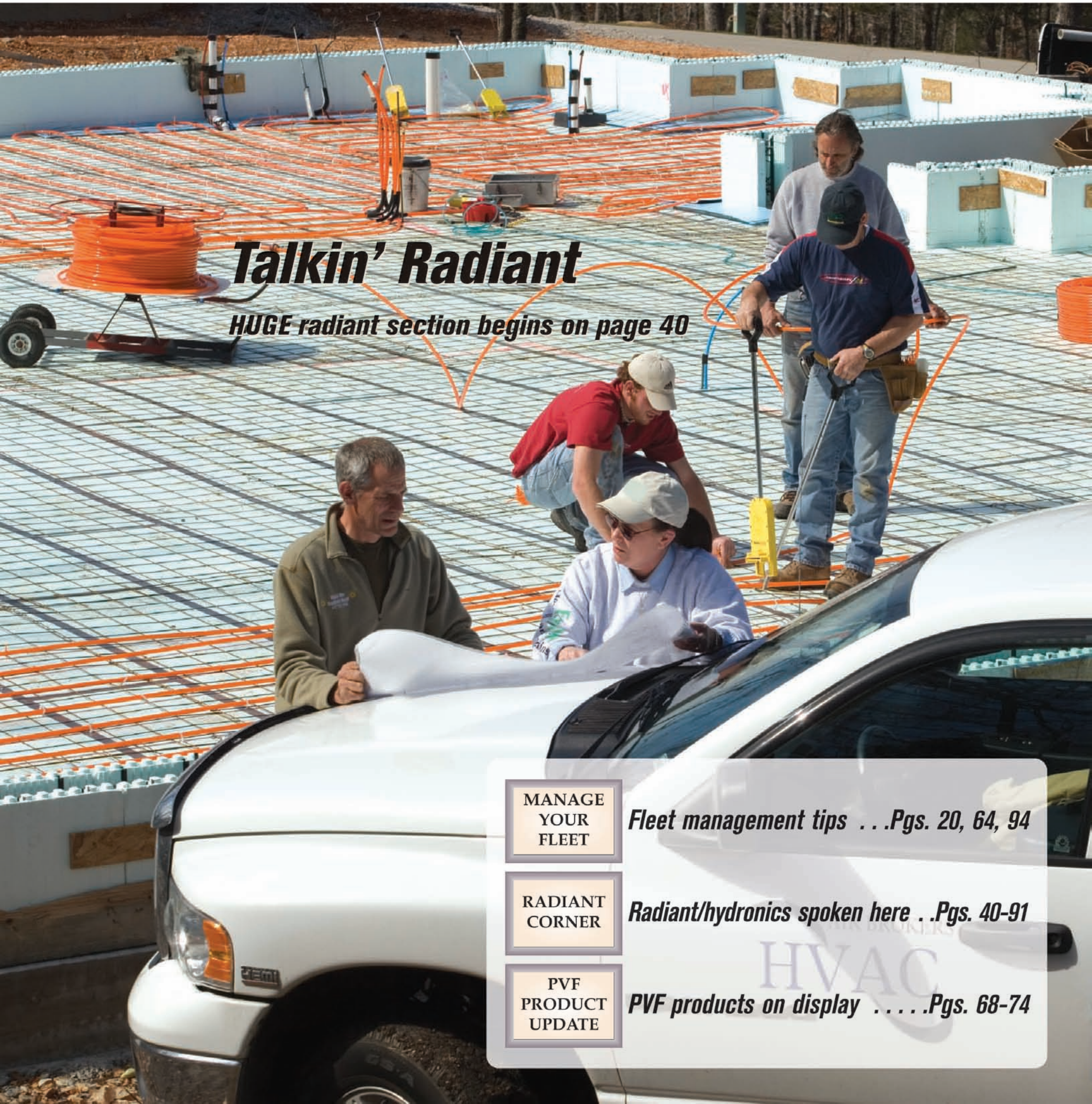


A TMB Publication

Phc News

plumbing & hydronic contractor news



Talkin' Radiant

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MANAGE
YOUR
FLEET

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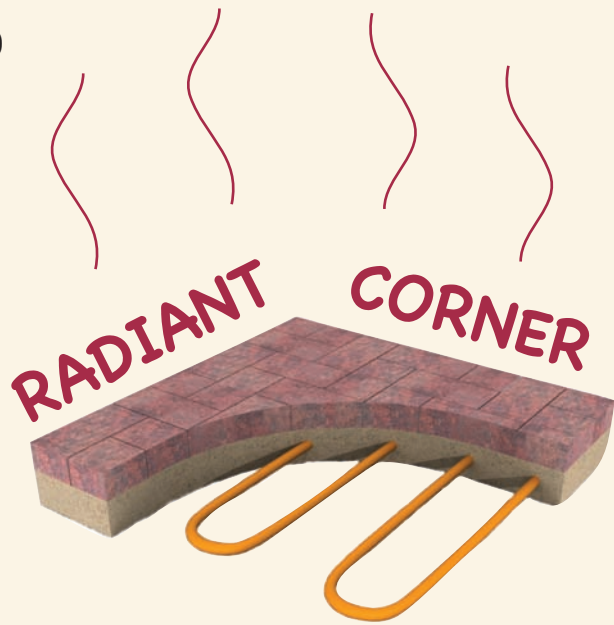
RADIANT
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HVAC



Color this home radiant green

Missouri home boasts radiant heat comfort, with air conditioning and domestic water heat, sourced from a geothermal system.

When industry giants combine their talents, amazing things happen. And thanks to the mechanical system expertise of “Hot Rod” (Bob) Rohr and Gemma (pronounced “Jem-ma”) McKee-Bartholomew, this new home in the Ozarks now has a radiant heat comfort, with air conditioning and domestic water heat, sourced from a geothermal system.

Rohr is *Phc News* magazine’s hydronic columnist. McKee-

Bartholomew describes the plan as a formula, one she now offers to clients far and wide. They’ve also become the focus of “High Tech Homes” training she conducts for professionals and homeowners alike.

She’s reluctant to ignore any key facet of a home’s design, so she often incorporates SIPS or insulated concrete form (ICF) structural components to create an air-tight envelope. She opted for superbly insulated ICF for this slab-on-grade project and is

For instance, she chose a “cultured” cobblestone driveway which requires no maintenance, gutter helmets to whisk leaves from rooftops, and composite decking. She also selected a composite flooring with laminate oak, designed specifically for use over radiant heat, compact fluorescent lights and low flow toilets.

And though she knew the house would be an energy miser, McKee took the extraordinary step to install electrical sub-meters to carefully measure energy use by the geothermal and domestic water heating systems. She uses three of the devices, typically found in commercial or multi-housing buildings; their purpose is to continuously monitor and track energy used for specific purposes.

The home’s radiant system had not yet been connected for the first winter season (‘05/’06). All of the home’s space heating and cooling needs from August 1 ’06 until July 17 ’07 required a net electric use of 1,104 kWhrs @ .09 per = \$99.36 for the 11 month, 2 week period, or \$8.64/month.

