Comfort from the Ground Up

Versatile In-Floor Radiant Hydronic Systems

AT A GLANCE

- Wide range of uses for under-floor tubing
- Knowledgeable system design essential
- Ideal for applications such as loading areas, lobbies
- Snow-melting, cooling also good applications

"This radiant floor heating system is ideal for a garage application like ours," says Tim Bossert, chief operating officer of Good Fellowship Ambulance Company in West Chester, Pennsylvania. "The floor heating system by Uponor heats up the entire slab, keeping the engine bays warm even when the garage doors open and close on cold, winter days. The system also helps melt the snow and ice off the vehicles after they return to the garage."

Bossert adds, "We just completed our first winter in our new building, and we've been exceptionally pleased with our system. I can't think of a better way to heat our garage."

An Ancient Idea

It's not exactly a new idea. Since Roman times, builders have understood the merits of under-floor heating. Those Romans built channels beneath floors to conduct heated air to warm the floor and the occupants of the room. Since that time, builders have experimented with systems of metal piping in the floor, and then with electric resistance cable. "Today, the growing trend is toward the use of flexible PEX tubing to carry a heated liquid through the floor slab.

For Entire Building or Spot Application

For commercial buildings, this tubing technology can be adapted to a wide range of uses, from full building heating to spot applications where a warm floor is particularly useful. The same systems can also be used for in-floor cooling, snow-melting on outdoor pavements, even for heating or cooling turf areas such as playing fields or golf greens.

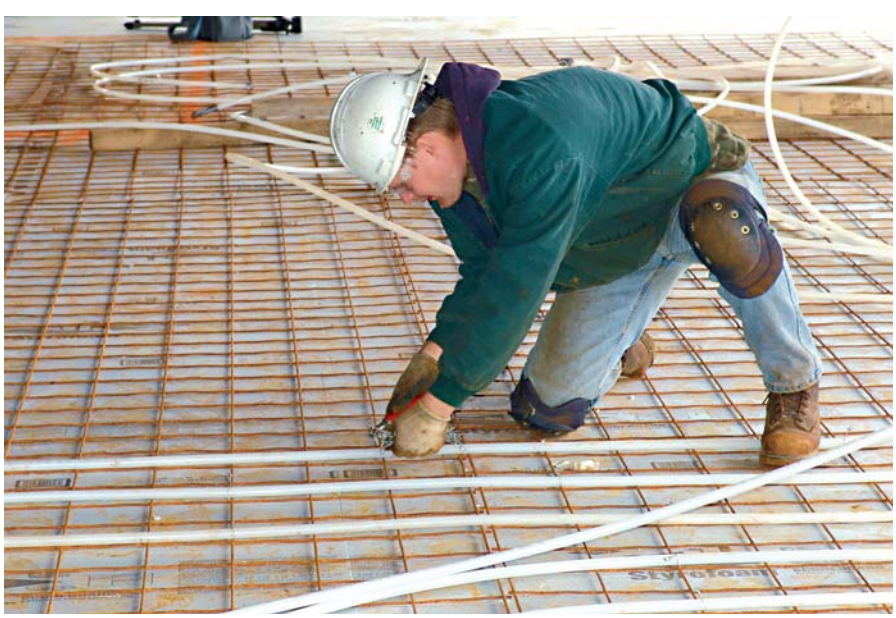
The key to these applications is the cross-linked polyethylene material — PEX. Using one of several processes, links between polyethylene macromolecules are formed to create bridges between molecules. The resulting linked molecular product is very durable under temperature extremes, chemical attack, and physical forces. This makes rugged PEX tubing an excellent material for hot water applications up to 200° F. When used in building heating projects, the circulating water or other heat transfer fluid is normally 100° to 110° F.

