What's Hot in Bathroom Heaters?

BY DAVID ERICSON

I have a vivid childhood memory of standing at our bathroom sink with an exposed electric-coil heater humming on the wall to the left of my head, crackling as dust hit the element. It was like standing in a toaster whose burners worked on only one side. I didn't want to go too far from that heater on a winter morning, though, because the window on the other side of the bathroom might have an interior coat of ice. We didn't bother trying to bathe in that room.

At the other end of the rainbow, a bathroom might have a fireplace, a whirlpool, radiant floors, hydronic tubing behind the mirrors to prevent fogging, and his and hers towel warmers—Myson offers a gold-plated model for $7,000. Somewhere between these two extremes, there are lots of options for people who need a little extra heat when they step out of the tub or shower.

This article is an introduction to bathroom-heating options. Choosing among them depends a lot on specific circumstances at the work site: physical layout of the building, budget and the contractor's experience. Of course, extra bathroom heat is best planned when the home's heating system is laid in; but that planning does not always happen. Some of the systems described here are specifically designed for bathroom additions or remodels, so you don't necessarily have to overhaul your furnace to get the heat that you need.

Before adding more heat, save the heat you've got

If you're upgrading the heating system in an existing bath, begin by calculating how much heat the room loses through underinsulation and air leaks around windows, doors, outlets, switches and recessed lighting. You can hire an HVAC contractor to pinpoint your heat loss precisely. Or you can do a lot with common sense. Bathroom air is often warmer than air elsewhere in the house, creating a pressure difference that results in warm air actively seeking a way out of the bathroom. Just stopping drafts makes a huge difference, even if the temperature stays the same. Reducing heat loss by sealing air leaks, improving insulation and upgrading windows will reduce the active heating requirement considerably. This backstage work makes possible an elegant heating system, one that does the job simply, without occupying much space or using much energy. Now you're ready to calculate just how much heat you really need (sidebar, facing page).

The simplest solutions are stand-alone heaters

Heat lamps, ceiling fixtures, wall units and tiny electric heaters that fit in the cabinet kick space are all worth considering (photos below). Infrared heating lamps are the least effective of the bunch. They are meant only to heat the skin when you're stepping out of the bath. They tend to warm only what is within a few inches of them—the food at a restaurant buffet table, or your head and shoulders in the bathroom. They are inexpensive, easy to install and, in the right situation, just fine. One of those heating units was more than sufficient where I stayed recently in Florida.

Similarly inexpensive and easy to install, baseboard heaters use the principle that hot


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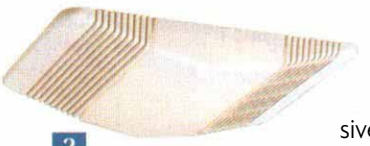
QUICK FIXES MIGHT BE ENOUGH

Stand-alone heaters offer relatively low cost and easy installation. Electric units such as those shown here by NuTone require only an extra electrical cable.

Overhead, infrared heat lamps and ceiling-mounted forced-air units will take off some of the chill. Heat lamps (1) provide spot heat as you step out of the shower. For small spaces with basic needs, NuTone makes an overhead unit (2) that has a 100w light bulb in the center, a 70 cfm vent fan on one side and a 1500w, 5118-Btu forced-air heater on the other. This no-frills unit is inexpensive but noisy.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If you rely on forced air to distribute heat, it might make more sense to use *a* wall unit and dedicate the ceiling to lights and ventilation. A wall unit **(3)** will accelerate convection and can heat the whole room for less than $200. Many electric heaters now come field-convertible for a choice of voltages and wattages. Kick-space heaters offer floor-level forced air without occupying the linear wall space


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There are lots of options for taking the chill off. Which one fits your house?

air rises to warm the entire room. Air heats as it passes over either heating fins or hydronic tubes, the heated air rises, and cooler air near the floor repeats the cycle until the air in the room reaches the temperature called for by the thermostat. Baseboards require two things: that you have sufficient linear wall space and that you want to use your linear wall space in that way.

Low price is the only advantage of electric baseboards. Landlords like them because they are inexpensive to buy and install, and the tenant pays the electricity bill. If the house has hydronic baseboards elsewhere, one more in the bathroom makes perfect sense and is energy efficient. Metal baseboards are prone to corrosion in high-humidity situations, however, so be sure to specify a corrosion-resistant paint, such as the paint on Slant/Fin's Rust Resistor model.

