on an island, particularly Liberty Island.” Barhydt said other challenges on the island included the geography of the area, and dealing with the National Park Service and their security issues.

“We are all very fortunate that we have a client who has a lot of foresight,” Barhydt said. Hill’s contract with the National Park Service dictated that the project reach at least a LEED® Gold rating, Barhydt said.

“Brad Hill has been in part the inspiration from the beginning to push the team as much as possible to see what we could achieve. And sort of to our surprise, early on in the design phase, we discovered that platinum seemed to be a real possibility,” Barhydt said.

Collins has achieved LEED® Platinum rating on past projects, and has also been instrumental in steering the Liberty Island Retail Pavilion toward that goal.

Carl Orio, CGD, of Hampstead, New Hampshire’s Water Energy Distributors Inc., worked as the outside design engineering firm for Collins. Orio designed the heat transfer system for the actual layout outside the building—the piping underground and bringing the geothermal water into the building. Orio likes the team approach Collins uses and commends his work.

“It takes coordination to do,” Orio said. “There have probably been 60 installations in the New York City area that have followed that format.”

Orio says there are three ways to take heat out of the earth and that they are geology and site specific. They include closed loops, standing columns and open to diffusion systems. The latter is also called dublets by Europeans, and involves taking water out of one well and putting it back into another. They work where soil is porous without bedrock and are used where there is a lot of water close to the surface, Orio says.

“Each of those options have advantages and disadvantages, but they are generally dictated by the site,” Orio says. “When we first go to a site, we look at what is required. The second thing we look at always, is what is underneath the ground,” he said. “And then we look at which of the three methods will fit.”

After the design and planning phases are over, work for the crews has to get going. While drilling standing column
“We are doing it mainly for environmental reasons,” Brad Hill of Evelyn Hill, Inc., says of the Liberty Island Retail Pavilion geothermal project. Hill has awards to back up his interest in the environment.

(Photo provided by Kit Noble Photography)
wells may be old hat in New York City, getting drillers set up on an island is a whole different situation. Drillers do not usually put their rigs on a barge to head to the project site.

On Liberty Island, drillers did just that. They loaded their equipment on ferries and used barges to get to the base of the Statue of Liberty. Anthony Ganio, president of Connecticut Wells, Inc., drilling contractor for the island project, had to make those arrangements. His company contracted to do the drilling for installation of geothermal needs of the Liberty Island Retail Pavilion, the place where America buys historical souvenirs when they visit Miss Liberty.

“All of the equipment was loaded in the dark and shipped over to the island before 6:00 a.m., in order to accommodate the public access to the grounds,” Nicole Murphy, CWI’s vice president, said. “Once there, the drill rig was set up and the drilling began on a 1,550-foot deep, 10-inch diameter geothermal well.”

CWI’s logs show the upper part of the bore consisted of 17 feet of sand and gravel. Solid bedrock was encountered at 18 feet. A 10-inch steel casing was installed to a depth of 80 feet and cemented in place to seal off the unconsolidated materials. Using an air percussion hammer, the bedrock was drilled in 9-7/8-inch diameter to a depth of 260 feet. The hole was then advanced in 8-inch diameter to 1,150 feet, and then 6-inch diameter to the final 1,550-feet depth.

Groundwater was encountered at depths ranging from 690 feet to 1,330 feet. To help keep the drilling rate up and the hole cleared of cuttings, an auxiliary compressor and Hurricane booster were used in addition to the air package mounted on the drill rig.

From start to finish, the drilling of the well on Liberty Island took five working days, Murphy said. When drilling was completed, tools were removed from the well bore and a 6-inch PVC Porter Shroud was installed to the bottom to act as a separator between the supply and return water within the well bore. A submersible pump was installed within the shroud and a return line was installed along the outside. The arrangement allows 120 gallons of water a minute to flow from the building, down the well bore, exchanging heat and entering the shroud through perforations at 1,500 feet. Water then flows up to the pump and circulates back to the building.

Ganio says this type of geothermal well is typical in commercial installations where a large system is present but the service area will not allow for a larger well field. He says many commercial systems in his area choose to use the standing column well, although a closed-loop well system can also be an option for some situations, particularly where space allows a larger loop field area.

