

GEO OUTLOOK

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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



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.)

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 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.

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



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.)

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 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.



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.)

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 pre-

ventive 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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