Small forced-air kick-space heaters or wall units don't require the linear wall space of baseboard heaters. Kick-space heaters fit into the base of cabinets or slip into the wall between studs. VRV Products' Quiet One 2000 kick-space heater is a hydronic unit whose fan uses about the same amount of electricity as a 40w bulb to disperse heat (photo 5, below). This option makes sense if a house has a hydronic system elsewhere but you either can't or would rather not tear up the bathroom floor to add a radiant floor. NuTone makes all-electric kick-space and wall units that are field-adaptable to switch between 120v and 240v, and range between 500w and 1500w (1500w is the maximum allowable at 120v). Blowing hot air across the floor, the fans can heat it enough to make an island of warmth if the floor is otherwise cold. The list prices for these models of heaters run between $113 and $190, plus installation.

A caution: If you choose an electric wall heater, make sure that it isn't installed below a towel bar or within the swing of a door that may include a towel or coat hook. A garment or towel draped over an electric-resistance heater can easily catch fire.

Radiant heat offers efficient, draft-free comfort

People use the words *radiant heat* to refer to both hydronic and electric systems. Most radiant systems work by the gentle convection

that baseboard heaters do, and can be electric **(4)** or hydronic **(5)**. This hydronic model by VRV Products can tie into an existing hydronic system without a major renovation.

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Photos 1-4: Courtesy of NuTone. Photo 5: Courtesy of VRV Products.

Rules of thumb for sizing bathroom heaters

Andrew Wormer's "The Builder's Book of Bathrooms" (The Taunton Press, 1998) recommends keeping an occupied bathroom's temperature 5°F above the ambient temperature of the rest of the house. Having the bathroom be a separate heating zone makes it easy to achieve this difference without overheating the rest of the house. Because bathrooms are small spaces and because running a bath or shower generates a fair amount of heat already, the extra couple of degrees shouldn't require much energy to provide.

There are various quantitative measures by which to estimate need. But none of these rules of thumb takes into account nonstandard ceiling heights or heat-loss calculations for your particular space. John Siegenthaler, author of "Modern Hydronic Heating: Residential" (DelMar Publishing, 1995; second edition forthcoming), reports that an average bathroom heat load is 4000 British thermal units per hour (Btu/h) to 8000 Btu/h, but that large custom bathrooms may need more. Runtal, a manufacturer of radiant wall panels and towel warmers, advises planning on roughly "40 Btu/h per sq. ft. of floor area, assuming a single outside window and a standard ceiling height." For electric heaters rated by wattage, one rule of thumb is to multiply square footage by 10 in a mild climate or by 15 in a more severe climate. According to this formula, a 100-sq. ft. bathroom would need a 1000w to 1500w heater.

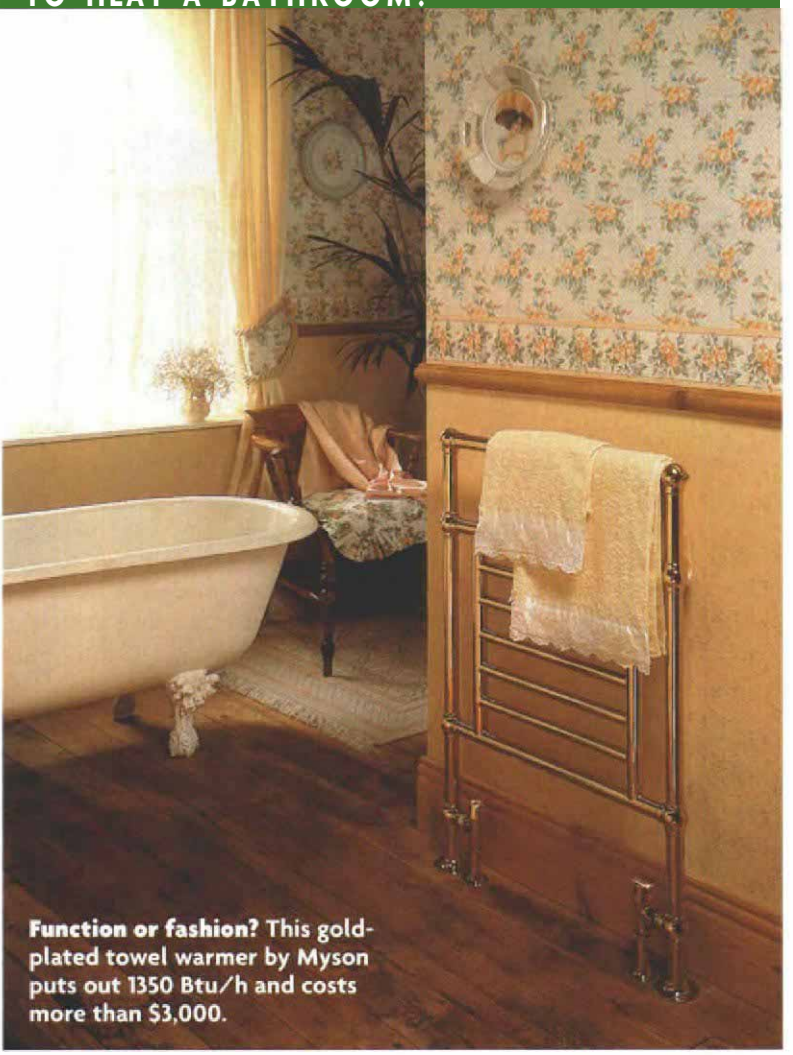
Ray Farley of Myson uses another equation, estimating Btu/h output based on a heater's wattage. Farley reports that 1000w equals roughly 3400 Btu/h. According to Runtal's 40-Btu per sq. ft. rule, that would heat 85 sq. ft. *—D.E.*