As America addresses energy efficiency issues for homeowners and businesses alike, the iconic symbol of this country’s freedom now also represents geothermal heat pump technology—the renewable energy technology currently poised to provide a cost effective and environmentally friendly solution worldwide.
THE STANDING COLUMN WELL

Originally called an “Open-Closed Loop” geothermal earth coupling the Standing Column Well (SCW) takes advantage of both the closed loop’s conductive heat exchange and periodically augments with an open well’s advective direct flow of earth temperature water. A SCW is a geothermal heat transfer method used when there is bedrock within approximately 200 feet or less from surface and water quality meets health drinking (primary) standards. SCW’s have been drilled to depths of 2,000 feet and can develop over forty tons of heat transfer from a single bore hole.

The SCW simply takes water from the bottom of a water well bore, passes the water through a geothermal heat pump and returns the water to the top of the bore hole. As the water travels back to the bottom of the bore, a heat exchange occurs between the water and the bore hole surface. By transferring earth energy directly with water, there is not a requirement for an anti-freeze solution and the necessary closed loop piping. Without the thermal resistance of the closed loop’s plastic piping and antifreeze, the SCW can conductively extract 2 – 3 times more energy per foot of bore than a conventional closed loop.
The home of the Robert F. Kennedy, Jr. family recently received an extreme green makeover to become a model of environmental consciousness. Black mold forced the family from their 1920s colonial farmhouse in Westchester County, New York. Their three children suffered chronic respiratory problems from the mold that resisted two years’ efforts to abate it. Their sick house was making them sick.

Instead of bulldozing the structure, the family chose to salvage the house to create a healthy living space for their family and to reduce their impact on the environment. With Kennedy’s reputation and passion as advocate and defender of the environment, it was a no-brainer that the project would be as green as possible.
The project started in May 2008 by raising the house to remove the foundation. “The original house could not be moved because of the septic system. Steel beam trusses supported the house while the foundation was excavated and replaced,” said Blansfield.

In keeping with the goal to salvage and reuse as much material as possible from the original structure, the foundation was crushed and used as gravel. “It’s really a new structure on a new foundation with mostly reused and reclaimed materials from other sites and projects,” said Blansfield.

The Kennedys chose a geothermal system because of their dedication to protecting the earth’s resources. The system would also meet their objectives to increase energy efficiency and to rely on power generated onsite. Once the new foundation was in place, the structure was lowered and work on the geothermal system began to replace the existing oil system. B & D Controlled Air designed and installed the system.

Two well fields contain six 400 foot deep wells. “Drilling required a lot of chipping of granite rock,” said Demague. “The rock was a positive because usually where there is rock, there is water moving through it, which is great for conductivity so you might not have to drill as deep.”

The 12-ton system services the 10,540 square-foot house, with a reverse/return closed loop system that features five radiant heating zones. All areas including the attic and mechanical spaces are in a conditioned environment. The loops contain 1 1/4-inch piping with 2-inch return piping. Five water-to-air...
Florida Heat Pumps provide cooling in the summer, and three water-to-water Florida Heat Pumps furnish heat in the winter.

A Dow Building Solutions continuous insulation product was a major upgrade to the poorly insulated house. The tight envelope created by the continuous insulation, a layer of rigid foam insulation applied outside the studs, air sealants and energy-efficient windows, reduced unit sizes of the geothermal system by 30 percent to 50 percent. These complimentary features resulted in cutting energy required to heat and cool the house by half. “You can’t have an optimum geo system in a poorly insulated building,” said Demague.

With ten new geothermal installations and three retrofits, including three LEED Platinum homes, Demague approaches construction as a building science rather than building mechanics. “The loads of geo houses are much less than conventional heating and cooling systems, which requires less mechanical equipment. The VIP certification test showed we are running 3.5 to 4.0 COP on the equipment on the heating side. On the air conditioning side, we’re running 27 to 30 EER,” he said.

The mechanical room, or engine of the house, as Demague calls it, is 15 by 15 with a 7 foot ceiling, located in the basement—
a tight fit for 90 percent of the houses’ mechanical equipment. “When you look in the room, all you see is a jungle, yet the owners call it the most beautiful room in the house. It’s a testament to the efficiency of the system and their green philosophy,” he said. The mechanical room for the second floor is located in the attic trusses.

The system includes a desuperheater and boiler for hot water and radiant heat as a backup if the geothermal system needs repairs.

Radiant flooring adds to the comfort of the home. More than 10,000 feet of Viega tubing snake through the two main floors and the basement living area.

