GEO OUTLOOK

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Guiltlessly Green Luxury Living

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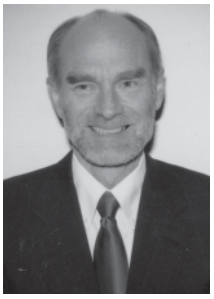
Directors' Forum

Notes from GHPC



By John Kelly
Executive Director,
Geothermal Heat Pump Consortium

Drillers put the "geo" in geothermal. Without proper heat transfer with the earth, a ground source heat pump (GSHP) can't deliver its designed performance. Whether that heat transfer is accomplished with ground water or a vertical closed loop, drillers play a critical role in assuring efficient operation of GSHP systems.

Experienced water well drillers bring invaluable skills and equipment to the GSHP environment. They have the right drill rigs and the knowledge of local geology needed to assure that aquifers are protected and that local regulations are followed. Drillers also have a lot to gain by diversifying into installation of GeoExchange systems. They have the opportunity to drill more bores and increase the productivity of their extensive investment in drill rigs. And they have the opportunity to learn new techniques, including different grouting methods for maximum heat transfer, handling and joining of ground loop piping, purging and flushing procedures, and antifreeze practices.

In turn, the GSHP industry depends on drillers to provide the installation capacity required to continue its rapid growth. To meet this challenge, IGSHPA's first-ever driller training is being introduced at their annual Technical Conference in Nashville. IGSHPA and GHPC are collaborating with the National Ground Water Association to update the NGWA "Guidelines for the Construction of Vertical Boreholes for Closed-Loop Heat Pump Systems".

Together, drillers and HVAC companies can deliver on the promise of this great technology.

Notes from IGSHPA

By Jim Bose
Executive Director,
International Ground Source Heat Pump Association

Drilling – Two questions keep cropping up in my mind. One, is there sufficient drilling capacity to meet new market demands? And two, are we sufficiently comfortable in our drilling standards? As an association, we rely mostly on word of mouth information from IGSHPA Accredited Installer Trainers and day-to-day communications, which in many cases go unshared. Some areas of the country are feeling the pinch while others seem to be unaffected. The IGSHPA Annual Conference in Nashville (October 1st through 3rd) is a most logical forum for discussion on what steps should be taken. The newly introduced IGSHPA drillers' course is an excellent first step to ensure that we continually bring to the industry new and professional drillers who accept the responsibility and ethics that this industry has come to expect.

The responsibility for drilling standards is shared by IGSHPA and the ground water industry (both state and national). IGSHPA has established best practices with respect to pipe, grout, bore spacing, etc. The ground water industry has as its responsibility, protection of the nation's underground water assets. IGSHPA standards are available to be adopted or adapted by local and state jurisdictions. Adherence to the standards of both groups is critical.

Both of these concerns could be softened if we engage in increased communications among and between members of both associations. We will be introducing at the Nashville conference several new electronic communication systems that have the potential to improve our discussions.

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Greg Wells, Jackson & Sons Drilling

Kevin McCray

Executive Director
National Ground Water Association

National Ground Water Association Executive Director Kevin McCray, CAE, works to increase international awareness of ground water and of the association, which today has mutual cooperation agreements in place with 14 of its foreign counterparts. A past editor of the association's Ground Water Heat Pump Journal and Ground Water Energy Newsletter, and a facilitator/editor of the NGWA Guidelines for the Construction of Vertical Boreholes for Closed-Loop Heat Pump Systems, McCray has served on a number of water-related regional and national advisory groups. He has authored or compiled six books and dozens of articles. A member of the CEO Advisory Board of the American Society of Association Executives, McCray has also served in various capacities for local non-profits in Ohio.

David Dinse

Project Manager
Tennessee Valley Authority

David Dinse has been employed at the Tennessee Valley Authority since 1981 as an R&D project manager and project engineer. He is the Tennessee Valley Authority's leading technical authority on geothermal heat pump technology. Since 1995 he has been a vital member of the TVA team responsible for TVA's highly successful promotion of geothermal heat pumps in schools and other commercial buildings. He has directed TVA's research on geothermal HP performance in commercial buildings for over 12 years. He has been a very active ASHRAE Member at the chapter (President), region and national levels. Since 1994, he has served in various capacities on ASHRAE technical committee 6.08, Geothermal Energy Utilization and has received several ASHRAE awards including the 2007 Distinguished Service Award.

