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Hopper Residence Alexandria, VA

Geothermal led, energy-efficient renovations provide occupant comfort in historic 1830's home.

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New technologies make historical residence retrofit possible

When Harry and Maria Hopper purchased their 1830s Federal-style Old Town Alexandria home, they were excited to take ownership of a piece of architectural history just miles from the nation's Capitol.

"We realized in the initial years of living in our Old Town home that this was going to be a challenge for us when it came to maintaining indoor comfort, and that ultimately we would need to compensate for lost heating and cooling with a highly efficient HVAC system upgrade," said Maria Hopper.

The Hoppers have a geothermal heat pump system in their farmhouse in rural Virginia, and hoped to retrofit a geothermal-driven HVAC system into their Old Town home as well. A 17 x 30 ft walled backyard added to their challenge.

"Boreholes typically require 20 ft spacing, and with the Btu requirements for the HVAC system we'd designed, the backyard space was technically not quite big enough," said Rich Abernathy, president of Air Cool & Heating Systems, and mechanical contractor for the job. "However, using the RAUGEO PEXa-based system, including double U-bends that allow for collection of up to 30% more energy per borehole, we only needed to drill five wells, which the backyard could accommodate."



The system was designed using a home-run loop field configuration, with five 260 ft loops of RAUGEO PEXa pipe run from each of the five 230 ft deep boreholes. In addition, two 5-port REHAU PRO-BALANCE® 1 1/4 in. balancing manifolds were used to accommodate 10 supply and 10 return runs from the borehole field.

"Another advantage of RAUGEO is that each U-bend in the borehole can be controlled and isolated individually, which is incredibly advantageous for both the mechanical contractor and the homeowner," said Mike Maher, sales manager, renewable energies at REHAU. According to Maher, RAUGEO provides an additional level of security as, unlike HDPE applications, there are no joints or fusions inside the borehole itself.

According to Gregg Drunagel, the project's geothermal contractor and chief operations manager at Green Hill Mechanical, the RAUGEO PEXa-based system provides a new level of opportunity for retrofit applications.

"Getting significantly more Btus out of a borehole like this opens up so many project doors," Drunagel said. "We are experiencing more interest in retrofit versus new construction projects these days. It helps to be able to say with assurance that we can deliver the required amount of energy no matter what kind of tight space we're faced with."

"We're looking forward to a summer of that consistent, dry, cool temperature that only geothermal can provide," Hopper said.

"With our experience in our other home, we're also confident that the utility bills are going to be minimal compared to what we've seen here over the past 12 years. The system is so pleasantly quiet, friends who visit always seem to wonder if it's even on!"

Project: Hopper Residence, Old Town Alexandria, VA
Construction type: Residential retrofit, opened in 2012
Construction: 1,300 ft (396 m) of pipe; 5 geothermal boreholes
Architect: Adams and Associates
Mechanical contractor: Air Cool and Heating Systems, Inc.
Geothermal Contractor: Green Hill Mechanical, LLC
REHAU systems used: RAUGEO™ ground loop heat exchange

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