INDOOR/OUTDOOR RADIANT: A Companion to Commercial Renovation or Construction

Discover real-world radiant-heating applications, used indoors and outdoors, as a more energy-efficient means to heating/snow-melting.

BY JOHN VASTYAN

During the winter months, weapons of mass destruction are commonly used throughout the Northern realm to eliminate snow and ice—salt, chemicals, plows and heavy blades are frequently the first line of defense. Sadly, many exterior concrete surfaces are chipped, cracked and chemically attacked. Nearby plants are not very fond of the stuff, either. And the result is oftentimes marginal at best… while snow/ice accumulation continues.

But it does not need to be that way. Snow-melt systems, similar to (but not the same as) radiant heat, are a great way to eliminate winter precipitation from driveways and walkways. Snow-melt technology can be used to heat concrete, stone pavers and even asphalt, to keep surfaces safe and clear of ice accumulation.

"The key function of a snow-melt system is to keep walkways, driveways, and other areas dry and clear," said Kolyn Marshall, System Designer with Watts Radiant, a provider of radiant-heat technology. "For commercial applications, especially those deemed critical areas—such as hospital and senior housing entry areas and helicopter pads—snow-melt warmth performs a valuable, even life-saving function."

Indoor/outdoor

Indoors, radiant heat works by using warm water-filled tubes or electric heating elements to warm the mass of a floor or wall. The surfaces then gently emit radiant energy to warm all the objects in the room—heat seeks cold.

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"Modern hydronic radiant-heat systems use a closed-loop design," said Dave Yates, President of F.W. Behler Inc., a York, PA-based mechanical contracting firm.

Water is heated by a heat source, typically a boiler, and then is circulated through the tubing to all areas of the building. Warmth is then delivered to each zone as thermostats call for it. Hydronic radiant-floor heating operates on

Image courtesy of Taco.

<< AA technician completes installation of a variable delta-T pump and zone valves while commissioning a light-commercial radiant-heat system.

low pressure (usually below 20 psi) with low temperatures often in the 90°F to 130°F range.

Surprisingly, those surfaces most *un*comfortable without radiant heat—concrete, stone and tile—become the *most* comfortable with radiant because they transfer the heat well.

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"Occasionally, people refer to snow-melt technology as 'radiant heat,'" explained Rich McNally, Senior Sales Manager for Watts, a supplier of plumbing and heating system technology. "That's really not the case because snow and ice are melted through convective and conductive heat transfer—there's a key difference."

Electric systems

There are even ways to use electricity for snow-melt applications. Several manufacturers now offer heavy-duty electric cable on a spool or in mat form that is suited for outdoor environments. These cables, which are often used for slabs, stairs and ramps, will not deteriorate with age. Because the cables are constant-watt, the ability to manipulate heat output on a square-foot basis happens through cable spacing, usually at distances of 3–4 in., or between 38 W and 50 W per sq ft.

"For exterior uses, heavy cables are embedded in concrete to melt snow and ice," said McNally.

Whether hydronic or electric, radiant-floor heat costs less to operate than other forms of heat. Because radiant floors offer comfort at lower thermostat settings, most people find that they are comfortable at lower room temperatures.

The use of radiantly heated concrete is growing. The most likely uses for heated concrete inside a structure are for on-grade, high-mass slabs and finished basements. Though, today there is growing interest in suspended, thin-slab and lightweight concrete applications that stiffen, isolate sound, fireproof, or level floors. Radiant heat works in these types of slabs, too.

›› EPDM radiant tubing is labeled prior to spacing and before the concrete pour at the West Friendship Volunteer Fire Department facility in Sykesville, MD.

Snow-melting, too

While designing a radiant-heat system, look at the floor plan carefully to see if there might be a door, a sidewalk, or a garage entrance that faces north or is exposed to ice and snow buildup. Perhaps the home or building owner should consider snow-melting zones. This entails moving heated water/antifreeze solutions underground from a heat exchanger to cold surfaces outside. Snow-melting zones can be activated when weather reports call for freezing precipitation, or a microprocessor control could be employed to do the job.