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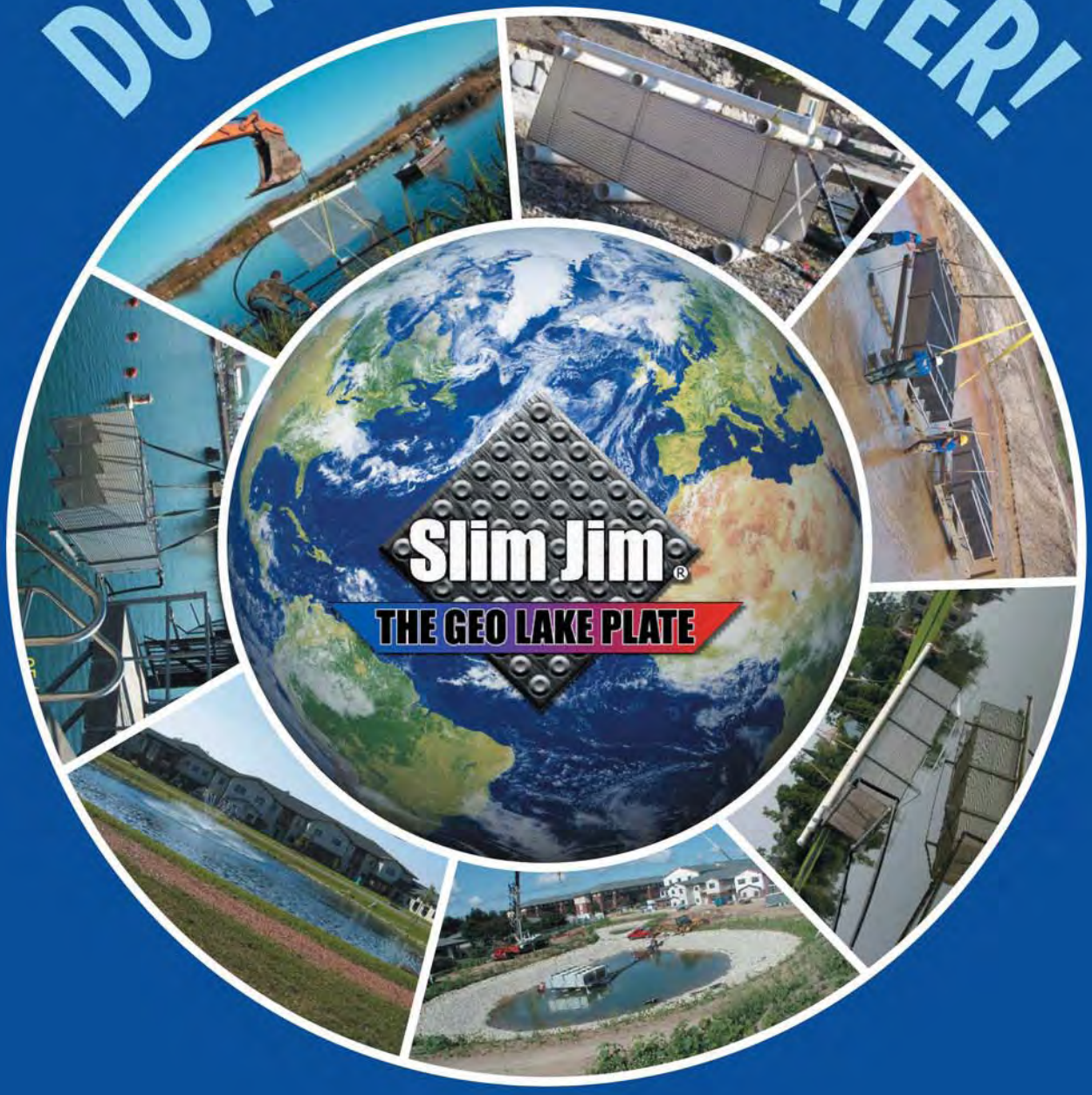

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Guiltlessly Green Luxury Living

By Megan Wible

The Hill at Bricktown speaks to a luxurious lifestyle. (Photo courtesy of The Hill at Bricktown.)

Cover Story

Bustling traffic, a riverwalk-style canal, vivid nightlife, multiple art galleries and an arena fit for an NBA franchise. It may be hard to see how all of these things come together, but in Oklahoma City, it's happening. Located in the heart of downtown Oklahoma City, Bricktown is an old warehouse district that has been remodeled into a local hot spot. And now, the entertainment district is becoming a place for luxury living. Guiltlessly green luxury living, that is.

The Hill at Bricktown is luxury living at its finest. Its goal is to provide residents with a high-class urban living environment. The town homes offer spacious rooms and walk-in closets, allowing residents to make the city their home. The Hill is marketed as private and secure, much like a neighborhood in the midst of skyscrapers. Residents have access to amenities that will pamper them at the Town Hall, which provides a fitness center, postal services, indoor and outdoor pools, and even concierge services.

The Hill is all about individuality. Residents can choose from 26 different unit types, which range from 1,650 to 3,579 square feet and vary in height from two to four stories. Beyond that, residents have many other choices to make, including choosing hard wood floors, granite counter-tops, whether or not to have a balcony, customized cabinetry, and more. Residents can even add a fireplace or jetted bathtub to their home. Also, each property is equipped for surround sound and prewired for digital cable, making entertainment that much easier.

The Geothermal Advantage

The history of the land surrounding The Hill is another rich aspect of the community. Located near The Hill is Deep Deuce, a historic jazz district in Oklahoma City that inspired the architectural style. "They are reminiscent of the style from the 1920s and 30s in the Deep Deuce area," Troy Rhodes, construction administration architect, said. "During the design phase architectural elements from buildings of that era were chosen to give character to the exterior designs." Another advantage of The Hill is its lower utility bills, which come directly from the use of ground source heat pumps (GSHPs). Geothermal, however, was not included in the original design. Instead, it was added later not only to help The Hill be more environmentally friendly, but also to take away the obstruction of rooftop units and condensers. "When we looked at the benefits of geothermal, one of the primary benefits was not just the energy savings, but getting rid of the clutter on the roof," Rhodes said. "We were able to completely eliminate all the condensers and rooftop units in the original design, which will allow residents to have a better view of downtown."

The $100 million development features 18 buildings with 157 town homes, which are being built in three

Oklahoma City's Deep Deuce, a historic jazz district, inspired the architectural style for The Hill at Bricktown, a high-end residential destination that places owners in the middle of the city's current entertainment venue. (Photo courtesy of The Hill at Bricktown.)

phases. The first phase of the project includes four buildings, the second phase includes six buildings and the Town Hall, and the third phase includes eight buildings. There were some challenges in the design and installation of the ground loop heat exchangers, ClimateMaster's Dr. Xiaobing Liu said. "All of the boreholes were limited within the garage of each dwelling unit," Liu said. "The dwelling units in one building are attached to each other, but each of the dwelling units has its individual loop and completed GSHP system." The thermal interactions from the boreholes in the neighboring town homes had to be accounted for in the ground heat exchanger design for each dwelling unit.

With each individual town home varying so much in size, many other aspects of the geothermal application vary, as well. "In most dwelling units, each floor of the dwelling unit is conditioned by individual packaged heat pumps," Liu said of the project. "The individual heat pumps are connected through a water loop that connects the ground heat exchangers. The total tonnage of each dwelling unit varies from three to seven tons, depending on the conditioned area, location in the building and even orientation." The average tonnage for each unit in the closed-loop system is five tons, so it is estimated that the entire complex will be about 785 tons upon completion.