Blansfield and Demague worked closely with the interior design team to hide all the ductwork. “We did a nice job of keeping the envelope of the entire heating and air-conditioning ductwork hidden within the insulation envelope. It finished out well,” said Blansfield.

Cost of the system was $200,000 including the wells. The family took advantage of the 30 percent government tax credit incentive. “There was not much available in local utility rebates. The driving force was the long-term payback to the environment instead of rebates. Kennedy stayed true to his core beliefs as an environmentalist,” said Demague.

Energy bills from the previous structure were not documented. Compared to a similar non-geothermal home, energy savings in the Kennedy Green House are estimated at 30 to 35 percent.

Working from the ground up, the project team continued with sustainable building practices and products. The extreme green home reused every piece of the old structure and sent unusable items to Green Demolition, a nonprofit compa-
ny that recycles and resells building materials — nothing went to the landfill the owners proudly claim.

The four-bedroom, six-bathroom house sits on twelve acres overlooking a 30-acre private lake at the back of the property. Surrounded by trees, wetlands and rocky terrain, it is a perfect site for environmentalists like the Kennedys and their green house.

Other energy-saving features of the house include solar shingles — the first of their kind on the East Coast, newspaper and soybean sealant insulation, LEDs, hybrid hot water heater, passive Solatubes for natural daylight, fiber-optic lighting, energy-star appliances and a three-bin recycle center.

Kennedy’s involvement as founder and president of the Waterkeeper Alliance and attorney for Riverkeeper and the Natural Resources Defense Council carries over to water conservation in his personal home with low-flow plumbing fixtures and an underground storm water collection system.

Reclaimed, reused and salvaged materials and items continue the green theme throughout the house. Some bring a history of their own like the slate roof from the former Wassaic Mental Institution from upstate New York and reclaimed brick pediments featuring the eagle emblem of the United Farm Workers of America, a favorite cause of the Kennedy family.

The interior of the house is a classic design that belies the scavenged elements. Memorabilia and heirlooms of U.S. and family history combine with natural art to make the house a comfortable story of the Kennedy family’s public service and environmental interests. A virtual tour of the home is available at http://www.kennedygreenhousetour.com.

The home’s design also includes accessibility features to make it comfortable for all ages and abilities, including a rear entrance ramp, elevator, curbless showers, lowered light switches and closet storage for wheelchair users.

Designer Robin Wilson named the project the Kennedy Greenhouse and wrote a book by the same name detailing the construction process from architectural drawings to final move-in. Photos document the project from start to finish. Once settled in, the family opened their home to suppliers and various community interests to demonstrate green construction techniques and how to live a green lifestyle. The project is in the application process for LEED Gold certification.

“We utilized some of the best technology that now exists to allow us to move construction to sustainability,” said Blansfield. In a house where everything old has become almost new again, the Kennedy family practices day-to-day lessons in healthy green living. The Kennedy Green House is a family and industry legacy for the future with forethought, resourcefulness and creativity in design, construction and function.
Eureka Lodge, a historic mining dormitory turned remote bed and breakfast, is located at 10,000 feet elevation in the San Juan Mountains of Colorado, next to the headwaters of the Animas River. The lodge near Silverton took on a new life after a recent geothermal heating retrofit. Clever use of a water-to-water cistern inside of the existing mine shaft now allows year-round use of the facility.

Before the geothermal system was installed, the 28-room lodge didn’t have the capacity to store enough propane to last through an entire heating season or the ability to acquire enough propane once snow began to fall. A 1,000-gallon tank of propane only lasted a month.

This was a constant worry for Bob and Terri Brokering, owners of Eureka Lodge. Every time they would leave the lodge unattended, they would have to winterize the lodge. This required a complete draining of any water in the building so it wouldn’t freeze. This process took several hours and took place every week.

“Propane lasted 28 days before we were out and unable to have more delivered. We were not able to live there year round or be open for business,” Terri Brokering said.

Dean Moffatt, architect of Sundesigns Architects PC, in Glenwood Springs, Colo., visited the lodge on New Year’s Day in 2007. As part of the stay he was given a tour of the 1,000 feet horizontal mine shaft.
“It was minus 15 degrees outside, but at the bottom of the mine shaft it was a constant 57 degrees,” Moffatt says. That got him to thinking about the possibility of designing a geothermal heat pump system for the lodge, he said.

