



phc news

NEWS, PRODUCTS AND INFORMATION FOR PLUMBING & MECHANICAL CONTRACTORS

INSIDE

Cover story: sophisticated heating installation combines technologies – Pg. 112

- *PVF sector hot again – Pg. 14*
- *Tool reports – Pgs. 97, 102-105*

Beginning on page 21:

**SUPPLIER
PROFILES**

2006

Midwestern home combines best attributes of radiant and forced air systems

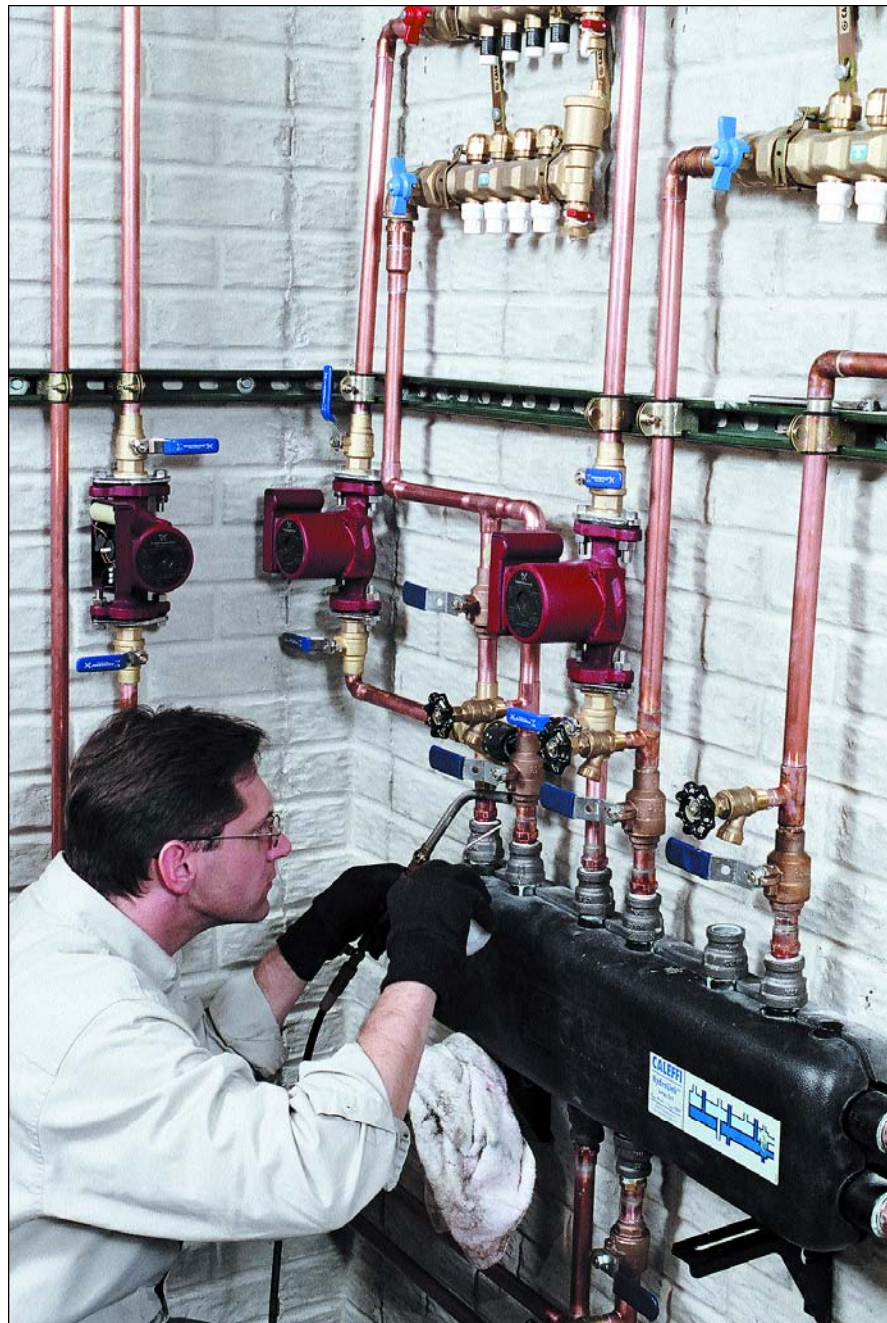
Winter storms that brew on Lake Michigan are legendary. In their path, ships, homes and whole communities are at risk when gale-force winds move with icy fury against them.