The Dirt of It All

The drilling, loop installation and grouting were done by J. Grantham Drilling Co., where there were two air hammer truck rigs on site. The production goal on site was drilling between 1,000 and 1,200 feet per day and this was met consistently, owner Jimmy Grantham said. "It was pretty good drilling," Grantham said. "There was water at about 180 feet, but the only thing that really hurt was the grouting. You could grout up to about 180 feet and then it'd just carry your grout off, so they had to gravel up from 40 feet to the top." Each building had a different number of boreholes depending on the size of the town home, but they were typically drilled between 225 and 400 feet deep. The top 20 feet of each borehole was cased. The bore size is 4 1/2 inches with 1-inch pipe being used for the loops. Although J. Grantham Drilling Co. was responsible for containment, there was no problem, Grantham said. "Containment was good on this job," he said. "Everything was pretty systematic."

Energy savings from the GSHP are expected to be substantial. "I wouldn't be surprised to see 40 to 60 percent energy savings compared with a traditional air conditioner and gas furnace system," Liu said.

Green Way of Life

Although there were no manufacturer rebates offered for this project, The Hill is aiming to be eligible for several federal and state tax incentives. The Hill is working with local utility OG&E's Positive Energy program and Guaranteed Watt Saver Systems Inc. (GWS) to ensure their eligibility. GWS inspects homes during construction that are trying to earn ENERGY STAR certification. "They can also go in after the fact to do an infrared study to determine where your hot spots and cold spots are," Rhodes said. GWS and OG&E's Positive Energy program help ensure homes that are said to be in compliance really are compliant. It is this certification that determines whether or not a project can get the tax incentives, Rhodes said. Although geothermal alone does not make a project eligible for the incentives, The Hill has other green features that, when combined, will help meet the qualifica-

At a Glance

Estimated tonnage of entire complex: ..... 785 tons

Bore size: ..... 4 1/2 inches

Pipe size: .... 1-inch HDPE pipe

Estimated savings: .... 40 to 60 percent

Town home size: .. ranges from 1,650 to 3,579 square feet

Number of town homes: ... 157

tions. These include: an extra two-inches of insulation on all exterior walls, energy-efficient windows, and ENERGY STAR appliances. The Hill was also hoping to earn the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) certification, but found most of the certifications were reserved for individual buildings, Rhodes said. "There is a new LEED certification for community developments, but it's just a pilot program right now," he said.

Living at The Hill offers residents a unique experience: the feel of a community in the middle of a city. Even with all of the benefits of geothermal and other green features, the main selling points of The Hill at Bricktown are still luxury and convenience, but savings will no doubt be a plus. "We've had a lot of potential buyers ask about the savings," Rhodes said. "If the owner or developer is willing to pay the initial cost for the long-term benefits then I see no problem with using geothermal as a HVAC system on any project I work on."

Town home selection includes 26 different styles and allows residents to customize from a wide range of features. (Photo courtesy of The Hill at Bricktown.)

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Profile to Success:

Jimmy Grantham

By Megan Wible

Jimmy Grantham has been doing drilling for geothermal applications for nearly 30 years. (Photo courtesy of Jimmy Grantham.)

Jimmy Grantham's family has been in the drilling industry for more than 75 years. It all started with his father, H.V. Grantham, who did seismographic drilling in the Texas oil fields for 44 years. Jimmy joined the family business after attending Northwestern Oklahoma State University. Soon after, he decided to start his own company in Poteau, Okla. Then, in 1979, Grantham learned about ground source heat pumps (GSHPs). A man by the name of Harold Arter asked Grantham to do the drilling for several geothermal projects he had going in the area.

"We did geothermal back when you used the drill cuttings to fill in the holes," Grantham said. "Then they changed it to sand, but that still left hot spots in the loops. That's when the industry came up with grout, which pretty much eliminated that problem."

In business for nearly 30 years, J. Grantham Drilling Co. does both commercial and residential jobs. The company's current projects include an intermediate school in Hot Springs, Ark., and universities in Napa Valley, Calif. With four Gardner Denver truck rigs and jobs all across the country, the geothermal industry has been good to Grantham. His favorite part of it all, he says, is traveling. "I've seen a lot of places that I wouldn't have gotten to see if it hadn't been for my business," Grantham said. His favorites include Rome, Ga., Niagara Falls, and Bath, N.Y., where he got to witness the annual bathtub races.

When Grantham is not drilling, he can be found bass fishing with his wife, Robbie.

Grantham believes his success comes from doing a good job. "If you do a good job, people will call you back time and time again. I also think it's important to show people that geothermal really is the way to go over time," he said. Another reason for his success is his experienced help, he said. He pays his drillers year-round, allowing them job security and thus giving Grantham an advantage – loyal employees.

"It's been a good business to me and my family," Grantham said. "The good Lord's been good to us."

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Closed-Loop Systems Gaining Popularity in New England

By Janet F. Reeder

Roger Skillings is finding renewed interest in ground source heat pump (GSHP) technology in his corner of New England. Skillings includes GSHP technology in his Skillings & Sons Inc. drilling operation out of southern New Hampshire, and says he has seen an increase in requests for information that could correlate with rising energy costs across the nation.

"Ground source heat pumps are definitely becoming more popular in New England for residential and commercial use," Skillings said. "New England is below 70 degrees more than it is above. And it has a long heating season," Skillings said. "Homes in the region are designed for heat dominant systems, but commercial buildings may be cooling dominate because of glass and other features."

Skillings said closed-loop GSHP systems are becoming more popular in his service area where standing-column systems have been dominant in the past. He points out that both system applications have pros and cons.

The closed-loop system presents fewer environmental concerns, entails less governmental intervention and also presents less water quality and rock issues, Skillings said. The type of pump used, a circulator instead of the typical submersible, also attributes to the decision to use closed-loop due to the easy accessibility. Closed-loop systems do require more land area than standing column, and that can often cinch the choice. All of these considerations weigh against the nearly 25 percent more efficient standing-column, a system that is approximately a third less investment, Skillings said, but requires good water quality and the submerged pump.