“But this past winter was to be different,” said McKee-Bartholomew. “The first winter heating of the home was provided strictly via the 2-ton, ground loop-to-air geo system that was originally intended for use only as a cooling system.”

Meeting home comfort needs during the most recent heating season was accomplished with radiant heat, providing data that permitted her to determine the actual cost of geothermal heating with forced air, versus geo heating with radiant.

“We expected 10 to 15% better efficiency, and a whole lot more comfort inside,” she said. “What we got — with comparable winter conditions — was an astounding 22% greater efficiency with radiant. That’s hard, objective data provided by the sub-metering of energy use. With much better comfort from the radiant, we can set thermostats at around

68-69 degrees and accomplish a comfort level greater than the forced-air when set at 74-76 degrees. The other thing I noticed is that the radiant offsets cool areas near windows and doors which adds very nicely to our comfort at home. The data proves-out the theory but, subjectively, there’s nothing like radiant comfort.”

Peanut is radiant, too

“My husband, ‘Doc,’ and I had an almost giddy feeling when we experienced our first real snowfall,” she added excitedly. “It was about 18 degrees outside. We were standing in the living room in our bare feet, cozy from our toes up, as we watched a blanket of white appear before our eyes. And to know that the warmth we felt was coming directly from the ground underneath our feet, costing so little to produce, added a new dimension to the concept of comfort. We have the technology today to . . . have it all.”

Apparently, their two-pound pooch, Peanut, took a shine to radiant heat, too. The poor feller shivered all winter long in their previous home. But these days she prances around comfortably inside and, according to



Contractors lay down about 2,700 lineal feet of Watts Radiant’s RadiantPEX in just two heating zones embedded in heavy concrete.

Bartholomew is a nationally-acclaimed geothermal expert who owns Kimberling City-based High Tech Homes Construction, Consulting & Seminars and Air Brokers HVAC, LLC (www.hthconstruction.com).

