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Mulmur Township, ON Private Residence

REHAU mechanical systems bring comfort
and convenience to modern farmhouse.

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REHAU radiant heating and snow and ice melting join forces to warm a custom modern farmhouse in eastern Canada's countryside

An hour northwest of Toronto lies a tranquil escape from the rush of city life. The rolling hills of Mulmur Township span across acres of green farm fields and towering forests, with nearly 4,000 residents inhabiting charming hamlets and hidden-away homes.

After years of city living, one Toronto family was ready to trade in the constant crowds and traffic for the spacious serenity of Mulmur. In 2007, the family purchased a small seasonal vacation home in the rural township. After a decade of enjoying the vacation home and the surrounding area, the family decided it was time to transform the property into their dream home.

From the start of the project, the homeowners took a hands-on approach. They sat in on meetings with the builder, Profile Custom Homes, and the architect, David Small Designs, to transform the 1,800 sq ft (167 sq m) cottage into an 8,000 sq ft (743 sq m) modern country farmhouse. The homeowners and project team worked side-by-side to honor Mulmur's history by adding traditional and natural elements to the home's design, including 400-year-old barn beams and fireplaces and walls made of local river rock. The three-floor home is arranged around a three-acre pond in the heart of 200 acres of woods to provide the family with panoramic views of Mulmur's natural beauty.

A dream home deserving of the best heating solution

With floor-to-ceiling glass windows and soaring cathedral ceilings incorporated into the home's design, the homeowners knew it would be a challenge to evenly heat the space. "We didn't want the inevitable cold spots that you normally get when you go solely with forced air systems," they said. "We wanted to invest in the best heating solution."

The homeowners investigated several heating options through conversations with HVAC experts when project planning began in 2017. They recalled, "We asked three HVAC guys early on, 'if you were building your own home, what would you do?' Without hesitation, they all said radiant heating."

As the project manager, Profile Custom Homes enlisted AK Mechanical for the design and installation of the home's radiant heating system. AK Mechanical owner Adis Kardumovic is no stranger to what it takes to build resilient mechanical systems. With nearly 20 years of radiant heating and snow and ice melting (SIM) installation experience, Kardumovic is a trusted partner to Profile.

In turn, Kardumovic trusts REHAU RAUPEX O2 barrier pipe and PRO-BALANCE manifolds for his radiant and SIM projects. **"I've used REHAU pipe and manifolds for about 10 years," he said. "RAUPEX pipe is more durable compared to other brands of PEXa pipe. I also like the strength and functionality of the PRO-BALANCE manifolds. I've used plastic manifolds in the past and had instances where they broke."**

Kardumovic first encountered REHAU products in a former job role. When Kardumovic went solo eight years ago, he was curious how REHAU pipe would compare to competitors. He evaluated several piping options, which solidified RAUPEX as his preferred piping choice for mechanical systems. Additionally, Kardumovic appreciates the hands-on, personalized technical support he has received from the REHAU team over the years.

Given Kardumovic's extensive experience with building REHAU radiant heating and SIM applications, the homeowners were at ease throughout the design and installation process. "Kardumovic is a tremendous resource who can speak from deep experience and expertise to all products in radiant heating and SIM systems, whether it's REHAU products, Viessmann boilers or Tekmar controls," they said. "In his view, all of these system elements would work well together; they are proven performers. Our confidence in his expertise was rewarded – today we have a superbly performing system for our home."

Control comfort with radiant heating

Personalized comfort was a key consideration when deciding how to zone the house. "In our family, it seems that some people are always cold and some are always hot," the homeowners explained. "If you only have forced air, you don't have the ability to determine your individual comfort level – you set the thermostat and the temperature is the same for everyone. Zoned radiant heat gives you control over your environment, over your own personal comfort level."

