

# Environmental Design+ Construction

SEPTEMBER/OCTOBER 2004

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USA \$5.00

THE PREMIER MAGAZINE DEDICATED TO EFFICIENT AND SUSTAINABLE BUILDING



USGBC President and  
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ENVIRONMENTAL EXTERIORS,  
CONCRETE SPECIAL SECTION



Winter came in that year with a cold, icy blast. On one side of the window, a frozen wonderland. On the other, we stood in awe at the first snowstorm of the season, content in shorts and bare feet while experiencing a giddy comfort that's hard to describe. That first warm floor experience was the beginning of our enduring romance with radiant heat. But until you've experienced it, you can only imagine the unexpectedly luxurious sensation it delivers.

Radiant floor heating works by using water-filled tubes or electric heating elements to warm interior mass. The surface of a floor or wall then gently emits energy that moves gracefully to all the objects in the room, making them – and your feet – cozy warm.

Radiant heat delivers uncompromised comfort, the highest energy efficiency available (typically, 25 percent to 40 percent better than forced air), and – with no air grates, radiators or baseboard to factor-in – there's no interference with room function or furniture layout. Radiant heat systems can also be fueled by many different energy sources, and sometimes even a combination of two or more, including fuel oil,

gas, electric, solar, ground source heat and solid fuels.

Today, there are also many ways to deliver radiant heat to existing, and new, floors. These systems also offer snowmelt-ing options for safe access to a home or commercial facility.

#### **HERE'S TO YOUR HEALTH, AND GREATER COMFORT**

Without question, warm floors are the most comfortable form of heat you can have. The radiant heat from your floor will warm all the mass in your rooms, giving every surface an inviting sensation that you can feel. Surprisingly, those surfaces most uncomfortable without radiant heat – stone, tile and hardwood floors – become the most comfortable with radiant because they transfer the heat so well.

I've also heard the comment, "I breathe easier with radiant heat." There's a reason for it. A furnace literally burns the air you breathe, scorching it beyond arid desert levels. It then stirs and recirculates dust, dander and allergens throughout the building. Moving air is also uncomfortable, making you feel cool as it dries eyes, hair and skin.

Electric heat pumps are like a furnace in that they, too,



# WARM FLOORS

## AFFORDABLE, EFFICIENT COMFORT FOR COLD FEET

BY JOHN VASTYAN

escapes from a building as cooler air infiltrates it. But, with lower air temperatures and the lack of forced air (positive pressure), a radiantly heated building retains much more of its heat. And, radiant heat doesn't stratify at the ceiling as it does with forced air. Another advantage is the zonability of radiant heat – thermostatically controlled zones are the essence of control.

Hydronic (water based) radiant floor systems are used in larger areas or for an entire home or commercial facility. Generally, hot water radiant is best for spaces of 500 square feet or more, or in a building where hot water is already used as a heat source. Hydronic tubing can be embedded in concrete slabs, in thin-slabs over frame floors, stapled up between floor joists, or installed on top of the subfloor.

An electric system may be the best choice for small areas like a single master bathroom. Of course, if electric energy is cheap in your area, it could be used to heat, or provide floor warming, to an entire home. Typically, low-profile electric floor

radiant systems are installed right in the thinset used to set a finished tile or stone floor. Warm solid surface floors are popular for master bathrooms, entries, kitchens and sunrooms.

SunTouch (Springfield, Mo.) offers mats that come in 12, 24, 30 and 36-inch wide rolls with lengths up to 80 feet. These are shaped on the jobsite to fit any floor plan. The mats contain a woven-in heating element. Other types involve attaching spacers to the subfloor, and stretching a wire back and forth that's attached to the spacers ("WarmWire" by SunTouch). Yet another, Step Warm Floor (St. Louis, Mo.), uses low voltage screens that can be stapled directly to the subfloor.

In most instances, installers of electric radiant products first attach a cementitious backer board over the subfloor. The mats are then stapled or taped to the backerboard and thinset mortar is applied with a notched trowel just prior to setting tile or stone.

An option, especially well suited for remodeling projects where an existing solid surface floor has no heat, is a new type of

move air constantly within the home. But the cost to operate them is typically much higher. And, with lower outdoor temperatures, building occupants may never have the warmth they want. Where temperatures dip below 25 or 30°F, heat pumps rarely muster the heat that's needed.

Allergy sufferers love radiant. In many instances, allergy problems are eliminated in homes with radiant heat. Anyone with arthritis or poor circulation will enjoy the warmth of radiant.