ARE TOWEL WARMERS ANOTHER WAY TO HEAT A BATHROOM?

Towel warmers may be one way to heat a bathroom. But they're mostly to be used for supplemental heat or just plain luxury. Towel warmers can be hydronic or electric. Electric towel warmers can be hard-wired or simple plug-in models. Generally, hydronic systems provide more Btus per square foot than the electric panels do. Either one will work just to heat towels, though.

There are some inexpensive electric models on the market. Warmrails Inc.'s towel warmers are meant to heat just towels. They use about as much power as a light bulb and range in price from $105 self-installed (40w plug-in model) to $130 plus installation (80w hard-wired model). Mostly, though, heated towel bars are an upscale item, with Myson's line ranging from $500 to $7,000.

Sometimes a towel warmer is just a towel warmer, but sometimes it's more. Some are designed to heat a room. Runtal and Walney both market bathroom radiators that can be towel warmers, but that put out considerable heat. Runtal's 120v electric Omnipanel, projecting 3¾ in. from the wall, is 24 in. wide by 34¾ in. tall. When set on high, it operates at 700w and generates 2400 Btu/h. Walney makes 600w electric models that should generate about 2000 Btu/h. Runtal's largest hydronic panel, which is 36 in. wide and 61 in. tall, generates about 7900 Btu/h when run with a water temperature of 180°F. Walney offers a hydronic model that generates a similar Btu figure for between $772 and $1,790, while Myson's 5200-Btu/h model costs between $1,777 and $4,822. —*D. E.*



Function or fashion? This gold-plated towel warmer by Myson puts out 1350 Btu/h and costs more than $3,000.

of a thermal mass, such as a heated floor, and by radiating varying amounts of infrared energy. For example, hydronic tubing heats a floor through conduction to a relatively low temperature, 85°F being about the warmest floor that is still comfortable. Then the thermal mass of the floor—besides feeling great on your feet—heats the air slightly through gradual convection. But some percentage of energy escapes the floor as infrared-energy waves that people and solid surfaces absorb and convert to heat.

John Siegenthaler of Appropriate Designs, an engineering firm in Holland Patent, New York, says that "low-temperature radiant floors are typically about one-third convection and two-thirds radiant, although the fraction depends strongly on the temperature of interior surfaces. The cooler these surfaces, the greater the radiant fraction becomes." Hydronic systems can also go into walls and ceilings, and there are electric radiant units that mount to the wall or to the ceiling. People disagree about the degree of radiant vs. convective heating coming from walls. Radiant ceilings emit 90% to 95% of their energy as radiant heat. Both hydronic and electric radiant systems work well, and both operate quietly while minimizing the drafts and the temperature stratification that make wet, naked people uncomfortable in the bathroom.