To achieve the homeowners' goal of personalized comfort in nearly 7,000 sq ft (650 sq m) of heated space, Kardumovic zoned out the entire house, including the three-car garage, with a thermostat in each room. Nearly 10,000 ft (3,048 m) of 1/2 in. RAUPEX O2 barrier pipe was



installed in circuits ranging from 250 ft (76 m) to 300 ft (91 m). When handling the pipe, Kardumovic recalled, "RAUPEX bends nicely. Other types of pipe kink, but in my experience RAUPEX is more resistant to kinking."

Kardumovic laid the pipe with 9 in (23 cm) spacing between the circuits. To prevent heat loss near the windows, Kardumovic tightened the spacing to 6 in (15 cm). The pipe was fastened using the 1/2 in. RAILFIX fixing rail from REHAU, allowing Kardumovic to easily clip the pipe into the slots and move on to laying the next circuit.



The circuits were connected to 1 in. REHAU PRO-BALANCE manifolds via 1 in. RAUPEX O2 barrier supply and return piping. To accommodate the multiple zones throughout the home, the main level, second level and basement each have two manifolds and the garage has one. "I like how the PRO-BALANCE manifolds go together," Kardumovic said. "Compared to other manifolds I've used, REHAU's manifolds are easier to connect to the pipes and they look very neat."

Not only do PRO-BALANCE manifolds look professional, they also allow for a visual check on flow rates and provide ease of flow regulation using a key for circuit adjustments. Kardumovic noted that he appreciated how the PRO-BALANCE manifolds made it easy to accommodate varying circuit flow requirements. A 4-wire manifold valve actuator provides flow control of each circuit, allowing the valves to be opened and closed as needed.

Additionally, PRO-BALANCE manifolds offer the ability to visually monitor temperature. An NPT isolation ball valve set is designed to accept a mini thermometer that displays the supply and return fluid temperature, providing the ability to monitor and calculate heat input and output. "Being able to see the temperature coming in and out of the system helps when I'm troubleshooting and making temperature adjustments," Kardumovic said.

As the final step in the radiant heating installation, the circuits were encased with a concrete overpour followed by the installation of hardwood floors throughout the home. Radiant heating systems are compatible with a variety of flooring options, such as hardwood, carpet, vinyl, ceramic tile or natural stone to offer flexibility in flooring design without sacrificing warmth.

Reflecting on radiant heating

After experiencing one winter with radiant heating, the homeowners now understand why all of the HVAC experts they spoke to recommended radiant so readily.

"We haven't had radiant heating before, but we will never not have it again," they said. "It gives the house an entirely different feel in the winter time. No matter how good your insulation is, you'll still have cold spots with forced air. Radiant heating radiates a nice temperature throughout the house – every surface is as warm as the person in that room wants it to be."

The homeowners noted how the Mulmur residence has become a frequent gathering and entertaining spot for extended family and friends, so they appreciate how the radiant heating system creates a warm, welcoming environment for their guests. "Everybody remarks that they would expect our home to be drafty, cold and hard to heat in the heart of winter, but it's the opposite," they said. "It's a snug and toasty place."

Snow and ice melting offers a warm welcome for guests

To safely welcome family and friends to their home during the winter months, the homeowners decided to include a SIM system in the hilly driveway and walkway leading up to the front door. "Visitors can drive up a clear driveway without ice, snow, sand or salt. You can jump out of the car and won't slip or fall," they said.

Although Mulmur is just an hour north of Toronto, temperatures can differ significantly between the country and city. Mulmur sits at a higher elevation in the hills and is exposed to western winds that pass over the Great Lakes. As a result, Mulmur receives much more snowfall than Toronto. Affectionately nicknamed "snow country" by the homeowners, Mulmur experiences snow flurries nearly every night from November to April. Since snow removal is a daily constant, SIM is a convenient solution. "SIM systems are a real luxury because you essentially don't have to do anything," the homeowners said. "It's nice to wake up without thinking of shoveling."

