ThermaCEILING Radiant System Provides Net Zero Comfort in Connecticut ICF Home

By Robert Barmore, Founder, CEO, and Inventor of ThermaPANEL



In central Connecticut, where humid summers and freezing winters test any building envelope, a new ICF home is redefining comfort and efficiency. Designed by architect Leigh Overland and powered by Therma-HEXX's ThermaCEILING hydronic radiant heating and cooling system, the project achieves silent, balanced, net zero performance.

The Challenge: Comfort Without Compromise

Homeowner goals were clear: absolute comfort, quiet operation, and net zero energy use. Traditional forced air systems couldn't deliver that without compromising comfort, acoustics or efficiency.

Overland recalls, "We designed and engineered a home that operates efficiently with a decoupled comfort control system. The unobtrusive ThermaCEILING radiant heating and cooling system handles the sensible loads while the Build Equinox CERV2 and Aprilaire dehumidifier handle the dehumidification (latent) and ventilation tasks."

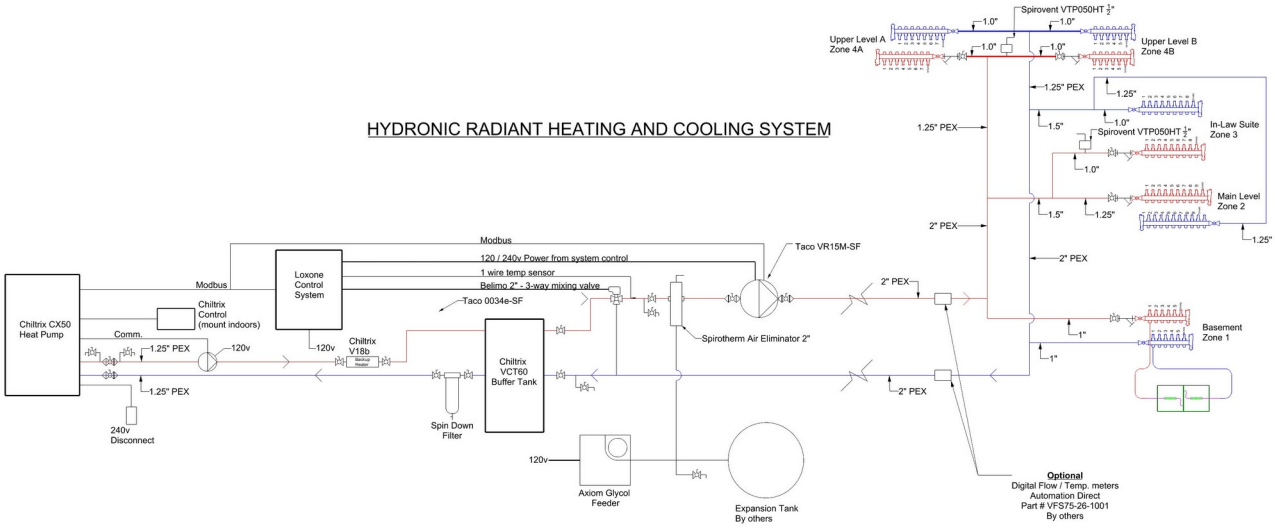
Overland decided to avoid traditional radiant tube systems. Their inability to meet cooling loads without reliance on fan coils that introduce all the noise, chilly drafts, dust, allergens, and zoning difficulty of conventional forced air systems required a fresh approach.

The Solution: Decoupled Sensible and Latent Systems

To meet the owner's needs, Overland specified Therma-HEXX's ThermaCEILING system, using ThermaPANEL hydronic modules thermoformed from Dow Hypertherm PE-RT plastic with a high performance emissivity of 0.96. Each lightweight panel contains one quart of turbulent fluid (moveable mass) flowing through 24 channels. Energy is transferred in both directions through the directly attached 5/8 in drywall at up to 80 Btu/hr/ft$^{2.}$ Rapid response and even performance is achieved in heating and cooling mode. This capability now delivers safe, reliable radiant cooling the industry has been waiting for.

The movable mass design allows quick temperature shifts without overshoot, unlike high mass concrete or low emissivity aluminum plate systems. The panels are 100% made in the USA with 50% recycled content from the production process, are 100% recyclable, and carry ICC-ES PMG-1788 certification with a Class A (0/0 flame and smoke) E84-24 rating.

Designed for longevity, the panels are expected to last more than a century.



"The installation was a new and interesting approach to radiant," says Fred Cuttitta of 4T's Plumbing and Heating. "The ThermaPANEL rows and TRAK system are installed easily. Each room is individually controlled. This will be my preferred radiant system to install moving forward."

"Therma-HEXX delivered on time and provided onsite installation training and immediate assistance during the installation, keeping the installation process flowing smoothly," says general contractor Cole Bristol of Bristol Building Company, LLC of Simsbury, CT.



Why Decoupling Loads Improves Efficiency

• Latent control (humidity) is managed separately from the sensible control (temperature). This allows each room to have its own temperature while the entire house maintains a set level of humidity for perfect comfort year round.

• The specified Build Equinox CERV2 system removes incoming humidity using an integrated heat pump, and replaces stale air only as needed. The system is in parallel with an Aprilaire dehumidifier and steam humidifier for perfect year round humidity control, all within the manageable ERV ductwork. The small ERV duct system engineered by Sophie Ashley of Energy Vanguard, founded by the renowned engineer Allison Bailes, PhD, is routed within the steel web type joist system, eliminating dropped ceilings or horizontal chases.