Last winter — the first in their newly-heated home just 60 yards from Oakwood Lake in Wisconsin, one of many smaller lakes within the Lake Michigan basin — Jim and Kris Sopa and their son Alex were thankful that the weather was relatively mild. Rather than the all-too-common temperatures of -10°F, the warmer temperatures in the 20s and 30s still gave them plenty of appreciation for the now-active radiant heat system that lay dormant since the home's construction three years ago.

The plan from the start for this 3,100-sq.-ft., four bedroom home was to rough-in the radiant heat distribution system for later connection and use, a concept that some refer to as "radiant-ready." The important thing to do, before the basement slab was laid, and while walls, floors and ceilings were open, was to get the tubing in.

"We had good advice during the planning stage," said Kris Sopa. "We liked the idea because, for relatively little added expense on the front end we could install all of the material needed to get the job done...at a later time."

"The 'radiant ready' concept makes great sense," said Mark



The combination of the high-mass basement slab, high-temperature suspended system for the first and second floors, and indirect water heater demand meant that the hydronic system needed to provide both high and low temperature mixes. This was accomplished by using a Caleffi three-way thermostatic mixing valve for the low temperature basement zone.

Krumnow, a radiant heat and hydronics controls expert with manufacturer's rep firm, MBA Corp., with offices in Milwaukee and Rhineland, Wis. Krumnow designed the radiant heat system and installed the FAR control package (see sidebar) for the home. "It was clear to us from the beginning that the Sopas wanted radiant heat. But they preferred to build up the funds for it, estimating a three or four year wait."

"They called back two and one-half years later and said they were ready to complete the system,"

added Daniel Schlicher, DS Design Consultants, who designed the mechanical system for the Sopas. "Of course, with all the tubing in place, everything was ready to go. When we returned to the home to do all of the mechanical tie-ins, everything was where we left it, waiting to be activated."

"The radiant-ready approach works well for anyone that may not be ready to take on the cost of a complete installation right away," said Jim Sopa. "We tend to be a bit more cautious than some when it comes to



expenditures."

In the basement, above a 1/2" layer of reflective, R7 InsulTarp, 1,200 lineal feet of 1/2" PEX tubing was strapped to a wire grid before it was embedded in a three-inch slab of concrete. PEX tubing supply and return runs were sleeved with larger, two-foot polyethylene tubes as a protective measure. The PEX extended well beyond the slab, simply strapped to the wall at ceiling height and sealed for later use when the homeowner's "radiant dream" would come true.

Another part of the radiant-ready recipe was the use of a suspended, joist-bay system that would serve the first and second floors of the home. All told, the house has nine radiant zones, comprised of twelve 300-foot loops for a total of 3,600 lineal feet of (Turn to ... page 114.)

Flexible control system integrates forced air and radiant

Mark Krumnow, a manufacturer's rep with MBA Corp., is an electrical engineer and self-proclaimed hydronics and radiant heat "junkie." Among his many inventions is the patented FAR (forced air and radiant) control unit installed in the Sopa's home.

The FAR Controller™ manages radiant and forced air systems in one simple, five-zone controller. A single stage thermostat for each zone controls both the radiant and forced air systems. Radiant heat is controlled as the primary source of heat with forced air as the secondary source of heat.

Additional features are the ability to control forced air cooling and humidity, group radiant heat zones into two similar groups, supplemental heat for the first two zones, and high velocity circulator control. The unit also offers occupancy control, and dynamic priority control for an indirect water heater.