Then, when Moffatt also noticed a 3-inch water line on the sides of the mine shaft indicating water flow, the two factors inspired him to start investigating the possibility of installing a geothermal water cistern in the mine to use to heat the lodge.

IGSHPA accredited, but not confident enough in his skills to install the geothermal unit himself, Moffatt teamed up with Bill Slaughter, also IGSHPA accredited, of Slaughter Heating and Cooling, LLC, Delta, Colo., to install the geothermal system.

“Instead of using a typical trench or drilled loop field we utilized the constant temperature and water source in the abandoned mine shaft,” Slaughter said. Both Slaughter and Moffatt realize how unique the Eureka Lodge geothermal situation is and both also think it could offer promise for a number of other locations in Colorado.

Entertech manufactured two 6-ton Hydron units with the heating capacity of up to 61,000 Btu’s for the system. The total tonnage is 12 tons.

“There was only a relative small amount of water to work with and a very large area to heat—approximately 11,000 square feet,” Slaughter said.

He said in designing for optimal cost savings and function, the two were difficult to balance for performance. They found they had sufficient water flow and not a large enough unit to heat the square footage of the lodge, or there was a unit large enough to accommodate the size of the lodge but not enough water to make the unit operate, says Slaughter.

“Getting the water-to-water cistern to operate flawlessly with the temperature issues created some challenges,” Moffatt said.

On start up of the system the entering water temperature from the mine shaft was 38 degrees instead of 45 degrees, which was less than Moffatt and Slaughter had calculated.
“We utilized the de-super heaters off of the GSHP’s injecting directly into the source intake. This in turn raised water temperature just above freezing on source water out, allowing shortage of water, shortage of temperature, and shortage of tonnage to perform as needed,” Slaughter said.

Installation of the geothermal water-to-water cistern began in February 2007 and was completed in March 2008.

The most exciting part of the project for Moffatt was seeing it work, he said. He considers the whole system installation experimental and very promising.

“Being able to heat a leaky 100-year-old mining structure to 70 degrees with heat from water dripping a thousand feet out of a mine shaft is truly what one would call renewable and sustainable,” Moffatt said.

When the Brokerings were asked why they chose to install a geothermal system, they said it was more a matter of availability. The only other available option where they live was electric, which was cost prohibitive. There is no motorized access to propane during the winter months because of the area’s snowfall and the mountain roads.

The couple’s goal was to live at the lodge and to be open to the public as a secluded get-a-way destination year round.
Moffatt said it took more than three months to install the
geothermal system because it was such an isolated place. Ev-
everyone who worked on the Eureka Lodge project had to travel
hundreds of miles to get there.

When winter snow starts to fall the roads are closed due
to possible snow slides. The only mode of transportation
is riding on a snow-cat, snowmobile or skiing in for over a
quarter of a mile.

“We had to bury the line from the mine to the lodge 6-feet
depth due to frost levels. But no external changes to the building
had to be made. We already had a propane in floor radi-
ant heat system installed and we just added the geo to those
lines," Terri Brokering said. "The total installation cost when
it was all said and done was about $75,000," she said.

It is estimated the Brokerings will save $1,650 a month on
heating costs for the lodge. And best of all, they are now
able to see their dream of year round operation of the lodge
become a reality.

Built in the 1920s, the lodge is one of the best preserved
and largest examples of an early mining boarding hotel

Earth Energy
Technology & Supply, Inc.

Geo-Excel Geothermal Heat Pumps
Geothermal Pipe
Poly fittings: butt, socket, electro-fusion
Brass fittings & valves EETS pump modules
EETS Deluxe Purge Cart Grout
Fabricated headers & transitions

1-800-771-9455
www.earthennergytech-supply.com
found in the west, according to the Eureka Lodge website. It is also listed on the National, State and Local Register of Historic Places.

During the gold and silver mining days, population reached a peak of 5,000, in Eureka, which is now a ghost town. Silverton, the town right below the lodge, has a population of 700.

Mining hotels represented a step up in lodging. Generally, the lodge had individual bedrooms with two men to a room. There was a bunk for each man and an indoor bathroom, which offered hot water for showers. Other amenities offered to the miners could have been a better quality of food, china in the dining room, and a library.

Bob and Terri Brokering have worked the past 15 years to make this historic lodge “a step up” lodge. It is best described as a perfect weekend retreat.

