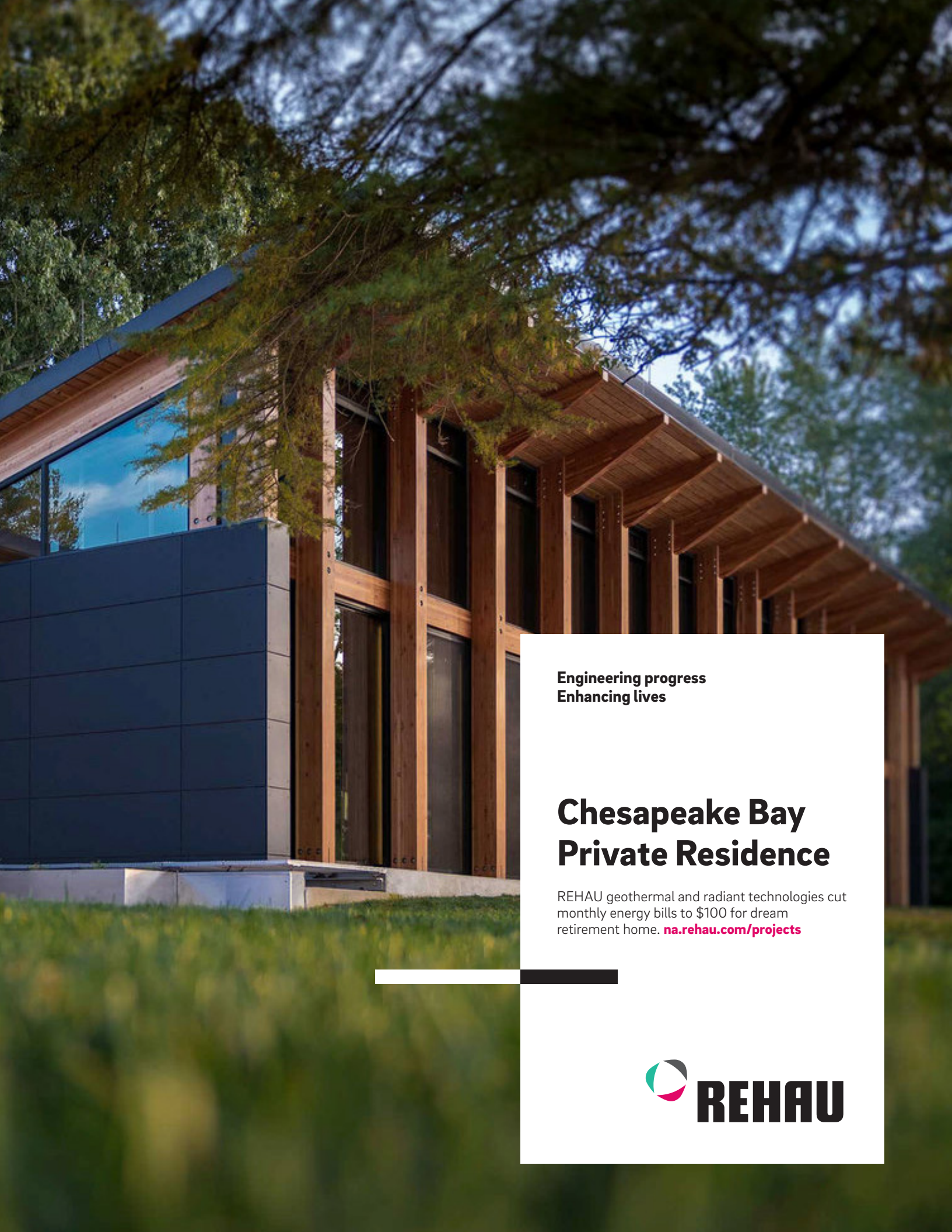

Engineering progress
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Chesapeake Bay Private Residence

REHAU geothermal and radiant technologies cut monthly energy bills to $100 for dream retirement home. **na.rehau.com/projects**

REHAU

Geothermal and radiant combine to cut monthly energy bills for Chesapeake Bay home

After years of unsuccessful house hunting, Mike and Donna Hager decided instead to build the retirement home of their dreams. And they found the perfect location: A high point overlooking the Tred Avon River where it widens just before flowing into the Chesapeake Bay on Maryland's Eastern Shore.

As fortune would have it, the Hager's son Mitch was also pursuing a graduate degree in architecture at the time from Virginia Tech. Together they planned a home that was beautifully designed, comfortable, easy to maintain and energy efficient. Mitch then turned to REHAU for help making their vision a reality.

The result is a 3,800 ft^2 (353 m^2) two-story home with massive polished concrete walls and floors embedded with a highly efficient radiant heating and cooling system that draws its energy from an advanced "vertical" geothermal system. High ceilings and a wall of windows capture the Bay's gentle breezes as well as a spectacular view of the river where "clammers" harvest shellfish as eagles and ospreys hover to capture what they miss.