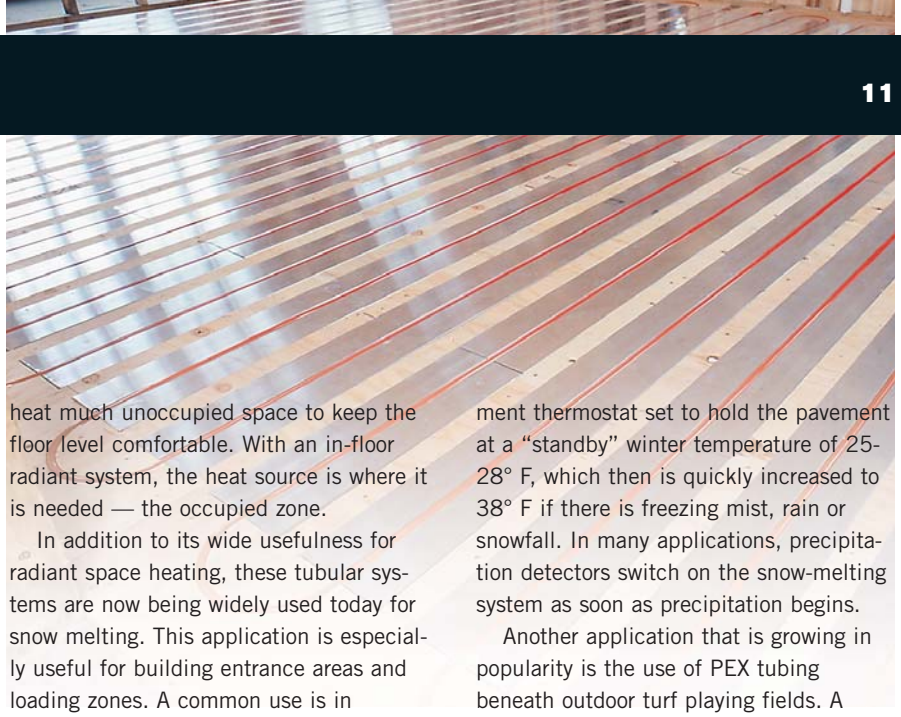
Various providers of PEX tubing systems for radiant floor heating include Uponor (formerly Wirsbo), REHAU, Watts Radiant, and Vanguard Pipe. In addition to PEX tubing systems, they offer proprietary tubing connection devices and tools, pipe manifolds, valves, controls and software.

Importance of Good Design Knowledge

REHAU, headquartered in Leesburg, Virginia, is a global firm with wide expe-

Using rugged PEX tubing speeds installation because the flexible tubing bends, eliminating the need for extra fittings and joints.





rience in polymer products. According to Lance MacNevin of REHAU, the successful installation of an in-floor system requires a knowledgeable design, high quality components, and correct installation.

MacNevin indicates that interest in in-floor systems in North America came first to the residential sector, but in recent years he has seen a great increase in installations in commercial and institutional buildings. He says, "I think this is being driven in part by rising energy costs, and partly by a growing realization of what in-floor heating can do to improve building comfort." He adds that his firm and others are now providing systems to meet the special needs of commercial and institutional buildings, including zoning controls that tie in with building automation systems.

Warehouses and Loading Docks

MacNevin gives examples of the types of building applications where radiant in-floor heating is especially attractive. "Warehouses and especially loading dock areas are good candidates. With a convection heating system, when the outside doors are open, the heat is mostly lost and it takes a long time to make up the losses. With an in-floor system, the heat continues to radiate from the floor and space comfort is restored nearly as soon as the door closes."

He notes that another popular use is in lobbies and gathering areas, where there is a lot of foot traffic. "The comfort of a warm floor is appreciated, and when outdoor traffic tracks in moisture, it dries up quickly on a heated floor. This helps maintain safety and a good appearance."

Heating People, Not Spaces

MacNevin points out that in commercial and institutional buildings with high ceilings, conventional convection systems heat much unoccupied space to keep the floor level comfortable. With an in-floor radiant system, the heat source is where it is needed — the occupied zone.

In addition to its wide usefulness for radiant space heating, these tubular systems are now being widely used today for snow melting. This application is especially useful for building entrance areas and loading zones. A common use is in unloading areas for hospital emergency rooms and trauma centers, and for medical center helipads. In these areas it is especially important that the pavement be free of ice and snow.

Snow Melting Application in Canada

An innovative hydronic snow and ice melting system enjoyed an extremely successful inaugural year at the Niagara Fallsview Casino and Resort, in Ontario. Featuring PEX pipe manufactured by REHAU, the approximately 125,000-square-foot system was installed in parking lot areas and walkways to melt the accumulation of snow and ice caused by the constant spray from Niagara Falls.