Smart Hydronics: Intelligence Behind the Comfort

At the heart of the system is a Chiltrix CX50 air to water heat pump delivering the required temperature glycol to a buffer tank. Communicating via Modbus, the Loxone intelligent control adjusts output to meet loads efficiently for an optimum COP at all times. An inline electric backup heater kicks in as needed during extremely cold weather.

A single Taco VR15 ECM stainless circulator, controlled by the Loxone Miniserver, modulates the flow to the entire system. A Belimo three way mixing valve ensures fluid temperature always stays above the dew point, with a close on failure feature, eliminating any chance of condensation if power to the valve fails. Individual Loxone proportional zone valves fine tune flow to each room or circuit and are closed immediately if the system detects a window or door open during humid weather.

Ali Alrobaiay of Babcon LLC, the local Loxone integrator, programmed the system's control algorithms and procedures: *"The control learns each room's behavior and adjusts for outside temperature and humidity, time of day, upcoming weather forecasts, and with redundant dew point protection, it's virtually foolproof. Any adjustments can be made remotely by the homeowner, Loxone integrator or Loxone USA support, if required."*

Performance and Results

The system's Perfect Comfort Mode delivers precisely what its name implies: an environment that feels naturally comfortable, not mechanically conditioned.

• Heating COP: about 4.0 at 100 F supply
• Cooling EER equivalent: over 20
• Temperature stability: within 1 F
• Humidity: 40 to 55% RH
• Annual HVAC energy: about 9,200 kWh (about 30% less than comparable forced air systems)
• Noise level: below NC 25

A 10 kW solar array powers the entire system, allowing the home to achieve true net zero operation.

The owners commented, "The house is always comfortable. No sound, no draft, no hot or cold spots. It's what we dreamed of."

Why Ceilings Outperform Floors

• No obstructions for radiant exchange.

• Uniform temperature delivered to all surfaces and occupants.

• Superior cooling performance capturing emitted and convective heat.

• Superior heating performance without temperature restrictions for high load areas.

• Space saving 1.5 in low profile.

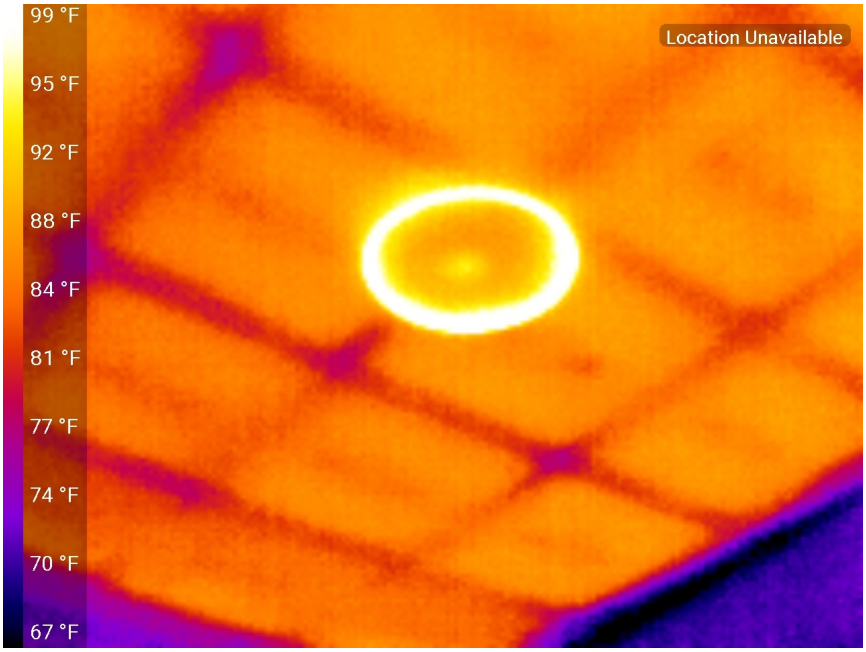
Proven Indoors and Out

ThermaPANEL's technology has been field proven in outdoor applications: pedestal mounted paver snowmelt, invisible thermal solar, and permeable pavement driveway heating, including installations on some of the highest observation terraces in the Western Hemisphere.

The same durable, proven panels now deliver quiet, efficient comfort indoors, integrating seamlessly with advanced controls and renewable energy. The system is delivered with factory tested, preassembled rows and is mounted or suspended with the acoustically isolated ThermaTRAK strut system.

System Specifications

- System Type: Therma-HEXX ThermaCEILING hydronic radiant ceiling system
- Heat Pump: Chiltrix CX50 air to water inverter, Modbus controlled
- Controls: Loxone USA
- Circulator: Taco VR15 stainless, Ethernet controlled
- ERV and Dehumidification: Energy Vanguard, CERV2 by Build Equinox, Aprilaire
- Architecture: Leigh Overland Architect, Fairfield, CT
- Loxone Programmer and Installer: Ali Alrobaiay, Babcon LLC
- Installer: Fred Cuttitta, 4T's Plumbing and Heating
- Panels: ThermaPANEL, Dow Hypertherm PE-RT, emissivity 0.96
- General Contractor: Cole Bristol of Bristol Building Company, LLC of Simsbury, CT



Comfort You Can't See, Only Feel

This Connecticut home demonstrates how smart radiant hydronics create a measurable, repeatable standard of comfort, one that is clean, quiet, efficient, and enduring.

Engineered from a completely new perspective, Therma-HEXX radiant systems don't force air, they orchestrate comfort. Comfort you don't notice the source of.

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