The 4,000 sq ft (372 sq m) SIM system has one zone with 12 circuits that include nearly 5,500 ft (1,676 m) of 5/8 in. RAUPEX O2 barrier pipe. The flow is regulated by a 1 1/4 in. PRO-BALANCE manifold. The concrete driveway is reinforced with rebar. "There was a lot of concrete poured on the hill going down the driveway, so rebar was the best choice to hold it all in place and prevent cracking," Kardumovic explained. The rebar was suspended 2 in (5 cm) above the insulation, with RAUPEX pipe laid on top and secured with zip ties. The 250 to 300 ft (76 to 91 m) circuits were spaced 9 in (23 cm) apart and covered with 8 in (20 cm) of concrete.

REHAU slab sensors and controls were programmed to use WiFi to pick up inputs from the weather forecast. The Tekmar control box responds to the weather forecast and a driveway sensor allows the SIM system to fire up at the first sign of ice or snow. "If the forecast is calling for snow the next day, the driveway pre-heats," Kardumovic said. This feature is especially appreciated by the homeowners who said, "SIM is brilliant. The system offers versatile control options."



Making the most of mechanical systems

While Kardumovic and the homeowners were thrilled with the outcome of the radiant and SIM systems, this project was out of the ordinary for AK Mechanical. "This project was a little different from what I usually see. It is a bigger home including multiple applications, so more design work was required when it came to plotting the controls for the radiant and SIM systems," explained Kardumovic. "I typically see customers install radiant in their basement or only have a SIM system. The boilers in this project do everything – radiant, SIM and pool heating."

Two Viessmann 285,000 Btu boilers power the radiant and SIM systems. An additional boiler heats the pool in the summer. "It's becoming more common to see radiant and SIM in one house," Kardumovic said. "You can achieve a certain amount of Btus with SIM, so why not add radiant heating or vice versa?"

A core of radiant and SIM expertise

Despite the challenges posed by the scope of the project, REHAU came through with the products and support to meet Kardumovic's needs.

"Everybody at REHAU was great. REHAU sales rep Mihai Broscatean took the time to come out and make sure everything was where it was supposed to be," Kardumovic said. "I was also happy with the next-day delivery. I said I needed pipe and it was dropped off."

The teamwork between REHAU and local distributor Hydronic Solutions helped Kardumovic stay on track with prompt product delivery. Hydronic Solutions additionally supported Kardumovic by contributing to the design of the radiant heating and SIM systems.

The homeowners were happy with the expertise and collaboration among the project team members. "Working with AK Mechanical and Profile was a no-brainer. We simply confirmed what we wanted to achieve, and they made it happen," they said. "Kardumovic knows his stuff and puts in the time to make it work. We spent a lot of time with him just learning and watching. He showed us what everything is for and how it all works together. We also met Mihai from REHAU – everyone on the project came through here at some point and we received quite a thorough education. There was a significant core of expertise applied to this project."

As the REHAU mechanical systems undergo their second winter in operation, the homeowners are pleased with their decision to include radiant heating and SIM in the family's dream home. "We would definitely recommend radiant heating and SIM to a friend, and have already done so," they said. "We've also reinforced this with direct feedback to the David Small Designs architect team and the project manager and builder Profile Custom Homes. These are fantastic systems with tangible benefits that make a big difference in your lifestyle."

Project: Mulmur Township Residence, Toronto, ON

Construction type: Custom single family home, built in 2021

Project scope: 10,000 ft (3,048 m) of radiant heating pipe and 5,500 ft (1,676 m) of snow and ice melting pipe

Builder: Profile Custom Homes

Architect: David Small Designs

Mechanical contractor: AK Mechanical

Distributor: Hydronic Solutions

REHAU systems used: Radiant heating, snow and ice melting (RAUPEX® O2 barrier pipe, PRO-BALANCE® manifolds, RAILFIX™ fixing rail)

Finished photography: Profile Custom Homes

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