Skillings & Sons meeting GSHP need

With experience in commercial, industrial and municipal systems, the Skillings operation is equipped to address the increased need for geothermal exchange work. His company did the GSHP drilling for Pease National Air Guard Base in Portsmouth, N.H., a job that was highlighted in the April 2006 edition of Water Well

Roger Skillings stays actively involved in his drilling projects, and is as likely to man the rig as not. Skillings and Sons has the experience and equipment to do geothermal work in New England's demanding topography and is staying busy providing GSHP technology to commercial and residential clients trying to get ahead of the energy and expense increases expected this winter. (Photo courtesy of Skillings and Sons.)

Journal. Skillings was also recently involved in drilling on the largest geothermal site in New England, a nursing home that opened in late 2007, where 16 boreholes, 8-inch in diameter, were drilled to a depth of 1,500 feet.

For more than 35 years Skillings has designed, installed and maintained water systems in a three-state geographic region where drilling is often more demanding than nearly any where else in the country. He said that while other parts of the country have hard rock too, the demands of drilling in New England and particularly in New Hampshire, Massachusetts and Maine, the three states where he drills, have necessitated investment in special drilling equipment.

"The cost of drilling in New England is higher than it is down South because we can only typically get one to one-and-a-half holes done in a day—where down South they can sometimes do three in a day," Skillings said. "Along with that, it takes equipment costing $700,000 to $800,000 for well drilling rigs here," he said. New England is different, he said, because of "overburdened conditions" that routinely see drilling through boulders or big rocks, a process that slows drilling. He also mentioned the need for casing in many instances, especially when ground water is encountered.

"Installation of the loops themselves requires these pumps that are not the norm for the well drilling industry," Skillings said. "They are specially made to pump grout down into the holes. To make it more efficient, we have set up a truck to do loops when we do geothermal."

Joseph Story House uses closed loop

Most recently Skillings did the drilling for the residential GSHP closed-loop system in the historic Joseph Story House in Salem, Mass., where considerable restoration and remodeling work is nearing completion.

The property, a three-story red brick Federal-style structure, was built in 1811 as the new residence for Joseph Story, who at the age of 32 became the youngest justice appointed to the U.S. Supreme Court. He is also known as the father of the Harvard Law School, having saved the school in the early 1800s.

(continued on page 19)

Neil Chayet, a Boston-area attorney, is sold on ground-source heat pump technology for the historic Salem, Mass. Joseph Story House. An energy conservation goal coupled with potential LEED certification has driven the extensive remodel of the 1811 National Register of Historic Landmarks residence Chayet and wife Martha plan to occupy.(Photo courtesy of Chayet.)

On the National Register of Historic Landmarks, the Joseph Story House sits at 26 Winter Street near the Salem Common, among a number of historic homes built by 18th and 19th century merchants. With 9,000 square feet of living space, the home presents above average challenges in a heat dominant area, Skillings said. Geothermal exchange technology was incorporated into the complete remodel of the residence, following its purchase by Neil Chayet, a Boston-area attorney and well-known radio personality who for 33 years has broadcast a CBS syndicated daily program entitled "Looking at the Law."

Work on the closed-loop installation did not go without hitch, as Skillings said they initially hit ground water while drilling. The system includes seven vertical boreholes drilled 500 feet deep. Polyethylene 1 1/4-inch pipe circulating water and glycol was used in the 20-ton installation.

Wenzel installs closed-loop system

Bill Wenzel Heating and Air Conditioning Inc. of Merrimack, N.H., completed the Chayet's installation. Wenzel said the geothermal system was designed with a total of 23 zones. A Venmar heat recovery ventilation system was installed to bring fresh air into the house. A ducted central dehumidification unit was also installed in the basement area.

"Challenges of the work for this National Landmark historical home included the lack of space for sheet metal ductwork installations and limited floor heights, necessitating use of Quik-Trak flooring for radiant in lieu of poured gypcrete," Wenzel said. Preparation for ice melt is being considered for brick walkways surrounding the home.

Skillings and Wenzel have coordinated and completed many jobs together, Wenzel said. "The job went a lot smoother because of the benefit of that long-term relationship," he said.

Bill Wenzel Heating & Air Conditioning, Inc. specializes in geothermal heating and cooling installations with hundreds of successful projects completed. Recent geothermal installations include the Peabody Mill Environmental Center in Amherst, N.H., the Plowshare Farm life sharing community center in Greenfield, N.H. and the Prescott Farm Audubon Center in Laconia, N.H.

The Joseph Story House installation included seven ClimateMaster units utilizing forced-air, radiant and ice melt systems. Wenzel said ClimateMaster Tranquility units were used throughout. A 4-ton water-to-air unit was installed for the kitchen area; a 5-ton water-to-air unit was installed for the entry, Neil's study, the parlor and the dining room; a 2-ton split water-to-air unit with Carrier air handler was installed for an apartment area; a 3-ton split water-to-air unit with Carrier air handler was installed for the master suite; a 4-ton split water-to-air unit with Carrier air handler was installed for the

Specialized drilling equipment for use in the New England area can easily run into $800 thousand rigs to get through the geographic structures common in the area. Skillings has outfitted rigs for GSHP work to facilitate loop installation. (Photo courtesy of Skillings and Sons.)

third floor area; and two ClimateMaster THW water-to-water heating only units were installed for radiant floors and domestic water heating only, using Wirsbo Quik-Trak and radiant tubing.

Owner advocates for national GSHP tax incentives

Chayet, president of Chayet Communications Group, was drawn to the residence because of the historical connection to both Story and to his alma mater, Harvard Law School.