### LOWER OPERATING COSTS

Radiant floor heat costs less to operate than other forms of heat. Because radiant floors offer more comfort at lower thermostat settings, most people find that they're comfortable at lower room temperatures.

A key source of heat loss is energy that



A snowmelt system (shown here, during and after) eliminates shoveling, scraping, salts and chemicals.





EPDM synthetic rubber "Onix" tubing is durable and flexible.

electric radiant mat that's approved by UL for joist bay applications. If you have access to the framed underside of the floor, these mats can be secured within the joist bays, just under the subfloor, and then insulated.

Electric mats are commonly installed with programmable controllers that use a remote sensor embedded in the floor to keep your feet at the temperature you select.

There's one thing to check on with electric products. Ask about electromagnetic field (EMF) radiation. EMF is generated by the flow of electrical current, and although the health impact is hotly debated, most experts advise that people minimize their exposure to it. Some manufacturers offer very low, or zero-EMF electrical systems.

#### WHERE CAN YOU PUT RADIANT HEAT?

When building a home or addition, radiant heat can be applied anywhere – floors, walls and ceilings. One technique is to staple radiant tubing to the top of the plywood subfloor. It's then covered with a thin slab of lightweight concrete or gypsum based masonry. Joist bay staple-up is also popular for new construction and retrofits.

If you have access to the floor from below, you can staple radiant tubing directly to the underside of the subfloor. To enhance efficiency and heat transfer, aluminum heat emission plates can be used; these sheet metal pieces attach to the pipe and are stapled to the subfloor. Typically, a foil-faced batting insulation is then attached 2 or 3 inches below the pipe. This method works for any type of floor covering and does not affect the finished floor height.

There are a variety of other products suitable for new construction or remodeling. One method offered by a few manufacturers provides excellent BTU output per square foot (see SubRay photo). Plywood sleepers are screwed to the subfloor and tubing is laid between them. A floor installer then bridges over the system with any finished floor using hardwood, a laminated product, tile or stone. This method adds a 1/2 inch to 3/4 inches to the finished floor height.

Another intriguing product used for



Thinset mortar is applied directly onto SunTouch electric mat.



Radiant PEX tubing for snow and ice melting is attached to rigid insulation before layers of sand, gravel and brick pavers at Mammoth Mountain ski resort in Calif.

hydronic radiant is a hi-tech, interlocking underlayment, Bekotec, made by Schluter Systems (Plattsburgh, N.Y.). Studded polystyrene foam panels are placed over even, load bearing substrates. The panels provide insulation, hold radiant heat tubing without fasteners, and allow for the installation of mortar beds or poured gypsum without control joints. Microfine cracks form between the studs and divide the screed into small "modules,"

#### INDUSTRY REFERENCES

LAARS HEATING SYSTEMS (HYDRONIC HEATING SYSTEMS)  
WWW.LAARS.COM  
805-529-2000

THE RADIANT PANEL ASSOCIATION  
WWW.RADIANTPANELASSOCIATION.COM  
800-660-7187

SCHLUTER SYSTEMS  
WWW.SCHLUTER.COM  
800-472-4588

STEP WARM FLOOR (ELECTRIC PRODUCTS)  
WWW.WARMFLOOR.COM

SUNTOUCH (ELECTRIC PRODUCTS)  
WWW.SUNTOUCH.NET  
888-432-8932

WATTS RADIANT (HYDRONIC AND ELECTRIC PRODUCTS)  
WWW.WATTSRADIANT.COM  
800-276-2419

eliminating curling and continuous crack formation – a key risk with overlayments. The system can be finished with thinset mortar and Schluter's Ditra uncoupling membrane, and then tile or stone. Ditra is a space age membrane that protects the tile layer from thermal stresses and helps distribute heat evenly through a network of interconnected channels on its underside.

#### **WHERE TO GET STARTED?**

The key to a successful first venture into radiant heat is to involve the talents of a professional installer who knows and has experience with radiant heat, preferably a member of the Radiant Panel Association. But hurry. Your toes deserve the happiness only radiant heat delivers.



*John Vastyan is president of Common Ground, Uncommon Communications, based in Manheim, Pa. He specializes in communications for the radiant heat, hydronics, plumbing and mechanical, HVAC and geothermal industries, serving regional, national and international business-to-business manufacturers and trade associations. Common Ground can be reached at 717-664-0535. +*