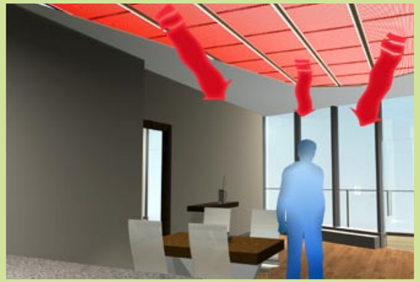
Capillary Mats

With passive design planned and hydronic radiant energy the most efficient space-heating option, the Olympic Village's design team had to select a specific system for thermal comfort in the Village's many homes.

They chose a radiant "capillary mat" system invented by Donald Herbst in Germany in 1981 and installed extensively in commercial and residential buildings in Berlin. The inventor likens the system to the capillary veins in a leaf – or those in a human body, which maintain body temperature at a constant 37 degrees. Mats made of multiple thin-gauge tubes circulate water (warm or cool) across an extensive surface area, exchanging energy with any nearby mass.

"Radiant heat always moves in one direction only – always from the warmer element to the colder element," says Goran Ostojic of Cobalt. "During the winter we heat the ceiling to a slightly higher temperature than we want to achieve in the space. The ceiling radiates to all the solid objects in the room, whether it's a human body or the furniture or your pot of coffee, and the opposite occurs in the summer, when we cool the ceiling to a temperature below what we want to achieve in the space. Then all the solid objects are losing heat towards it, so a human body is losing heat."

The system is governed by a simple control where the resident can shift the system between "heating" and "cooling" and adjust the intensity depending on their comfort level. (Non-market housing does not include a cooling mode.) The system has no blowing air, so maintenance is reduced, and there is no noise from fans, nor movement of dust or allergens. And since the system doesn't produce hot air, a resident can opt for warming while also having a window open for fresh air – and not "let all the heat out" of their space or waste significant energy.



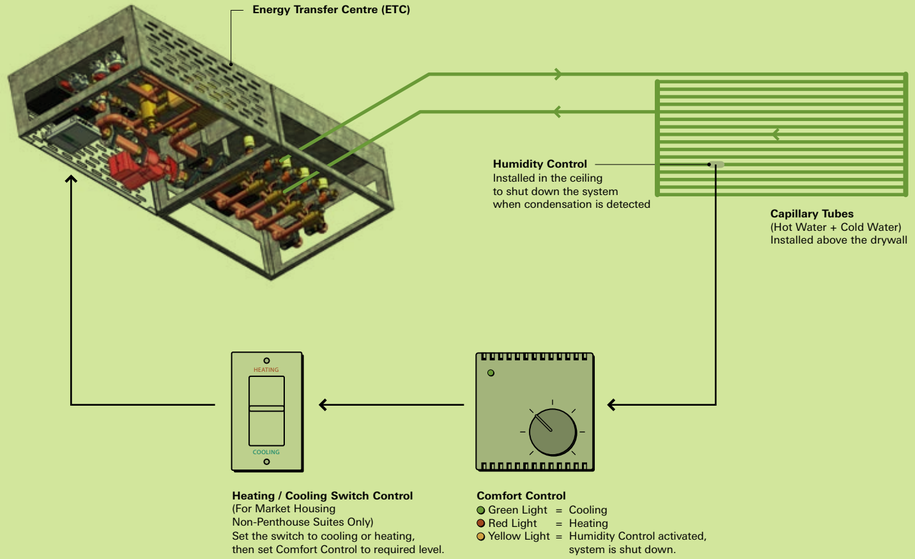
Left and center: Radiant energy transfers heat from a mass with higher temperature to one with lower temperature, in the same way we are warmed by the sun. When the radiant system is switched to cooling, it draws heat from objects – including bodies – that are warmer than the water, giving a cooling effect.
Right: Capillary mat heating is a "low intensity" system. Due to the extensive area covered by the mats, the temperature differential between the circulating water and the bodies it interacts with does not need to be extreme (i.e. water heated to 38–41 degrees Celsius). This contributes to the system's energy efficiency.

Energy Transfer Centre

The operating systems for each suite includes: hot/cold circulating water; a circulation pump; an expansion tank; control valves connected to the comfort control (room by room); and monitor wiring for usage reporting (see pages 26-29). These components are located in a panel, called the Energy Transfer Centre, which is mounted in storage rooms or closets in the suites. The system also includes a sensor to determine whether unacceptable condensation has developed (during cooling mode), which then shuts off cooling until humidity subsides.

In-Suite Radiant Heating and Cooling System

Each suite comes with a manual to teach owners about their capillary mat heating system.



PROFILE

Goran Ostojic

P. Eng, LEED
Partner, Cobalt Engineering

Goran Ostojic moved to Canada from Europe in 1994. Ostojic has been the lead partner on Cobalt Engineering's Olympic Village project team, overseeing mechanical design issues across the site. He says the tight timeline, new technology and sheer size of the project added to its complexity.

"We had to integrate and understand the new technology, and we had to implement the new technology across 1.5 million square feet – you need people to build it, so they have to buy in and get understanding," he says. "We went through some upsets and a lot of hoops together, but it was a great experience."

"People could see the benefit and opportunity," he says. "From the City's ODP [official development plan] and its sustainability direction, to an open-minded client, it's a great opportunity to create something different. And also the design team being brave enough to take this challenge and keep pushing the limits. We've had the chance to create something that's not done every day, that's going to be a benchmark of sustainability in North America on this size and scale.

"It's an amazing project. We'll reflect in the future and say hey, it was a challenge, but it turned out pretty good."