He maintains an active legal and consulting practice in the area of health law and serves as special counsel to several law firms in Boston and Washington, D.C. He serves on the faculty of Harvard Medical School and as an adjunct professor at Tufts Dental School. He is vice president of the Harvard Law School Association. Martha Chayet is a trustee at the Peabody Essex Museum, America's oldest museum, in Salem. Together with Neil, as members of the Board of Advisors, they co-chair the Programs Committee at MIT's Whitehead Institute in Cambridge.

"The industry is really moving so fast," Chayet said of the GSHP industry. Chayet is working to promote government tax incentives to assist in promoting GSHP technology. Along with Dan Ellis, president of ClimateMaster, a leader in the GSHP industry, Chayet has met with members of Congress regarding measures that would tie tax incentives to the use of GSHP's proven energy conservation and ecologically sound technology for both commercial and residential applications.

The Chayets are applying for LEED certification for the home, having installed closed cell insulation and thermo-pane windows. They are pleased that they will

not be using fossil fuels for heating and cooling the residence.

They have invested much time and energy to ensure that the Joseph Story House exterior facade and other important historical features of the home remain intact and protected throughout the extensive remodeling process. A number of regulations apply to the exterior of the structure, requiring approval from the Salem Historical Commission.

Carvings apparent in crown moldings and mantels inside the residence display the work of important early New England craftsmen from the late 1700s and early 1800s, and include woodwork by Samuel McIntire. McIntire was one of America's earliest architects. McIntire's work is representative of architecture of the Federal period, a time when the Republic was establishing many institutions to represent the United States. In 1981, Salem created the Samuel McIntire Historic District. The area contains 407 buildings and is the city's largest historic district.

The Story House played an important role in other historical endeavors, the Chayets noted, following Joseph Story's tenure there. From 1860 to 1900, it was the home of Dr. Amos Johnson, who practiced early preventive medicine and was a member of the Fidelity Investments family.

Later, the Vaughan family added a quarter-sawn oak paneled room to the residence in 1901. Children of the Vaughan's led illustrious careers, with Norman Vaughan managing critical parts of Admiral Byrd's Antarctic explorations. Janice Vaughan's husband, Crocker Snow, was an early pioneer of the skies as one of America's first aviators.

The Joseph Story House's rich history in law, medicine, exploration and aviation, along with three centuries of historic architecture, made restoration of the property important to the Chayets. They are pleased to have saved this important property, and to be utilizing GSHP technology in the restoration.

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Old School, NEW LEARNING Environment

By Marie Kadavy

St. Margaret Mary School and Parish in Omaha, Neb. (Photo courtesy of St. Margaret Mary.)

When St. Margaret Mary School in Omaha, Neb., set out "to create a warm, accepting environment in which each student feels comfortable to grow in his or her relationship with Christ and others," it might not have had temperature in mind. When it made fostering an atmosphere which promotes responsibility for one's own actions part of its mission, energy efficiency and environmental stewardship might not have been the intention. However, a decision to go geothermal is helping St. Margaret Mary School and Parish achieve its mission while creating a comfortable and safe learning environment for its 575 students.

Leuck's Drilling at work on a borefield for the ground-source heat pump installation at the Nebraska school and church. (Photo courtesy of Leuck's Drilling.)

A Simple Choice

One of the oldest Catholic schools in the area, St. Margaret Mary was heated by two 1950s gas-fired boilers and offered students no air conditioning. A 1941 system heated the church and a 35-year-old air conditioner provided cooling for more than 3,000 parishioners. When the decision was made to replace the heating systems that had served the school and church for decades, a committee of parishioners was assembled to investigate alternatives. With backgrounds in construction, architecture and even geothermal, committee members, without hesitation, suggested a ground source heat pump (GSHP) system for heating and, for the first time ever in the school, cooling.

"In the past, we've had adequate heating, inefficient as it was with old boilers, but we did not have the capacity to cool the building," the Rev. Gregory Baxter said. "With a geothermal system, we could do both very efficiently and effectively."

The retrofit was part of a $2.4 million renovation that included new windows and building upgrades in the school to accommodate air conditioning for the first time. Leuck's Drilling of Papillion, Neb., was chosen as the full-service geothermal contractor, and the team was one of the first on the site in February 2007.

Weather is always a drilling factor, and conditions in Omaha provided challenges to the crew that included draining all equipment at the end of each day's work. (Photo courtesy of Leuck's Drilling.).

A Challenging Drill

Although the job site was not complicated by existing constraints, drilling the 196 boreholes at 235 feet deep did pose challenges for Leuck's Drilling. A harsh winter did not mix well with Leuck's two mud rotary drill rigs, and a target production of 13 boreholes a day was reduced to just nine. Drilling was shut down when temperatures fell below 17 F. Dale Leuck, owner and International Ground Source Heat Pump Association (IGSHPA) accredited installer, recalled more than 25 weather-related days when conditions were just too cold and wet for work.

"The weather was our biggest challenge," Leuck said. "Every time it snowed we had to plow the fields. Since we were doing mud rotary, everything had to be drained completely every night – water lines, drill rigs, pumps, grouters, grout lines."

As the school's football and soccer field turned into a muddy loopfield, drillers uncovered more of the field's history. Drillers discovered a junkyard along with basement foundations and more than 30 feet of solid rock. Just 10 percent of the boreholes drilled into the Omaha earth had to be cased. Despite a number of barriers and freezing temperatures, the company was able to reach its desired depth for each of the 6-inch bores, and once drilling completed, the athletic field was replaced as planned.

More than 13,000 gallons of an environmentally friendly water and glycol solution circulate through 18 miles of ground loop. Leuck's used ThermoGrout Light with sand, which has a conductivity of 1.0 Btu/hr-ft-∞F, to surround the 1-inch high-density polyethylene pipe. The closed-loop ClimateMaster system totals nearly 293 tons and provides heating and cooling capacity for the entire parish plant. Today, the system only offers space conditioning for two buildings while the complex's other three buildings – an office building, parsonage and parish center - are all heated and cooled by traditional systems. In the future, however, as the conventional systems in the plant's other facilities need replacing, those buildings will be integrated into the existing geothermal system.