Both types of radiant-heating systems tend to reduce energy consumption, too. Savings depend on the site conditions and the heating system used, but an often-quoted conservative figure for energy savings from radiant systems is around 20% compared with electric forced air, while other measures can bump the savings even higher. Figures vary from source to source, but you might be able to keep the temperature set as much as 8°F cooler than you would with forced-air or baseboard heaters and still feel the same level of comfort, thus the energy and money savings. According to Siegenthaler, "Energy savings is the icing on the cake. The cake itself is superior comfort."

Warm floors are hot sellers

Everyone wants radiant floors. With radiant floors, you won't end up huddling near a radiator because the entire floor is the radiator. The Radiant Panel Association (800-660-7187; www.rpa-info.com) reports that sales of hydronic tubing for radiant heat doubled to nearly 139 million ft. between 1996 and 1999. (For details on different hydronic installations, see John Siegenthaler's article in *FHB* #105, pp. 58-63.) Electric floor-warming systems are appearing rapidly, too. Some systems produce just enough heat to warm a floor and keep your feet comfortable, while others generate enough heat to warm the entire room.

Hydronic floor systems, wet and dry

Hydronic systems circulate hot water through plastic tubes that are either embed-

Photo this page: Courtesy of Myson

ded in a concrete slab or affixed to a plywood subfloor. If the tubes are on top of the subfloor, they run between sleepers that support the finish flooring over them. Installations requiring a poured slab are called wet applications, while stapling tubes to the subfloor is referred to as dry because there is no concrete pour. A slab of concrete can take an hour or two to heat up. For bathrooms, where the need for heat is only periodic, a system that reacts more quickly than a slab installation might be a better choice, either a thinner concrete or gypsum-concrete slab or a dry hydronic system using aluminum plates and no concrete or gypsum at all.

Laying hardwood floors over a slab can sometimes present moisture problems, so forgoing the thermal mass of a slab in favor of a dry installation may be an easier option. Dry radiant floors are light enough that they do not stress floor joists, and they allow relatively easy access to tubing in case repairs become necessary.

When poured slabs are planned anyway, running hydronic tubes in them is cost efficient—as little as $3 per sq. ft. installed. In renovations, though, if the subfloor is accessible from below, attaching radiant heating beneath the subfloor makes the most sense because it does not raise the height of the finish floor.

A newer, proprietary dry-hydronic configuration is Easy Floor by Modular Radiant Technologies (drawing, bottom right). Easy Floor is meant as an alternative to concrete or gypsum pours. Easy Floor consists of a polypropylene grid that holds ½-in. to ⅞-in. hydronic tubes in place and conducts heat to the finish floor through a tile substrate that the company calls a Bio-Coverstone. Modular Radiant Technologies reports that it is developing cover stones that can serve as the finish floor. Like other dry-hydronic installations, Easy Floor is light enough to be installed on second and third floors. The system comes in two thicknesses, 1½ in. and 1⅛ in. Currently, the Easy Floor system is not cost efficient for projects smaller than 500 sq. ft. to 700 sq. ft., and there are thinner floor systems that can help you to avoid raising toilet flanges and making similar adjustments during a retrofit. So Easy Floor would not make sense for a single bathroom project; but as part of a larger addition or new construction, Easy Floor merits consideration.

At least three manufacturers sell prefabricated panels for hydronic-heating installations. Plasco Manufacturing Ltd. makes ThermalBoard, a ⅝-in. panel of medium-density fiberboard (MDF) with a rounded groove to capture ⅜-in. PEX tubing (center drawing, right). To conduct heat to the subfloor, Plasco coats the entire surface with a 3-mil layer of aluminum instead of using a series of plates. ThermalBoard's list price is $4.50 per sq. ft. to $5 per sq. ft., plus tubing and installation.

Stadler-Viega offers a similar product (top drawing, right). Its Climate Panel is made of ½-in. plywood, uses ⁷⁄₁₆-in. O.D. tubing and affixes aluminum plates beneath the panel rather than against the subfloor, thus reflecting the heat back through the plywood. Stadler-Viega's panels are 48 in. long, coming in either 7-in. or 10-in. widths. They cost about $3.50 per sq. ft. plus tubing and installation. To attach tile floor over these panels, use cement backerboard and then thinset. Attaching wood flooring requires no extra substrate, resulting in a finish floor being raised only ½ in. to ⅝ in. Laying the panels perpendicular to the flooring allows you to see the tubes as you nail. A third manufacturer, Warmboard Inc., makes a panelized system that acts as a structural subfloor instead of adding a separate layer. We will review this product in a future issue.