The unit was chosen by the Sopas used because of its simple design, setup, and energy savings. Individual zones are designated as either radiant only (like the basement) or both forced air and radiant like many of the upper zones. This controller also handled the indirect demand with the heating system.



The plan from the start for this 3,100-sq.-ft., four bedroom home was to rough-in the radiant heat distribution system for later connection and use, making it radiant ready.

Radiant system rarely needs help from forced-air backup

(Continued from page 112.)

tubing, and one zone that serves the indirect-fired water heater.

A high efficiency Trane furnace (tied to ducted, central a/c and Honeywell humidifier) was used until the radiant heat system could be activated. From the outset, it was the homeowner's intent to use the forced air this way, and — when the hydronic system was installed — for the existing forced air equipment to be used as a secondary heat source. An A-coil and condensing unit were also installed to provide central cooling. The FAR controller is designed to manage this, and all of the hydronic zones.

Krumnow designed the system to combine the attributes of both the radiant and forced air systems. The radiant system provides the greatest comfort, while the forced air system offers fast response and an ability to provide cooling in the summer. The hydronic system also includes an indirect-fired water heater to meet the family's domestic water needs.

During the heating season any time one of the zones calls for heat the radiant system is the first activated to satisfy the demand. If the zone's call for heat isn't satisfied within a field-selectable time, in this case 30 minutes, the forced air system tied to that zone is activated.

Krumnow anticipated that only during the coldest winter days would the forced air system come on. And, last winter, his plan proved-out. According to the Sopas, the furnace

was activated only on rare occasion.

The combination of the high-mass basement slab, high-temperature suspended system for the first and second floors, and indirect water heater demand meant that the hydronic system needed to provide both high and low temperature mixes. This was accomplished by using a Caleffi three-way thermostatic mixing valve for the low temperature basement zone. And since there is a domestic hot water storage tank involved, Schlicher set that as priority over the space heating. "I especially liked the ease of being able to sweat the Caleffi mixing valves in, yet they also offer unions for easy install and future service or replacement if necessary," added Schlicher.

Caleffi technology became a real asset for the job. The HydroLink low-loss header and the fully-adjustable radiant distribution manifolds became the system's crown jewels. "The boiler is a small-block high efficiency unit that is somewhat flow-sensitive compared to higher-mass, cast iron units," said Schlicher.

The HydroLink performs the function of a parallel primary loop. The key detail is the unit's performance as a hydraulic separator between the boiler and the load circuits. Its purpose is to connect the secondary circuit to the primary loop in such a way that neutralizes any tendency to influence flow in the secondary circuit. This permits several circulators to co-exist within the same system without interfering with each other.

It's not just an incidental detail. The installation of a parallel primary loop or low-loss header is now widely regarded as fundamental to the optimal performance of multi-temperature, multi-zone hydronic systems of most any size or configuration.

"The ability to isolate system circuits eases our ability to design and build multi-load systems without worrying about how flow rates and pressure drops will change as various circulators turn on and off," added Schlicher. "Without hydraulic separation, circulators can get into a nasty tug-of-war, competing for water pressure."

The HydroLink provides a low pressure loss zone, enabling both primary and secondary circuits to be hydraulically independent of one another. The function of a low loss header is critical for the new generation of high flow-resistant, low-mass condensing boiler



Mark Krumnow, a radiant heat and hydronics controls expert with manufacturer's rep firm, MBA Corp., designed the radiant heat system and installed the FAR control package, which manages radiant and forced air systems in one simple, five-zone controller. Radiant heat is controlled as the primary source of heat with forced air as the secondary source of heat.

installations because it moves the point of lowest pressure drop from the boiler to the HydroLink's low pressure chamber. The distribution manifold has closely spaced tees, which connects the secondary circuit to the primary loop internally so that flow in the primary loop has little or no tendency to influence flow in the secondary circuit. This is an important role because it prevents pump conflict and the thorny dilemma of having different loop Delta Ps.