There is no telephone or cell phone service, no cable, or satellite TV. Individuals are able to relax and enjoy the beauty of the San Juan Mountains, and take a break from their busy lives. The Brokerings are certain they will be able to keep their guests comfortable all winter long.
VICTORIA’S LANGLEY BUILDING TOUTS GEOHERMAL

BY DAVID NEMATPOUR

(Photo provided by Chang Holovski Architects)
When it comes to renovating a building, it’s fairly complicated. Walls, floors, and sometimes ceilings have to be removed and replaced. But when the building is considered to be a historical landmark for the community, the process gets more complicated.

That is the scenario Richard Holmes faced when he decided to retrofit his building in downtown Victoria, British Columbia. Holmes wanted to please his future tenants of the four story, 12,069-square-foot commercial building. He realized that his market for possible tenants would more than likely include clients who would be more interested in renting commercial office space that currently employed “green” technologies. Holmes knew that would be a selling point in the Victoria historic area.

“We wanted the building to be green, we wanted to be responsible, both from our own corporate position, as well as a reflection of what the market was wanting. That is what the tenants want these days,” Holmes said.

But, Holmes also wanted to balance what the tenants wanted with what would also be the most cost effective in the long run. He says he looked at a lot of possibilities for the Langley Street building.

What drove Holmes to consider geothermal to cool and heat his building was the cost effectiveness estimation he received from the engineer on the project. While Holmes doesn’t believe in some “green” technologies, because he doesn’t believe the savings always outweigh the initial cost; the $10,000 a year savings greatly out-paced the initial $50,000 installation of the water-to-air geothermal system. Holmes knew he would see a realistic payback in a short amount of time for his investment. And that return on investment was a deciding factor.
Even though Holmes quickly adopted the idea of geothermal, he was unable to reap the benefits of any provincial or federal tax credits to help pay for the project. Canadians do not have the same tax credit structure that the United States allows for buying and installing geothermal heat pump systems.

“You get 30 percent residential tax credit, accelerated appreciation, and you get the renewable tax credit of 10 percent. We in Canada, have zilch,” Stuart Yanow said. Yanow is a senior engineer with GeoTility Geothermal Installations Corporation, the company in charge of the geothermal side of the project.

“We see a lot more geothermal up here than in the states. Not in the states as a whole, but we have an office in Seattle, and there is definitely a higher adoption rate in British Columbia than Seattle,” Yanow said. “I think that is interesting, because we don’t have a lot of grants. It seems the market in British Columbia is more mature or advanced than in the state of Washington.”

GeoTility recently expanded into the U.S. market by purchasing Seattle-based Earth Heat. With this expansion, they hope to bring their geothermal expertise into the U.S. market, according to a press release about the expansion.

While this project was unique in the form of making a historical landmark economically and environmentally friendly, it was also unique in the tools that were used. GeoTility and others involved in the construction had to consider was how the eight, 400-feet deep bore holes were to be drilled inside of the historical landmark.
GeoTility had the drill used for the project custom fabricated to be able to bring it inside the building for the project. The Geo Mole, as the company calls the unit, was originally designed for a different project in downtown Vancouver. But while the company was waiting for that project to start, the Langley Street project came up, Yanow said.

While the drill used for both projects, a hybrid electric/diesel low height rig, was designed to drill in low places or under buildings, Yanow explains that it is capable of doing standard drilling, but it is, of course, not always the first choice drill out of eight units they have available to choose from.

“Because of its height, if you attempt to use 5-foot rods or 10-foot rods, it tends to slow everything down. It’s also a little more costly to use, so we only use it if we have to,” Yanow said.

Yanow goes on to explain that the special drill unit is capable of drilling air or mud rotary, and it can also work with casing.

While one concern for the project was that of making the building green, through the retrofit, the building also had some major breakthroughs as a historical building.
The “Award Winning” Zephyrus utilizes R410A refrigerant and advanced, integrated controls for the utmost in efficient, clean, reliable performance.

For inquiries, please contact: T: 1.866.213.0742
www.geofinitymanufacturing.com
Karl Kaercher, the project’s general contractor, says the building is one of the highest seismically rated buildings in the area. In Victoria, as the buildings are upgraded and refurbished, construction workers have to seismically upgrade the building to survive any earthquake that would result from the fault line Victoria is on. Now, Kaercher says the building is one of the safest buildings in the area.

While a lot of things were going on inside the building to make it green, a great deal of consideration was also given to the actual work and processes used for the structures renovation. One example involved the restoration of the exterior brickwork.