The best is yet to come because this winning, ultra-efficient green-build formula is soon to be replicated. In fact, McKee-Bartholomew’s championship of smarter, earth-wise construction has earned her the local moniker, “Queen of Green.”

McKee-Bartholomew has fiddled with plans for a near-zero-energy home design for several years. Her plans finally took shape when she completed the home she built for herself near Branson.

Popular Mechanics magazine was so impressed with the plan and the combination of talents bringing it to fruition that they sent a columnist to develop a story; it’s slated to appear in one of their magazines this year.

currently in the process of building another model home of SIPS for comparisons.

The 3,570-sq.-ft., single-level home received about 2,700 lineal feet of Watts Radiant’s RadiantPEX in just two heating zones embedded in heavy concrete. One zone is comprised of the great room, office, master bedroom and all bathrooms. The second heating zone is made up of the dining room, living room, kitchen and guest bedroom. They also needed 1,200 lineal feet of WaterPEX for domestic water lines by Watts Radiant.

Sub-metered energy use

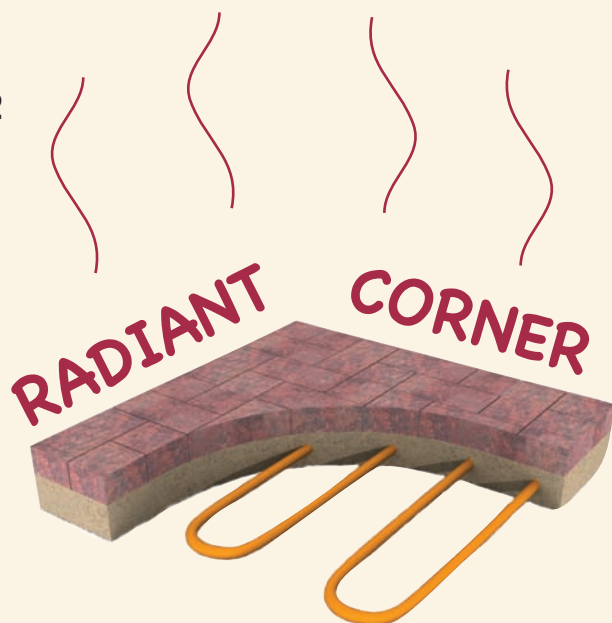
The home was designed to require minimal maintenance, to maximize the use of renewable resources, and for superb energy efficiency. “These were the key ideas from the earliest point,” she affirmed. “On them we hung every design, construction and mechanical concept.”



A different kind of Texas tea: geothermal drilling.

Gemma, has even added a few ounces because she’s not shaking all the time.

McKee-Bartholomew’s energy data from last winter reveals that, when taking into consideration all the benefits of radiant heating — from an efficiency standpoint as well as comfort (*Turn to Radiant Home, page 42.*)



Radiant home

(Continued from page 40.)

and health — radiant has a rapid payback which dispels yet another misconception about the affordability of these systems.

Inspired by the success of mechanical systems in this home, McKee now hopes to take green construction into the affordable housing market nearby. “Why should sophisticated, energy-wise homes be available just to people of greater means?” she asks.

She’s now preparing to develop a subdivision of small, energy efficient homes in the 960 - 1,400-sq.-ft. range

hermal boiler” is a high temperature, four-ton (48,000 Btu) unit that accomplishes this with no electric heating of the water, giving it a coefficient of performance (COP) 25% higher than current units on the market.

New scroll compressors within the Tranquility units make it possible to generate leaving water temperatures of up to 145°F even at ground loop minimum temperatures. Until now, many experts in the hydronic industry, like Rohr, have been reluctant to couple geo with radiant.

“Previously, geo systems were producing temperatures typically in the 110-120°F range,” said Rohr. “But

with extraordinary efficiencies up to 31.5 EER and 5.1 COP . . . meaning that, for every unit of energy used to power the system, it delivers 5.1 units in return. Another way to characterize that level of energy efficiency is simply to refer to it as 510% efficient!

A good lab = repeatable results

Results from Gemma’s first ICF test model were so positive that she decided to build another one right across the street, though the new house was constructed with SIPS (structurally insulated panels). The SIPS model is 4,125 s.f. and has many unique features such as the Titan Veil Cool Roof that rejects both solar and UV rays, cellular PVC windows throughout, and supplemental hot water with one of Bradford White’s high efficiency water heaters.

