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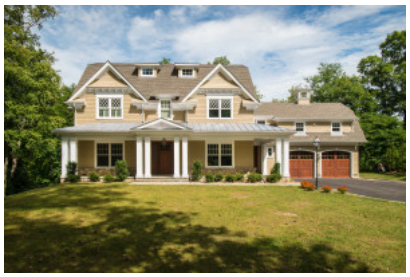
CEILING PANEL HEATING AND COOLING MAKES ITS EAST COAST DEBUT

A European heating and cooling system is put to the test by Connecticut's rigorous climate demands.

By Jennifer Goodman

Slideshow



New Canaan House

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Providing consistent, comfortable heating and cooling in a big house is a challenge. Especially in extreme climates, builders using traditional forced-air HVAC systems often outfit large dwellings with multiple heating and cooling units that require hundreds of feet of bulky ductwork, provide spotty temperature control, and consume considerable amounts of energy.

To mitigate these problems, some builders opt for radiant floor heating, which provides a range of benefits over conventional systems: It minimizes heat loss, requires no ducts or registers, and its silent, blower-less operation cuts down on dust, allergens, and bacteria.

Connecticut home builder Salvatore Zarrella had used these types of systems for years and found that his customers were satisfied with their efficiency, comfort, and health features. But he also knew their limitations, especially for cooling (see sidebar). So when he came across a new technology—one that flipped the idea of radiant floor heating and cooling upside down--he was intrigued. He decided to find out if the system from Italian manufacturer Messana Radiant Cooling, which had been used in a handful of homes in California, would be a good fit for Connecticut's temperature extremes.

PROJECT DETAILS

Location: New Canaan, Conn.

Builder: Construction Management Group, New Canaan

Architect: Nuzzi Architects, Stamford, Conn.

HVAC contractor: EU Systems, New Canaan

Construction cost: $1.6 million

The system radiates chilled and warm water throughout a home via ceiling-mounted panels. The tubing and heat transfer plates come installed directly into the prefabricated gypsum panels, so installation is easy. "The ceiling panel is the drywall as well, so you're killing two birds with one stone," says Zarrella.

For a 5,800-square-foot home in New Canaan, Conn., Zarrella convinced his clients to go with the Messana panels in lieu of a forced-air system by guaranteeing the new approach would work. He consulted with HVAC contractor EU Systems to tie the closed-loop system into a single-stage heat pump with a two-stage propane-fired boiler for backup.

A CUT ABOVE

Ceiling-mounted heating and cooling panels have several benefits compared with traditional floor systems. Here are a few:

--Radiant floor systems typically require a separate system for cooling altogether. "With ceiling panels, there is no redundancy," says builder Salvatore Zarrella. "In the wintertime we push warm water through the radiant panels and in the summer time, through those same tubes, we push chilled water."

The system performed as promised last winter, providing "fabulous comfort and absolute consistency," says Zarrella—within a ½ degree of set point. But the true test came last summer. Although residential radiant cooling has often been used effectively in arid climates, it can be problematic for homes in humid locales. To be effective, the panels must be maintained at a temperature very near the dewpoint within the house, and the house must be kept dehumidified, according to the Department of Energy.

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--Ceiling applications allow construction to progress on the floor. In typical radiant floors, there is an ongoing fear of puncturing the tubes during construction before the flooring material is laid.

--The temperature of the liquid in the ceiling can be hotter or colder than on the floor, where extreme highs or lows can make the flooring uncomfortable to walk on. "With radiant floor cooling, you can't have those types of temperatures which are necessary in North America to be able to handle the cooling loads," Zarrella says. "Water flowing through a floor would need to run at temperatures between 46 and 55 degrees to handle our cooling loads in this climate."

--Furniture and carpets don't obstruct radiant output on the ceiling like they do for floor installations.

The home's HVAC system includes a Messana heat recovery ventilator with dehumidifier as well as a temperature and humidity sensor in each of the home's 21 rooms that help combat summertime humidity to keep condensation at bay. The high-tech system makes customized heating and cooling decisions to ensure consistent comfort throughout the home by sensing changing dewpoints and adjusting water temperatures accordingly, according to Messana.

This solution did the trick at the New Canaan home. "When summer rolled around, we were biting our nails wondering 'Is this really going to take care of our latent loads and humidity?'" Zarrella recalls. "We were routinely hitting 92- to 95-degree days, but when we walked into the house it was cool and comfortable. The homeowners were thrilled."

The manufacturer estimates the installed systems run between $25 and $35 a square foot. Zarrella says the cost for the system was no more than for a typical radiant floor install and that the ceiling approach helped take a month off construction time. "The trades could get right into plumbing and electrical work and we didn't need to wait for all the conventional ductwork to be installed, except for the ventilation system" he says.

His customers aren't the only ones who are sold on the new approach to heating and cooling--he is, too. "We don't look at climate control the same way at all anymore," he concludes. "All of our thinking on this got turned upside down."

Jennifer Goodman is Senior Editor at BUILDER. Connect with her on Twitter at @Jenn4Builder.

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