The system is designed to clear snow and ice from vehicle and pedestrian pathways quickly and efficiently. Brian Mosher, executive director of facilities at Niagara Fallsview, says he couldn't be happier with the performance of the system. "The system performed extremely well over this past winter and met all of my expectations," said Mosher. "We did not have to do any ice or snow removal on the sidewalks that were equipped with the snow and ice melting system. Furthermore, we were the only property in the area to have sidewalks clear 100 percent of the time."

Holding Pavement at "Standby Temperature"

According to MacNevin, these types of areas are often designed with an in-pavement thermostat set to hold the pavement at a "standby" winter temperature of 25-28° F, which then is quickly increased to 38° F if there is freezing mist, rain or snowfall. In many applications, precipitation detectors switch on the snow-melting system as soon as precipitation begins.

Another application that is growing in popularity is the use of PEX tubing beneath outdoor turf playing fields. A heated liquid is circulated in this tubing, which is typically installed 4-6 inches below the surface of the turf field. By maintaining the temperature of the turf root zone above freezing, the grass stays green and healthy looking into the winter.

Keeping NFL Fields Playable

This application is especially popular for professional football playing fields in northern climates. Many of the cold-weather teams in the National Football League that have outdoor playing fields use buried PEX tubing hydronic systems to keep their fields green and playable through December. In the case of golf greens and tees, in-ground tubing can be used for both heating and cooling. In both cases, the tubing system is used to maintain or improve the condition of the grass playing surface.

Another important North American supplier of in-floor radiant heating systems is Uponor which also supplies PEX tubing systems for in-floor radiant heating and other applications. They also offer a complete line of connecting tools and fittings, controls and software tools for system design. According to Gary Fries from Uponor, in-floor heating has a special attraction for school buildings, health care facilities and hospitality buildings.

Everyone Loves Warm Floors

The warm and uniform comfort of floors year round is appreciated by patients, employees, students, guests and building

Uponor's snow-melting system keeps driveways, walkways and sidewalks free from snow and ice all winter long, forever eliminating the need for salting, sanding or shoveling. *Photos courtesy of Bob Dudley, Harris-Dudley Plumbing and Heating.*

visitors. He cites the example of office buildings, where employees are prone to complain about cold spots and drafty locations. "With in-floor radiant heat, these complaints virtually disappear. And the heat is directed to where it is needed most — building occupants. It's not wasted heating unoccupied space overhead."

Fries points out "The floors are not hot to the touch — typically only around 76° F in most cases. For most indoor installations, this is just about right." The heat to the tubing can be provided by a variety of systems, or even a combination of sources. Usually the primary source is a gas-fired boiler, which can deliver the needed hot water. These systems can be supplemented with solar collection equipment or hot water from a waste heat boiler.

Multiple Circuits, Zones

Commonly the system is controlled by a combination of standard room or zone thermostats and temperature detectors within the floor. The heat transfer tubing is set within the floor slab or in a topcoat that can be applied to existing concrete floors. In most system designs, the system consists of multiple circuits of tubing within each zone, and multiple zones for the building. With multiple circuits, the system can be fine-tuned, or individual areas can be shut off if heat is not desired or needed.

In outdoor applications where freezing temperature may be encountered, Fries indicates that a circulating fluid with a much lower freezing point is used. He stresses the importance of the system being designed by someone with experience in these types of systems and installed by a contractor with the appropriate installation tools. Fries says, "We find that once owners experience the comfort and economy with these systems, they often find other places where they can be installed."

Suitable for Retrofit

Underfloor heating systems can be retrofitted in existing buildings, though it is easiest to plan them for new buildings or building additions. Once installed, this type heating system requires no maintenance other than that associated with the hot water supply. If you are planning a new space or have a building renovation in mind, consider versatile in-floor heating with hydronic tubing. Your employees and guests will appreciate it, and there's a good chance of you reducing your energy bill.

MORE INFORMATION

REHAU	www.REHAU.com
UPONOR	www.uponor.com
VANGUARD PIPE	www.vanguardpipe.com
WATTS RADIANT	www.wattsradiant.com.org

INFORMATION ON SNOW MELTING

www.energysolutionscenter.org/tech/tech_snowmelt.asp