The home’s energy-wise construction, windows and roof are combined to cut the HVAC system’s heating and cooling load by more than half. A four-ton (48,000 Btu) ClimateMaster Tranquility system was chosen to meet the home’s heating and cooling needs.

“One ultra-high efficiency geothermal system, a straight forward design, and incredible energy savings all accelerate payback to the homeowner,” she said. “While many in the residential construction industry will claim the cost to install geothermal HVAC systems is prohibitive, I say it’s dirt cheap . . . and I have the data to back it up.”

The hydronic system for Gemma’s own home was designed by Rohr to deliver a range of temperatures. “We needed to accommodate the varying demands of an extensive floor heat system, one hydro-air coil, and domestic hot water.” Among the list of controls were Italian-made Caleffi three-way thermostatic valves, air separator, a boiler fill and backflow preventer. The manufacturer has won a stable following among hydronic devotees nationwide.

“And, because Gemma’s system may be altered and ‘tweaked’ at a later time, we also used several three-speed SuperBrute circulators from Grundfos,” added Hot Rod. “They give us the flexibility of increasing or reducing flow with the simple flick of a switch. I’m also a real fan of the wet rotor design among circulators, using the liquid that’s circulated to lubricate the device.”

Hot water recirculation

For those of us in the trade, it’s no mystery that waiting for hot water to reach a sink, faucet or shower can be costly. Not only does it waste time, and the energy to heat the water, it wastes our most valuable natural resource: water. And because sewage taxes are based on water meter volume, the

penalty is paid once, and then again.

Knowing this, and with a real penchant for all things “green,” McKee-Bartholomew chose Grundfos’ UP10-16 pump to recirculate domestic water within the home. The pump is installed above McKee-Bartholomew’s indirect water heater and uses a dedicated return line (it’s insulated) to accomplish the recirculation path.

Grundfos estimates that a family of four wastes 12,000-to-16,000 gallons of water per year without recircula-



Hot rod roughs in a radiant manifold.

tion. This would be millions of wasted gallons per sub-division.

In-house water treatment

Water conservation is a big issue these days. But so is water quality. McKee-Bartholomew is confident that she’s found the ideal solution for water treatment, filtration and purification; an all-in-one device that, in her opinion, has revolutionized the industry. She chose EcoQuest’s Springhouse system. Its seven stages of sediment filtration are augmented with a sequestering agent to treat hard water and prevent scale. It then uses a powerful UV light to disinfect the water it treats, instantly killing a host of microorganisms.

“I planned this house for several years,” said McKee-Bartholomew. “Every facet of its construction — with special attention given to all mechanical components, my specialty — was thought through deliberately. It’s essentially a live-in laboratory that was green-built from the start, before “green” became iconic, the new Holy Grail in construction that it is today.

“When we at last broke ground, there were few surprises,” she concluded. “Today, the home has surpassed my expectations for energy efficiency, performance and comfort. The lab test proved-out nicely, but we’re still looking for ways to improve the formula. That’s what High Tech Homes is all about.” ■



Bob “hot rod” Rohr installs a caleffi fill valve below the air eliminator.

with the goal of providing heat, air conditioning and domestic hot water production in the cooling season, for as little as \$12.00 - \$15.00 per month respectively.

Geo-to-radiant? You bet.

“I’m eager to tell my customers that radiant heat is the most comfortable kind of heat and radiant floors put that heat at our feet, where we’re uniquely built to appreciate it,” added McKee-Bartholomew. “Radiant doesn’t stir up allergens or stratify heat at the ceiling. Less temperature stratification means you can set the thermostat down to 65°F, which puts less pressure on the heat to escape the envelope through conduction.”

The geothermal unit she most recommends for super energy-efficient combination with radiant heat is ClimateMaster’s new Tranquility water-to-water heat pump. The “geot-

with temperatures above 140°F, we can use it for all types of radiant heat, many forms of hydronic convection, and to exchange heat for domestic water supply — all with no need for expensive, additional electricity to generate that heat.”

McKee-Bartholomew acknowledges that most “geo homes” are coupled with more conventional, ducted, water-to-air geothermal systems. “Radiant heat delivery offers comfort without compromise, but it is less expensive to provide heating and cooling through a ducted system.”

When ducted delivery is chosen, she typically recommends the Tranquility 27 geothermal product line, a series of water-source heat pumps that use EarthPure (HFC-410A) zero ozone depletion refrigerant. The systems are available in sizes of two tons (7.6 kW, or 24,000 Btus) through six tons (21.1 kW, or 72,000 Btus)