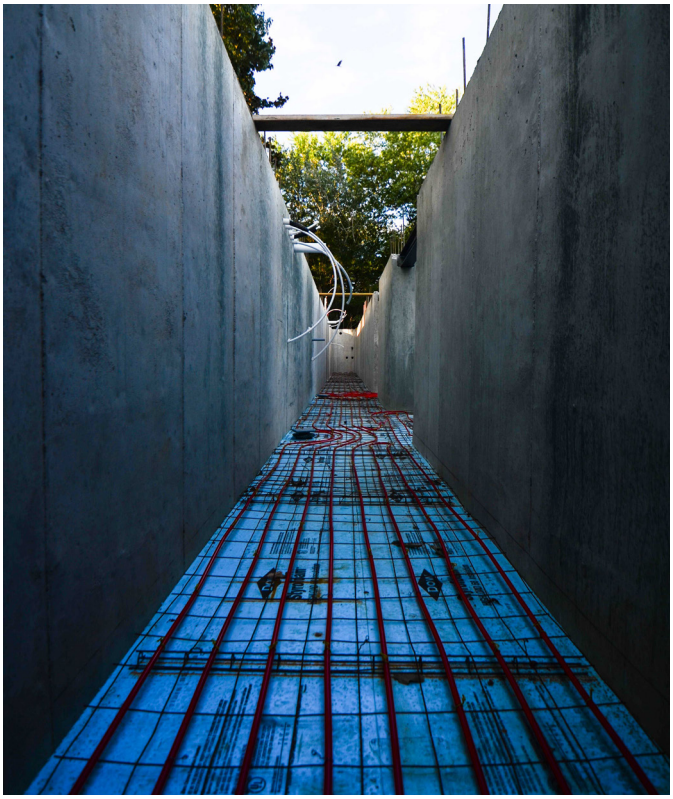
"No one had done anything like this before," Hager said. "It was unique and the project was small. So a lot of local contractors wouldn't touch it. But REHAU was willing to roll up their sleeves and work with me."

"I knew them from their work at Virginia Tech on the Lumenhaus (an experimental advanced solar home project). REHAU invests money and time into innovative projects, regardless of scale. I can't say enough about their help in every phase of the project."

What made the design unique – and challenging – was the use of enormous amounts of concrete to create the thermal mass needed to absorb energy, then gently release it as consistent, uniform cooling during the summer when Eastern Shore humidity tops 78 percent and as even, steady warmth during the winter when below-zero north winds scour the Chesapeake.

To provide enough thermal mass, Hager had to think big. He had more than 50 truckloads of concrete hauled in for massive footings, and walls that sit on twin slabs of concrete sandwiching a layer of insulation. In the top slab, contractors embedded nearly 5,000 ft (1,524 m) of 5/8 in. RAUPEX O_2 barrier pipe in 20 loops. Hager also ran RAUPEX UV shield pipe for the home's drinking water through conduits embedded in the concrete. "It wouldn't have worked without the flexible RAUPEX piping," Hagar said. "That made the whole system possible."

Next up was the home's geothermal energy source, built on a field of eight RAUGEO double U-bend vertical ground loops sunk into four boreholes 300 ft (91 m) deep – a system that collects 25 percent more energy than HDPE single-loop "vertical" systems and reduces the requiered borehole footage. A ground source heat pump extracts energy from fluid circulated through the ground loops and pumps it through the in-floor radiant for both heating and cooling. The heat pump also triggers backup supplemental forced air to remove condensation during the summer's muggiest days.



The result is a heating and cooling system that provides uniform comfort, slashes energy costs and will last as long as the home stands, a major reason Hager said he chose REHAU. "I believe in sustainability, and for me that means installing systems that you don't ever have to replace," said the young architect.

Together, the home's form and function translate into energy bills averaging $100 a month, nearly 70 - 80 percent less energy than older homes of similar size in the area. But even that bill is deceptive, Hager added, because that $100 bill also covers two outbuildings and power-hungry appliances, such as a 60-amp kitchen stove.

"I actually can't tell you what the home's heating and cooling energy bills are. But I know they're next to nothing. It's worked better than we even imagined."

Hager said his work with REHAU and the company's innovations in construction services, design and materials have convinced him to partner with REHAU for every future project, including an 8,000 ft^2 (743 m^2) building he's proposing for a client.

"In the United States, we're still building things the same way we did 150 years ago. REHAU's people work hard, they're innovative, and they're a leader in Europe, which is way ahead of us," Hager said. "Thanks to their help, we did something people said we couldn't do. I think it has opened some eyes."

"Words cannot convey the beauty and quality in our home's design, construction and operation," seconded Mitch's mother, Donna.

Project: Hager Residence, Easton, MD
Construction type: Single-family home, constructed in 2016
Project scope: 3,800 ft^2 home; 5,000 ft (1,524 m) of pipe; 8 geothermal boreholes
Architect: Mitch Hager LLC
Mechanical contractor: Foley Mechanical Inc.
REHAU systems used: Radiant heating/cooling (RAUPEX® O_2 barrier pipe, PRO-BALANCE® manifold), plumbing (RAUPEX UV shield pipe) and geo-exchange (RAUGEO™ U-bends)