For snow-melt systems, system designers must consider the influence of local weather, insulation, pipe spacing, pipe diameter and circuit length. PEX (cross-linked polyethylene) or EPDM synthetic-rubber radiant tubing should have at least 2 in. of concrete over the top of the tubing. Usually, building codes provide exact measurements for this.

Snow-melting has several benefits. Icy surfaces are no longer a concern, and the areas are maintenance-free. Facility costs can be reduced because ice-melting chemicals are not required. These chemicals kill landscaping, increase building cleanup—as they are tracked inside—and can degrade concrete and asphalt.

PEX tubing is often used for radiant-heat and snow-melting applications. Some care must be taken to protect it from jobsite puncture, crushing or exposure to the sun's light.

›› Here, EPDM radiant tubing is attached to concrete reinforcement wire prior to the pour.

"We use a lot of EPDM synthetic-rubber tubing with aluminum-oxygen barrier and layers of Kevlar, which is much more resistant to jobsite abuse and UV radiation," said Yates. "And for winter installations, it stays flexible—meaning we can work with it—even at below-freezing temperatures."

Miles of PEX

A good example of exterior slab-warming is a snow-melt system installed for the recently completed 40,000-sq-ft, two-

Image courtesy of Watts Radiant.

‹‹ Tubing is attached to a distribution manifold. When all lines are connected, the tubing is filled with air to a specific psi, then closely monitored during the pour—when lines are most vulnerable. If pressure dips, repair work can be done immediately, long before the concrete solidifies.

level West Friendship Volunteer Fire Department headquarters located in Sykesville, MD. During construction, an 18,000-sq-ft snow-melt system was installed. When fire and EMS personnel need to make a quick break from base camp, the last thing they want to contend with are the hazards of snow and ice.

"Around here, we can now say that fire and ice are dealt with accordingly," said Fire Chief Mickey Day.

The L-shaped facility is home to EMS personnel and equipment on one side and large fire-equipment bays on the other. Common areas include food service, office and training areas. In the enclosed, radiantly heated bays, 10 pieces of equipment are kept in mint condition.

The West Friendship job billed out at about $1.5 million. According to Mike Mallick, General Superintendent and Project Manager of Gaithersburg, MD-based Mallick Plumbing & Heating Inc., the job entailed installation of a large hydronic system with radiant heat, snow-melt, and hydro-air heat for the common and bunk areas. Mallick professionals installed 32,000 lineal ft of EPDM synthetic-rubber tubing and manifolds; two pre-engineered, prepackaged system panels for equipment-bay radiant heating; and one larger, custom-built skid package built specifically for the project to control the snow-melting operation outside.

For snow-melting, the un-insulated, 8-in. concrete slab was divided into three separate, 6,000-sq-ft slabs, all operating off one outdoor temperature- and humidity-sensitive sensor.

"Facility managers can override automatic activation of the system if they know that a winter storm's coming in," added Mallick.

Though the "heart" of the system may be the commercial boiler, the large skid package built for the job serves as the system's control and pumping system. The package is a skid-mounted mechanical unit that was specially designed to keep mechanical projects on schedule and on budget. The units are built entirely to specification, simplifying involvement and work hours at the jobsite. UL-listed components are used, and they are custom-engineered and manufactured in a factory-controlled environment to assure quality control. The number of zones, flow requirements and component choices determine overall footprint and height.

"[The skid] saved us a lot of piping strategy and field time," said Mallick. "Had we built the control unit ourselves, we'd have put hundreds more man hours into the job. The snow-melt operation is actually quite simple. When the system is activated, all loops are warmed at once. There are two pumps on the skid: One serves six manifold sets and the other operates seven manifold sets."

Getting started

The key to specifying and installing a snow-melt system is to involve the talents of a professional installer who knows and has experience with radiant heat. A good source for more information is at the Radiant Professionals Alliance's website, www.radiantprofessionalsalliance.org.

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