The city of Victoria does not allow the act of sand blasting for environmental reasons. Interior brick walls of the building were instead exposed to soda blasting, a type of blasting that uses baking soda instead of silica sand, Kaercher said.

The renovators also re-used existing materials that were deconstructed from the site. The old joist system and timbers were utilized for framework in the main floor area. Any brickwork that was deconstructed was saved and re-used. The con-
were pictures of the building when it was originally built. Using these pictures, Kaercher and others added a fourth floor to the Langley Street building while making sure the building looked like it did in the early 1900s from the street level.

The building is the first heritage building in Victoria to be retrofitted with geothermal, Kaercher said. Holmes believes it may also be the first building where a drill rig was brought inside to drill bore holes for the geothermal system.

The geothermal heat pump system totals 30 tons, using 2-1/2 and 3-ton Florida Heat Pump units.

The Langley Street building was originally built in the early 1900s by Francis Mawson Rattenbury, a famous English architect of that time whose Romanesque style was also employed for the British Columbia Parliament Buildings finished in 1898. The Langley Street building was one of a number of Rattenbury buildings commissioned in the new province of Victoria.

tractor went one more step forward and bought most of the wood used for the project locally, using wood that was readily available and close by in Victoria, BC.

While the interior of the building was refurbished to be more modern, the exterior of the building was required to keep its historic exterior appearance from the original construction. The building is in a popular historic district of the city, and maintaining the structure’s historic facade is important and is required by the city.

Exterior building elements had to be restored and kept as they were in the building’s original state. Over the years there had been renovations done where the columns were bricked in and elements had been hidden that had to be exposed again and restored to their original state.

Kaercher said visits to the city archives by the owner Richard Holmes and current Architect Philip Chang, along with the City Heritage Director, Steve Barber, revealed that there were pictures of the building when it was originally built.
GeoComfort Compass Series, where efficiency meets elegance.

- Field convertible cabinet – upflow, downflow, right or left return
- Eye-level controls for simplified installation and service
- Ultra quite operation
- Award winning design – inside and out

GeoComfort Geothermal Systems
Live comfortably.™

www.geocomfort.com
Thanks for the great conference, see you next year in Tulsa!

Tax credits make Geothermal Heat Pumps more affordable than ever!

Centennial Plastic’s Geothermal pipe is used in environmentally friendly heating and cooling systems that are 40% to 75% more efficient than conventional systems. Expanded tax credits make it more affordable than ever, with up to 30% savings on residential, and up to 10% savings on commercial installations. Many local utilities offer rate reductions and rebates on qualifying geothermal systems, too.

866-851-2227 • www.centennialplastics.com
SAFE-T-THERM®
Inhibited Propylene Glycol
Heat Transfer Fluid

GeoSafe®
Inhibited Ethyl Alcohol
Geothermal Fluid

Harnessing Earth’s Energy

Houghton Chemical Corporation
www.houghton.com
1-800-777-2466
JUST ADD WATER!

GEO LAKE PLATE®

“POND LOOP IN A PACKAGE”

The Smart Choice of Geothermal Contractors Around the World

GEOTHERMAL — AS SIMPLE AS IT GETS!

Distributed Exclusively by AWEB Supply • www.geolakeplate.com • 888-277-2932
**Geothermal Hydronic Control Panels**

**Eagle Mountain**

Hydronic Control Panels provide geothermal installers a simple method to integrate geothermal heat pumps with hydronic heating systems. Control panels are cost-effective, pre-wired, factory tested, and shipped to the job site ready for quick installation. Panels are designed for serviceability and have a professional presentation, often prominently displayed in mechanical rooms. Heat sources include geothermal, boilers (gas, LP, electric, wood), solar hydronic, and water heaters. Panel types include multi zone, injection, and 3-way mixing. Various configurations can integrate radiant floors, air handlers, domestic hot water, radiator panels, baseboard hydronic, or snowmelt systems.

Pete Frank  
Email: pete@eagle-mt.com  
Phone: 1-800-572-7831  
www.eagle-mt.com

---

**Header**

**Geo-Solar**

Drawing on 25 years of experience, Geo-Solar introduces the Geo-Solar Header, a new axisymmetric manifold that replaces the conventional ground loop manifold. The Geo-Solar Header is one piece – each loop branches from one common source, with no need for conventional reverse return methodology when fusing the system together. The Geo-Solar Header improves loop performance through balancing, with 59% fewer joints than conventional systems.