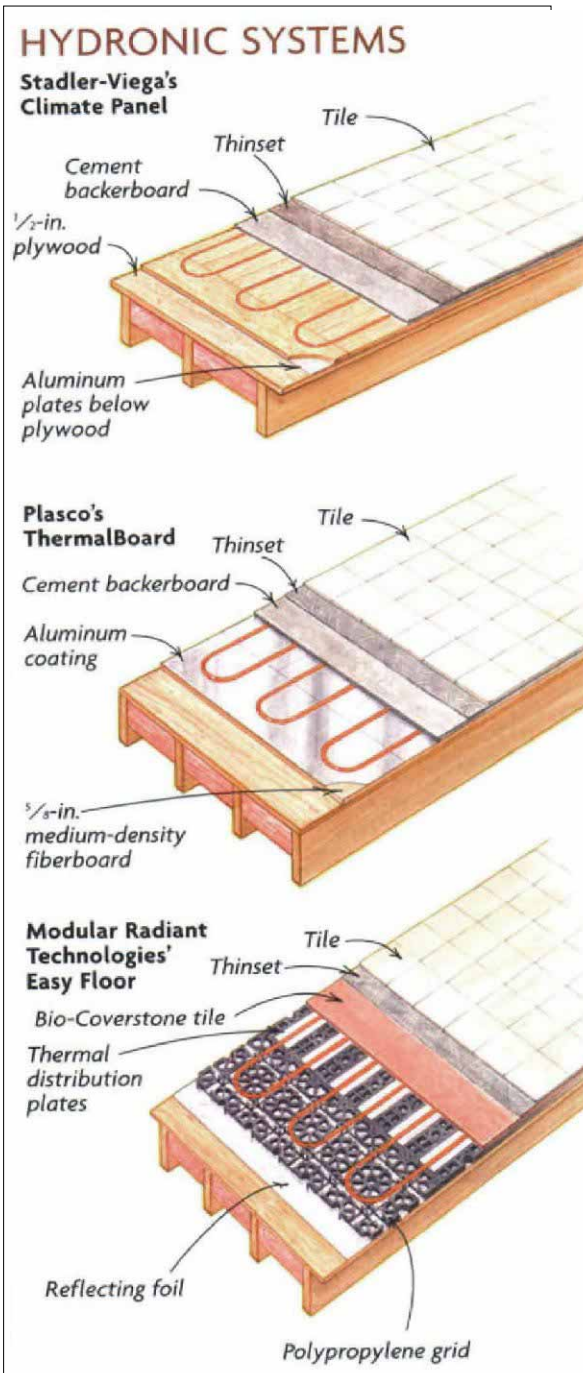
Electric radiant-floor systems can solve the boiler problem

If the house has no hydronic system, electric radiant floors are easy to install and more cost effective than installing a boiler to heat a bathroom. And electric floors raise the floor as little as ½ in. (photo left, p. 88).

Among electric radiant-floor systems, some use a single continuous wire to deliver heat, crisscrossing the floor like hydronic tubing, while others use a series of electric channels. Either way, electrical cables warm the floor controlled by an embedded temperature sensor tied back to the thermostat.

EasyHeat says that the continuous cable system in its Warm Tiles system "is supplied in one piece to eliminate all electrical connections in the floor," although a sensor in the floor does connect to a wall-mounted 16-amp thermostat. The cables are color-coded to indicate different amperages that can be mixed to achieve different heat outputs and to eliminate confusion during installation. This system does what the name implies—warms the tiles and not the whole space. In a reasonably warm room with no draft, a heated floor may be all you need to feel comfortable.

Bask Inc. encloses its SunTouch system's electric cable in a mesh that is simply unrolled and then embedded in the mortar beneath tile or stone floors. This sort of installation usually raises the floor only about ½ in., making it useful in retrofitting existing



With the growing market in hydronic radiant heating, manufacturers are working on ways to make installation faster. The panelized systems above all secure the tubing and support the finish floor. Stadler-Viega (top) and Plasco (center) support any type of finish flooring, while Modular Radiant Technologies (bottom) markets a plastic-grid system that supports any flooring except nailed hardwood.