"Those systems were relatively new so we couldn't put heat pumps in for those, but we have bulk heads up to each of those facilities that will be serviced by the well field in five to 10 years when we tap into them," Baxter said. "The capacity is there for the entire parish plant."

A Quick Payback

With the new system up and running since the beginning of the 2007-2008 school year, the church and school are experiencing 40 percent savings, and Baxter expects to see similar savings when the entire parish plant goes geothermal. Although three of the parish's buildings are still operating on fossil fuels, Baxter reported a 64 percent decrease in natural gas use.

Baxter called the parish's capital campaign to pay for the new system highly successful, and St. Margaret Mary seems to be right on target to meet its predicted payback period. "We believe we're looking at a nine to 10 year payback period," Baxter said. "That's very quick. As natural gas prices increase, the actual payback might be quicker than that, but we are certainly hitting the mark in the 9- to 10-year range."

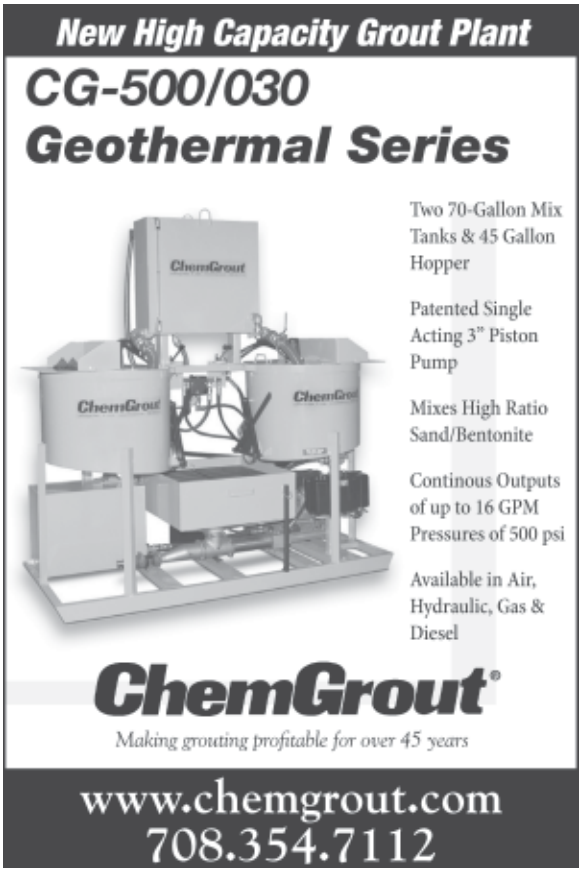
In addition to strong support from the parish, the Omaha Public Power District offered an interest-free loan to finance the borefield portion of the project.

A State of Geothermal

In Nebraska, business is booming for Leuck's Drilling, an exclusively geothermal drilling and full-service installation company that is considering adding other renewable energy technologies to its services. The project at St. Margaret Mary has earned the company quite a bit of media coverage, but Leuck said it's not because geothermal is new to Nebraska.

"I do see installations happening more in private schools in other communities around the state," Leuck said. "It's kind of the wave of the future for people who are more concerned about fossil fuels compared to something that is renewable."

Baxter said he thinks more parishes and schools will be considering geothermal in the future, and he has already heard from a few. "We've had some phone calls from other interested parties in the city of Omaha and outside of Omaha who have heard about our project," Baxter said. "I give them the same answer, 'We are happy with our decision, and we would do it again.'"



Although excited about the increasingly popular technology his company is founded on, Leuck is concerned about installers knowing what they are doing, he said as he stressed the importance of IGSHPA accreditation.

"We don't want incompetent people to give it a bad name," Leuck said. "Make sure it's done correctly or don't do it at all."

A Comfortable Learning Environment

"For the school, the benefits have been tremendous," Baxter said. "The heating and cooling system is climate controlled by each room, so teachers have the ability to set their thermostats for their particular needs for their particular room." With the GSHP system, teachers are able to heat and cool at the same time in different rooms in the same structure. If the west side is a little warmer one day because of the setting sun, that side can be cooled even though the other side might need a little bit of heat.

Baxter said the geothermal heating is much more even and consistent than the boilers it replaced, allowing temperatures to be constantly maintained. The kids are much more comfortable, and the cooling has been very helpful for the warmer months of the school year, he said.

True to its mission, St. Margaret Mary's heating and cooling upgrades have improved the students' learning environment while setting an example of responsibility. "It's a more efficient way to use our natural resources, and we're happy to be a part of that effort to use our resources more effectively." Baxter said.

Baxter said the system has run efficiently from the start with no signs of problems, and Leuck said he sees geothermal as a comfortable choice with a long-lasting future. "St. Margaret Mary has been there for 80 years and will be there for 100 years more - and so will the geothermal system," Leuck said.

Drilling reveals many things that have been buried and forgotten. A basement, old foundations and a junkyard were once part of the St. Margaret Mary football field where the borefield was located. (Photo courtesy of Leuck's Drilling.)

A New *Angle* on Horizontal Drilling

By Dara McCoy

The 922 Ditch Witch horizontal-directional drill can make getting into tight residential areas, where landscaping and existing homes can be obstacles, a much easier task. (Photo courtesy of Ditch Witch.)

If the ground source heat pump (GSHP) industry was polled to name the top challenges of installing a geothermal system in a residential application, the cost and physical restraints of installing a loop in a residential lot would easily crack the top five. When Oregon-based housing developer Steve Turner, owner of SR Turner Construction, decided he wanted to couple a radiant heating and cooling system to a ground loop for a residential development, he had no idea he was about to tackle those two issues head on.

Turner bought the residential lot in an existing neighborhood from an owner who had partitioned his lot. The lot gave Turner 6,000 square feet to work with, and the two-story home Turner constructed consumed 2,800 square feet. It didn't leave much room for a geothermal bore field, which meant Turner would have to find a way to get a loop installed in limited space with tight access in the already developed neighborhood.