And to further enhance system performance and balancing, Krumnow and Schlicher used Caleffi radiant distribution manifolds. "These state-of-the-art brass manifolds are the best we've found," said Schlicher. "We can accurately balance each circuit, control shut-off, and perform automatic removal of air from the system."

The supply manifold's micrometric

balancing valve provides precise ($\pm 5\%$) control of fluid with hand-turned convenience. The return manifold is equipped with manual shut-off valves which can easily shut-down or restrict the flow to individual circuits. Alternatively, they can be fitted with thermo-electric actuators which, when used with ambient t-stats, maintain ambient temperatures at the set limits when thermal loads vary.

The manifolds work well for glycol mixes of up to 50% and are rated for working pressures up to 150 psi and fluid temperature ranges of 32° to 200°F. They are available preassembled with three to 13 outlets, and include end fittings with automatic air vents, shut-off ball valves, drain cocks and a pair of mounting brackets for open, wall installation, or for containment within lockable enclosures.



With the forced air and radiant (FAR) system in place, it's time to relax in any favorite room in the house.

radiant installations

“The feature that stands out the most with these manifolds, however, is their shape,” said Krumnow. “Indentations in the body of the manifold correspond with placement of the balancing valves which extend into the manifold’s main passageway. This becomes an obstruction in any other manifold, increasing pressure loss within it. But the manufacturer solved that problem by extending the cast walls of the manifold outward to perfectly compensate for this, eliminating the pressure loss entirely. And in doing this, they created an ideal ‘nook’ for radiant tubing that exits the base of the upper manifold. The mounting brackets were developed to provide a 1" offset between the upper and lower manifolds, making alignment perfect.”

Their use of Grundfos SuperBrute pumps also became a big advantage on this job. The wet rotor circulators, now in three sizes, have three speeds to choose from and come with an internal flow check to eliminate “ghost flow.”

“Combining the Super Brutes with the Caleffi manifolds enabled us to precisely adjust the delta T for all of the zones,” said Krumnow. “The largest loop was adjusted by an open flow of the manifold and setting the correct speed for each circulator. After that the remaining loops were adjusted to the correct delta T by calibrating the Caleffi manifolds.”

One of the most important facets to optimal circulation for hydronic systems is for contractors to match a pump’s performance, or flow characteristics, to the specific job that it needs to perform within the system. A single-speed pump has one performance curve — a measurement of head (ft) and flow (gpm) — and operates at that level only, with great pre-

dictability. But these new circulators offer a much broader range of performance. With the flick of a switch, various speeds can be chosen, easily changing head and flow to meet the specific needs of the system.

“That’s an important advantage,” said Schlicher who, with Krumnow, installed the boiler and site-built mechanical “wall.” “With this substantial radiant heat installation, the multi-speed circs gave us the ability to balance water flow to each manifold no matter how many loops are on it. Here, we have one manifold with eight loops, and two manifolds with four loops. With multi-speed circs, we can deliver as much water as we need to each manifold.”

“By checking the delta-T for any of the zones, a field technician can adjust a multi-speed pump to operate within the most desirable pump curve,” said Schlicher. “That saves energy and promotes longer pump life.”

In developing its SuperBrute multi-speed circulator, Grundfos engineered-in two other characteristics

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that add to its value for contractors. It has super-high starting torque, made possible by a starting torque booster that pulsates DC current into the winding, making the pump act like an impact driver, virtually eliminating no-start situation. It also has an integrated, removable, check valve that doesn’t reduce pump performance and eliminates the expense of an inline check valve.

“It’s a high performance machine, but it’s built to give the smoothest ride” concluded Jim Sopa.

So next time you hear Gordon Lightfoot sing of legendary Great Lakes storms — when the gales of November come early and frigid winds slash at everything in their path — perhaps you’ll recall this placid lakeside scene. Of the radiant-ready home that lived up to its promise. And homeowners who now know the comfort only radiant can provide. ■



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