Drawings: Rick Daskam

bathrooms. But at $15 to $20 per sq. ft., this model is pricey.

Taking a different approach, CaloriQue's Warm Floors system uses a series of parallel resistors made of carbon and metal compounds applied to a sheet of polyester. The parallel resistors are joined at the edge by a copper-wire bus bar, and then the whole system is laminated with another layer of polyester. One advantage of this system is that anyone driving a nail through one of the resistors does not disable the whole floor, as would happen in a single-wire system. Instead, just the one resistor is interrupted, and those around it continue to function. Instead of being embedded in the subfloor, these units are stapled to the floor joists, 2 in. below the subfloor, so they will work under wood flooring as well as tile. The system comes presized for 12-in., 16-in. and 24-in. joist spacing, and is competitively priced. CaloriQue also has installation directions for systems in ceilings.

No matter what radiant-floor system you choose, there are some tips to keep in mind. Tom and Lane Meehan, who sell and install tile in Harwich, Massachusetts, were recently called out to fix a floor that someone else had installed and in which the tile was separating from the subfloor. Tom suspected that the cause of the failure was not the installation but that the owners had turned on the heat too soon, thus heating the thinset concrete before it had a chance to cure. Tom suggests waiting at least two weeks before turning on the heat in a radiant floor.

Also, Tom says that it is easy to damage coils when you're installing the tile over the electric mats. He recommends covering them with a sheet of vinyl or a piece of cardboard to protect the coils as you work back out of the bathroom. Finally, some companies offer custom-size mats. Custom mat sizes add unnecessary expense; just use standard units to warm the area you're likely to stand on.

Don't forget radiant walls and ceilings

With all the hype that radiant floors are getting, it is easy to forget that radiant walls are another—sometimes better—option, considering both price and performance. John Siegenthaler points out that enough of the floor is covered up in some bathroom designs that even if you wanted to install one, a radiant floor alone might not generate sufficient Btus. In this case, radiant walls and ceilings are good supplements, especially ceilings over the tub area, so that bathers are warm above the water and won't have to sink down in the tub to keep from shivering. Radiant walls and ceilings can be either hydronic or electric, just like floors.

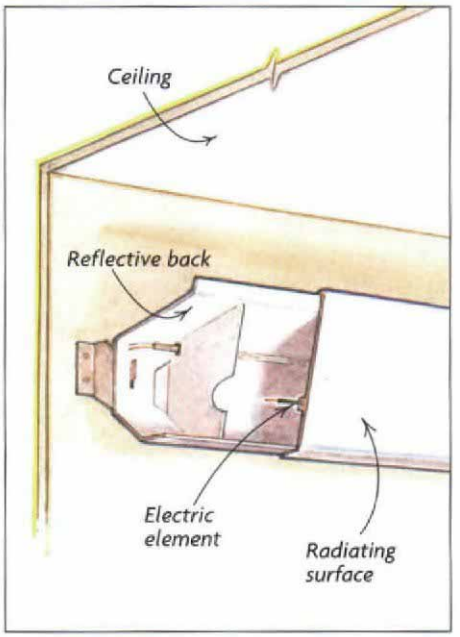
At $4 to $5 per sq. ft. installed, hydronic walls are often less expensive than hydronic floors. Walls can be warmer than floors, in the 90°F to 95°F range, because people are not in constant, direct contact with walls. Wall temperatures can go even higher if need be during those subzero days if your bathroom sits against exterior walls and you need to boost output up to 60 Btu/h per sq. ft. And the response time of drywall is about 15 minutes instead of the 30 minutes to 90 minutes of floor systems.

A typical hydronic wall starts with insulation between the studs (sources disagree about whether insulation should be faced or unfaced). Then ¾-in. furring strips are attached, leaving grooves to receive the tubing and the saddle of heat-transfer plates. On top of this layer goes ½-in. drywall.

Prefabricated panels such as Plasco's and Stadler-Viega's make installing hydronic walls fast and easy. In wall installations, radiant tubing should be installed no more than

ELECTRIC RADIANT HEATERS ARE UNOBTRUSIVE

Electric floor warmers, such as this one manufactured by Bask, install easily. They use about as much energy as several light bulbs and raise the floor about ½ in.