Eventually, Turner contacted Sean Hogan, sales representative of Ditch Witch Northwest. "I've been working on this for about five years trying to get the contractors who are building these systems to look at our tech-

When a fence or other constraints challenge drilling for GSHP loops the Ditch Witch 922, a machine the size of a small garden tractor, could provide an answer. (Photo courtesy of Ditch Witch.)

nology for drilling these wells," said Hogan, who was so determined to build a GSHP market for Ditch Witch directional drilling machines in his area, he donated the use of Ditch Witch equipment and his expertise in drilling wells for Turner's home. "It allows them to use horizontal-drill technology instead of a vertical drill to put wells where they typically can't be placed like underneath a residence."

Hogan didn't misspeak. Using the 922 Ditch Witch horizontal-directional drill, Hogan drilled six boreholes at 200 feet deep underneath the home. The drilling machine, the size of a "small garden tractor," is typically used to drill horizontally and then surface at one end, Hogan said.

For Turner's home, Hogan drove his drilling machine into the backyard, without tearing down fences or obliterating the yard, and drilled the six boreholes at a 45-degree angle underneath the home. Hogan said the challenge was drilling a "dead-end" hole as opposed to going down five or six feet, surfacing at an exit end and pulling pipe into the ground as might be done on a horizontal installation.

"I developed an anchor that we would place on the end of the pipe," Hogan said. "We pushed the ground loops down to the ground. Then, we would pull the pipe in the ground, while we retracted our drill pipe." Hogan's anchor, "nothing more than a pointed piece of steel," was installed to the end of the drill pipe and the geothermal loop. When it reached the end of the borehole the steel point would anchor the loop preventing it from being pulled out of the hole with the retracting drill pipe, he said. Though the process took some refining, Hogan said he feels he developed a good system for this type of installation. "This is just an idea that I've wanted to try," he said. "We had to come up with a system, and we have to develop tools to do it."

The benefits of the "semi-vertical" bore field in this project were significant. The ideal land mass needed for a horizontal bore field was not available. A conventional vertical drilling rig would have been impossible to get into the yard and more costly. "Our equipment is less expensive," Hogan said. "We can put wells in for

the least amount of money with a horizontal drill versus a vertical drill."

Conrad Brown, consulting engineer on the project from PAE Consulting Engineers Inc. noticed another potential cost saver in the amount of grout that was needed for the project. "They use a very small amount of grout slurry as they drill," he said. "They don't have to grout the hole afterwards. When they pull out of that hole, none of the earth actually gets physically brought out of the bore. It's just liquefied in the hole and once the moisture goes out, it solidifies again." The process was significantly cleaner, too. Brown said only three or four gallons of slurry came out of each hole, which was contained on a small trailer towed behind a pickup truck. "That's the extent of the mess," Brown said. "It's a big difference from a vertical system."

Turner realized there would be installation savings, as well as the energy savings his customer desired. "Had we done it vertical, I would say we would've spent $20,000 on the holes, and we spent about $5,000 on this option," he said. "It was significantly cheaper."

When Trying Something New Pays Off

Their involvement in this somewhat experimental project paid dividends for Brown and Hogan as well. Brown's employer, PAE Consulting Engineers, plans to use the same directional drilling process in a commercial net-zero building in Seattle, he said. For Hogan, his five years of promoting Ditch Witch for GSHP installations is paying dividends. "Since I've done this project, there's a new company, Oregon Geothermal, that is now doing this on a regular basis," Hogan said. "It was a heating and cooling company that decided to start putting in these ground loops this way, and they've been successful so far." In fact, without Hogan's semi-vertical drilling process, one of Oregon Geothermal's clients, who owned a house located on a cliff near the Willamette River in Portland, Ore., wouldn't have been able to have GSHP heating and cooling.

In 22 years of building homes in the Pacific Northwest, this was the first GSHP home Turner had ever developed, but it left lasting impressions by cutting estimated energy expenses in half for the four-bedroom home. "If all the U.S. market were to switch over to this type of system, we could cut our energy dependence as far as residential heating and cooling in half," he said. "This is a great solution." Turner plans to install the same type radiant and GSHP system in the next new home he builds for himself. "If you can get half of your energy in your backyard, that's a good thing."

Hogan has started hearing some feedback about his drilling method in Oregon but says word of mouth is sometimes a slow process. "People aren't aware of the technology so they're not using it," he said. "Once people see this being done, when you can go into somebody's yard and not even disrupt their shrubs or lawn too much, I think it will be the way of the future."

In the News

Interest in the International Ground Source Heat Pump Association and our training and technology is increasing at what appears to be an exponential rate with that of the cost of energy. Especially now going into the heating season, consumers, business owners, builders, facilities managers, school districts, military installations and all of the potential users of GSHP technology are looking for reliable information.

As a service to our membership, IGSHPA is going to begin placing noteworthy news items in a special area of our Web site at www.igshpa.okstate.edu. You may find these valuable to assist you in answering questions for your clients or customers, or in your efforts to help promote the technology.

We have included a sampling of recent media articles in an abbreviated digest form for you to see here. If you go to the sites listed, either by typing these URLs into your computer browser or by clicking on them on our Web site, you will be able to see and print entire articles.

The New York Times

With Energy in Focus, Heat Pumps Win Fans
By Liz Galst
August 14, 2008; Business/ Small Business

Like other energy alternatives, heat pumps have won new admirers as energy costs have skyrocketed, and the businesses that install them have been booming too.
http://www.nytimes.com/2008/08/14/business/smallbusiness/14sbiz.html?ex=1376366400&en=cf6c36dee53361fe&ei=5124&partner=permalink&exprod=permalink

KJRH-NBC Channel 2

Green Country Business Helps Make Olympics Green
By Deana Goll
August 12, 2008; NBCOlympics.com
Tulsa, Okla.