North American made, the Geo-Solar Header has a limited lifetime warranty. The substrate plastic has a 100-year lifespan. Multiple configurations and multi-header coupling systems are available for any sized project.

Phone: 1-877-GEO-7899  
geosolarproducts.com

---

**Sonic Probe 200**

**Sonic Drill Corporation**

When it comes to geothermal installations or environmental investigations, the Sonic Probe 200 is one of the fastest drilling methods on earth and it’s the only method that can easily “buzz” through challenging conditions where layers of silt, clay, sand and boulders are combined in one hole. Because of its exceptional performance, small size and lightweight footprint, the Sonic Probe 200 makes an ideal tool for fast, cost-effective geothermal drilling. And, with its unique ability to drill, case, loop and grout in one easy step, the Sonic Probe 200 can significantly reduce on-site time and per-foot costs.

Tom Savage  
tom.savage@sonic-drill.com  
604-854-1383  
www.sonic-drill.com
Geothermal Sure clip
Geothermal Sure Clip LLC

Geothermal Sure Clip LLC introduces the family of U-bend spacer clips that ensures that you get the heat transfer that you design for. These clips have a unique ribbed construction that will stop any tremie pipe from straight HDPE to galvanized pipe with couplers from hanging up on the clip and dislodging it from the U-bend pipes. The geothermal sure clips all have a non-slip gripping action that will prevent the clips from moving. The geothermal sure clips do not pin the U-bend pipe to the bored hole walls as some states are advising not to do that. Because of its exceptional performance, small size and lightweight footprint, the Sonic Probe 200 makes an ideal tool for fast, cost-effective geothermal drilling. And, with its unique ability to drill, case, loop and grout in one easy step, the Sonic Probe 200 can significantly reduce on-site time and per-foot costs.

Kevin McGuffin
sales@geothermalsureclip.com
810-964-8755
www.GeoDogBones.com

GeoComfort® Compass® Series Vertical Packaged Units
Enertech Manufacturing, LLC

The award winning GeoComfort® Compass™ series is the first ever multi-position packaged water-to-air geothermal heat pump on the market. Shipped as left-hand return/ top discharge, it can be field-converted to right-hand return and/or bottom discharge. Features include Copeland® two-stage scroll compressor, ECM blower, e-coated air coil, microprocessor controls, double O-ring water fittings, compressor isolation module, foamed-in-place heat exchanger, and more. Now available in capacities from 3 to 6-tons.

Brett Tate
btate@enertechmfg.com
618-664-9010
www.enertechmfg.com

Hydron Module® Revolution® Series Vertical Packaged Units
Enertech Manufacturing, LLC

The award winning Hydron Module® Revolution® series is the first ever multi-position packaged water-to-air geothermal heat pump on the market. Shipped as left-hand return/ top discharge, it can be field-converted to right-hand return and/or bottom discharge. Features include Copeland® two-stage scroll compressor, ECM blower, e-coated air coil, microprocessor controls, flush-mount brass FPT fittings, compressor isolation module, foamed-in-place heat exchanger, and more. Now available in capacities from 3 to 6-tons.

Brett Tate
btate@enertechmfg.com
618-664-9010
www.enertechmfg.com
GeoComfort® Compass® Series Water-to-Water Units
Enertech Manufacturing, LLC

GeoComfort® Compass® series water-to-water geothermal units meet Energy Star 3.0 requirements up to ten tons. The two-stage GeoComfort branded units perform with higher efficiencies throughout most of the year due to their ability to operate at a lower capacity when possible, also allowing for smaller buffer tank sizing, which in turn saves on installation costs. Innovative mechanical design simplifies installation and allows for easier service access.

Brett Tate
btate@enertechmfg.com
618-664-9010
www.enertechmfg.com

Hydron Module® Revolution® Series Water-to-Water Units
Enertech Manufacturing, LLC

Hydron Module® Revolution® series water-to-water geothermal units meet Energy Star 3.0 requirements up to ten tons. The innovative mechanical design simplifies installation and allows for easier service access. Hydron Module is the only geothermal heat pump available with a lifetime compressor, heat exchanger and cabinet warranty – the best in the industry!