Electric-radiant "cove" heaters are a wall-mounted option. This example by Marley Electric Heating supplements heat without taking up wall space or interfering with ceiling fixtures.

Electric radiant ceiling panels offer energy-efficient heat quickly. They also virtually disappear into the ceiling. SSHC offers one with a light, nightlight and ventilation fan built in.

Photo left: Courtesy of Bask. Photo right: Courtesy of SSHC.

48 in. high to avoid punctures when you're hanging pictures. Heating doesn't need to be installed behind vanities or cabinets, but special care should be taken when affixing tissue holders or anything else where hydronic wall heating is in place. To be on the safe side, take photos before you cover the panels with the drywall.

Radiant wall and ceiling panels

A number of manufacturers offer wall-mounted radiant panels, either hydronic or electric (photo right). Some of these panels are only towel warmers (sidebar p. 86), a luxury that feels great but that does not radiate much extra heat. On the other hand, Runtal makes a surface-mounted radiant panel that can generate nearly 8000 Btu/h, enough to heat 200 sq. ft. Surface temperatures can be controlled by adjusting water temperature in the hydronic units.

Marley Electric Heating sells electric radiant "cove" heaters under the brand name Qmark. Cove heaters mount on the wall a few inches from the ceiling, pulling 2.5 amps to 4.4 amps and radiating 2000 Btu/h to 3600 Btu/h, depending on the model (drawing facing page). A unit such as this one can provide good supplemental heat without taking up wall space or interfering with the ceiling lights.

Manufacturers of radiant ceiling heaters combat the notion that hot air rises. Infrared radiant panels heat surfaces and people directly with radiant energy, rather than heating air. Richard Watson of Solid State Heating Company (SSHC) says that SSHC's ceiling-mounted Enerjoy Radiant Peopleheater panels will warm a floor in about a half-hour, while more immediate heat comes off the unit, too. Each room is its own zone with this type of system, so the comfort and energy savings of custom-zone systems are easy to control. SSHC's heaters have been tested by the Department of Energy (www.doe.gov) and the National Association of Home Builders Research Center (www.nahbrc.org), and their positive reports can be read at their Web sites. SSHC's panels can be surface-mounted, protrude about an inch and respond quickly due to their low mass. Similar panels are made by Qmark, which distributes through contractors and supply houses. Depending on your current wiring, you could install an electric radiant-ceiling panel rated at up to 1640w using the existing wiring from your overhead light, and be done in one day. No tearing up the floor, no rewiring, no mess. SSHC's Bathroom Comfort Center units combine a radiant panel with a light, night-light and exhaust fan, and sell for $350 to $500, depending on size.

Warm towels, anyone? Radiant wall panels such as this one are available in hydronic and electric models, and vary from simple towel warmers to powerful space heaters.

Which heat source should you pick?

If I were building new, I'd consider hydronic floors and walls or radiant ceiling heat. In retrofits, radiant floors and walls are still possible but might be costly. If I were otherwise happy with my bathroom but wanted a little extra heat, I'd look at electric units.

Think also about using more than one heat source, either for convenience or for extra comfort. For instance, what about an electric floor warmer for comfort, a hydronic baseboard for primary heat and a towel warmer that you will love every time you use it? □

David Ericson is an assistant editor at *Fine Homebuilding*.

Manufacturers mentioned in this article

BASK
(888) 432-8932
www.bask.net

CALORIQUE
(508) 291-4224
www.calorique.com

EASYHEAT
(800) 523-7636
www.easyheat.com

MARLEY ELECTRIC HEATING
(800) 452-4179
www.marleymeh.com

MODULAR RADIANT TECHNOLOGIES
(206) 463-1267
www.pfgindustries.com

MYSON
(800) 698-9690
www.mysoninc.com

NUTONE
(888) 336-6155
www.nutone.com

PLASCO MANUFACTURING
(763) 274-2829

RUNTAL
(800) 526-2621
www.runtalnorthamerica.com

SLANT/FIN
(800) 775-4552
www.slantfin.com

SSHC
(800) 544-5182
www.sshcinc.com

STADLER-VIEGA
(781) 275 3122
www.stadlercorp.com

VRV PRODUCTS
(616) 925-8818

WALNEY
(800) 650-1484

WARMBOARD
(503) 977-1011
www.warmboard.com

WARMRAILS
(714) 957-4317
www.warmrails.com

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