A Green Country business is helping to make the Olympics a bit more green. The Olympic Village, also known as the "birds nest" plays host to the opening and closing ceremonies as well as numerous athletic events. Inside the "nest" is millions of dollars of eco-friendly technology from Catoosa.

"Certainly we had communication barriers" said Phil Schoen, President of Geo-Enterprises.

Through a partnership with Oklahoma State University, Schoen was instrumental in instructing the Chinese on ground source heat pumps.
http://www.kjrh.com/content/news/franchises/segment2/story.aspx?content_id=7C423E81-B574-4EB6-99DB-82D270E3EDFC&gsa=true

Rural Life Magazine

'Earthy' Tool Saves on Cooling
Tapping the Earth for Energy Efficiency
By Dan Crummett
July/August 2008; Cover story

When Blaine and Mary Talbot were building their rural home on acreage north of Stillwater, Okla., they were living in a 2,000-square-foot, 1960s-era, three-bedroom brick home with its original windows, insulation, and heating, ventilating and air-conditioning system. Their energy expenditures for their gas-and-electric HVAC system were more than $400 monthly.

Thinking Globally About Local Actions
By Dan Crummett
July/August 2008; Sidebar with Cover Story

Jim Bose is an expert on the technology of ground-source heat pumps. He has 30 years of engineering experience in heat and air, and is executive director of the

International Ground Source Heat Pump Association.

The potential economic and environmental savings for widespread use of GSHP technology in the U.S. could be astounding, says Bose.

www.RuralLifemagazine.com

The Oklahoman

Oklahoma Engineers Helped Chinese Warm up to Geothermal Power at Olympics

By Jim Stafford

Business Writer

August 15, 2008; Business front page and back page

Hidden beneath the marvels of technology on display at the "Bird's Nest" for the opening of the Beijing Olympics last week was an engineering wonder exported from the heart of Oklahoma.

Unseen by the billions who watched the opening ceremony was a geothermal heating system installed beneath the stadium, providing heating and cooling to the interior of the massive National Stadium and other facilities connected to it.

http://newsok.com/article/3283852

Heat Pump Group Verifies 'Green' Label

By Richard Mize

Real Estate Editor

June 14, 2008; Business front page

"Green" heating and cooling sources are close enough to stand on – within the earth. But what do people stand on to legitimately claim that installation of a geothermal system is "green"?

They probably rely on training and accreditation from the International Ground Source Heat Pump Association, a Stillwater-based, but international, third-party verifier and trainer of all things to do with geothermal system installation.

Geothermal systems were "green" before it was cool. The association observed its 20th anniversary in 2007.

http://newsok.com/article/3257317

The Stillwater NewsPress

Oklahoman Proud of Olympic Bird's Nest Involvement

By Janet F. Reeder

IGSHPA Writer/Editor

August 17, 2008

Stillwater, Okla.; Page A12

Oklahoman Phil Schoen is pretty much always on the go but because of a personal tie in, the Tulsa area businessman has taken the time recently to watch televised coverage of the opening for the 2008 Olympic Games at Beijing's National Stadium.

"Was that incredible or what?" Schoen asks, about

the huge display that began the Olympics. He is uniquely familiar with the location of the ceremony, and an obvious amount of pride comes through as he discusses it.

Schoen, the president of Geo-Enterprises, Inc., spent time in China last fall working with Chinese engineers who would install equipment and oversee drilling of 104 boreholes at a depth of 250-300 feet to support the technology that helps heat and cool the interior of the expansive National Stadium and a grouping of other athletic facilities connected to it.

http://www.stillwater-newspress.com/features/local_story_229232347.html

An article and photos about this installation will be in the upcoming 4th quarter issue of Geo Outlook. So be sure to watch for it. ◆

Earth Insights

If you have a question about geothermal installation, design or troubleshooting, send it to Phil Rawlings in care of *Geo Outlook*, Oklahoma State University, 374 Cordell South, Stillwater, OK 74078 or via e-mail to igshpa.news@okstate.edu.

Back to Barb Fittings!?!

Every once and a while an idea comes along that is so good and so logical you can't believe you didn't think of it yourself or that it took so long for it to surface. Happened to me a little while ago.....

Jack Henrich of Bergersen/Caswell (and a member of the IGSHPA board) and I were speaking at an NGWA conference and he tells me about this idea to use barb fittings. After all the fitting/clamp related problems of the '70s and early '80s, at "barb fitting" my mind goes blank and my ears plug themselves in self-defense. As we walk, I'm trying to figure out a nice way to tell Jack he's lost his mind. He takes me to a booth and then shows me THE fitting - a sprinkler system barb fitting plug. I'm immediately hooked!!!

From the beginning of this industry, we have adapted components and technologies from other industries. This one was a surprise - or - maybe I'm the only guy that didn't know about it. Either way, it's a low cost plastic plug that can be used to plug vertical or horizontal U-bend/loop pipe ends between installation and headering.

We've all seen loop field duct taped pipe ends loose the tape and open, or know the time and materials necessary to heat and melt them closed or fuse on caps. This barb fitting plug is simply force fit inserted into the pipe to plug the end, keeping loop water in and contaminants out. No tape that won't stick when it's wet or comes loose after the pipe end is taped up. No clamps, torches, tools, fusion equipment and caps, etc..... just inexpensive barb fitting plugs available in 3/4", 1", and 1 1/4" sizes. These plugs are inexpensive enough to be disposable - just leave them in the pipe when you trim the legs to fuse on to headers. They are available from several industry fitting sources (Merrill Manufacturing or Boshart Industries for example) and if purchased in large quantities are very reasonably priced.

Let's see, low cost, easy to install, permanent, disposable - have I missed anything? Check it out!!!

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.

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- **FHP Quality and Reliability**
  FHP's Aquarius II Series feature coated evaporator coils, stainless steel drain pans and black vinyl coated cabinet as standard to ensure long trouble free life of the units. Rigorous factory testing of each unit ensures trouble free operation from the start.

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