Brett Tate
btate@enertechmfg.com
618-664-9010
www.enertechmfg.com
Energy awareness, global warming issues, and incentive programs (Federal, State, and/or Power Company, where applicable) have all helped the geothermal heat pump (GHP) industry experience significant growth and marketplace expansion in spite of the current economic situation. Energy costs and reliable energy availability issues have introduced GHP into areas where the technology had not been considered previously. As GHP applications move into some of the more extreme climate and/or environment areas, there has been unfounded resistance. To resolve this, ground heat exchangers need to be considered at two levels; application and cost effectiveness.

Ground heat exchangers can be applied anywhere site space allows. Ground temperature, with the exception of where high temperature “hot rocks” geothermal resources are encountered, is not an issue. Heating only applications have worked successfully for years in northern Alaska and Canada – in ground temperatures near or below freezing. Cooling only applications have worked successfully for years in Saudi Arabia – where the deep earth temperature is 82° F. Ground thermal conductivity, diffusivity, and moisture content are factors in determining the size of a ground heat exchanger required to address the building load, but not whether or not it will work. On a national or world-wide basis I often hear “it won’t work here – the ground is too warm” – not so!! The same can be said for thermal conductivity, moisture content, or other assumed reasons it will not work – typically not so.

Before you think I’ve lost my mind, let’s move from application to cost. Yes, almost without exception, regardless of what Mother Nature has to offer properly designed ground heat exchangers will work – BUT – then there is cost. Ground temperature, low thermal conductivity values, and/or inadequate moisture content will increase the size and therefore the cost of a ground heat exchanger, not determine whether or not it will work. In the previously mentioned extreme areas, a snap judgment about ground conditions or temperature may prevent an appropriate and cost effective application when all factors are considered. The factors to consider are energy availability and costs, maintenance cost, and mechanical equipment capital replacement costs. Extreme environments and remote locations will increase all costs as well as the frequency of mechanical equipment replacement requirements.

Electricity cost is not the only energy factor. In more extreme locations, availability and reliability of adequate electricity resources must be considered. Inadequate capacity can limit growth, limit the ability to perform the mission, and result in brown-outs or rolling black-outs. In remote locations, fuel shortages and/or inadequate on site generation can have the same results. The key – efficiency – use less energy to do the same or more work. In some cases, what would appear to be a very expensive ground heat exchanger can actually be very cost effective, with an acceptable pay back time frame when all things are considered.

Mr. Rawlings has more than 30 years experience in the geothermal industry. He is a Certified GeoExchange Designer (CGD) and an IGSHPA Accredited Installer and Trainer.
Imagine being able to harness the energy of the earth to heat and cool in an environmentally friendly and cost effective manner.

**Geothermal Systems Can!**

**CENTRAL OUTDOOR AAON UNIT(S)** can supply from 2 tons up to 230 tons of cooling capacity with only a single geothermal water connection. The air from this high capacity central GSHP rooftop unit can be ducted through conventional VAV or CV ductwork or the air can be used to supply smaller interior GSHP units that serve individual zones.

**AAON GSHP SPLIT-SYSTEMS** allow the refrigerant-to-water heat exchanger, along with the compressor, to be located in a mechanical room or on the exterior of the building and only a quiet operating indoor fan and coil remain in the occupied space. This removes compressor noise and maintenance requirements from the occupied space.

**VARIABLE CAPACITY DIGITAL COMPRESSOR** systems improve comfort and efficiency in areas where heating and cooling loads are quite different by varying the capacity of the compressor to match the instantaneous heating or cooling requirement of the space. The compressor continuously adjusts its capacity to match the precise air temperature, or leaving water temperature, setpoint. During much of the season, the compressor operates at a reduced energy level but during periods of heavier demand the compressor ramps up its capacity to maintain a constant temperature.

**ADVANTAGE:**
- Energy Efficient
- Low Operating Costs
- Low Maintenance Costs
- Individual Room Heating/Cooling Control
- Durability
- Space Savings
- Integrated Systems
- Environmentally Friendly

**Defining Quality. Building Comfort.**

www.AAON.com  
918.583.2266

www.GEO-ENTERPRISES.com  
918.379.0193
MORE GREEN
 FOR THE PLANET.
 MORE GREEN
 IN YOUR WALLET.

FHP’s commercial - residential geothermal and water source heat pumps are setting a new standard across the industry for quality, efficiency and environmental innovation that also conserves more of your financial resources. At FHP, we’ve made it our mission to deliver a world of new ideas and create a better future, every day.

WWW.FHP-MFG.COM