

A TMB Publication

# Phc News

plumbing & hydronic contractor news



COVER  
STORY

Contractor of the year . . . . .Page 66

PVF  
UPDATE

Output reaches new peak . . .Page 30

PRODUCTS

Top Products of 2006 . . . . .Page 88

## Focused vision leaves contractor in the clear

BY JOHN MESENBRINK,  
chief editor

In the case of John Ruhnke, owner of JR's Plumbing & Heating LLC, Norwalk, Conn., attention to detail and craftsmanship sets this contractor apart from others. Don't believe me? Just ask the RPA, when, in 2005, Ruhnke received "Best in Show" honors at the Radiant Panel Association's "System Showcase Awards." According to the Radiant Panel Association, JR's Plumbing & Heating received the highest points total in its more than decade-long history of the competition, which featured entries from across Canada and the United States. JR's Plumbing & Heating won the accolades for the radiant heating system designed for the Grove Street Plaza project in Darien, Conn. The project also took first place in the commercial category. In 2004 another project by Ruhnke, the White Fox Road residence, took first place in the retrofit category.

The Grove Street Plaza consists of two buildings, located side by side, surrounding a plaza. The buildings house 10 apartments, along with two retail stores and a restaurant. The plumbing and heating specialists installed radiant heating in both buildings, and snow melt in the plaza walkways. The project also featured a heated fountain, which functions in the winter.

The system design consists of radiant tubing being installed on top of the sub-floor though the buildings. Warm water is sent through the tubes providing a comfortable heat. Tubes are also placed under the walkways to melt the snow in the winter. The fountain water runs underground through pipes and into a heat exchanger. A Tekmar computerized control system runs the entire system efficiently and reduces wear and tear. According to Ruhnke, "The design saves the client annually in fuel bills."

The hydronic heating was divided into five separate systems. All of the radiant zones are 100% radiant heated by the floor.

The first system handles the courtyard. The location of the boiler room made a condensing boiler too difficult to install. A Buderus G334X two-stage boiler was chosen. It supplied a heated fountain and 2,000 square feet of snowmelt. A Tekmar 667 snow detector and melting control handled the injection mixing leading to the snowmelt system. A Tekmar 261 boiler control handled the two-stage boiler. A Tekmar snow/ice sensor and outdoor sensor control activates the system. PEX tubing is attached to two inches of Dow blue board. "This saves a lot of

boiler feeds seven air handlers.

The fourth system handles two apartments in the smaller building and it is radiant. A Buderus G115x boiler and St200 indirect heater were chosen. The Tekmar 369 controls connect to indoor sensors and an outdoor sensor to adjust the heating curve automatically. Slab sensors protect the floors. A Tekmar 363 universal reset control runs the injection mixing system to give full setback to the radiant zones and partial setback to the convectors. Convectors are in the stairwells and basement. The 363 handles the domestic hot water and the boiler also. The radiant floor is gypsum over slab construction. Hardwood and



The Grove Street Plaza project garnered Ruhnke "Best in Show" honors at the 2005 RPA System Showcase Awards.



Jr's Plumbing & Heating installed radiant heating and snowmelt in the plaza walkways.



The mechanical room of the Grove Street plaza, which was meticulously installed, featured hydronic heating that was divided into five separate systems.

money in fuel bills by not running all the time when it is cold outside," said Ruhnke.

The second system handles eight apartments in the big building. The eight apartments are radiant. Two Buderus G115x boilers along with two Buderus ST300 indirect heaters were chosen. Two Tekmar 369 zone controls connect to indoor sensors and an outdoor sensor to adjust the heating curve automatically. Slab sensors protect the floors. A Tekmar 362 mixing control runs the injection mixing system to give full setback to the radiant zones and partial setback to the convectors. Convectors are in the stairwells and basement. A Tekmar 262 boiler control stages the two boilers and handles the domestic hot water. The radiant floor is a mixture of gypsum over slab and gypsum over a wood subfloor. Hardwood and ceramic tile are the floor coverings.

The third system is a hydroair system for the restaurant in the big building. The Tekmar 262 controls the two-stage Buderus G334x boiler and the Buderus ST400 indirect heater. The

ceramic tile are the floor coverings.

The fifth system handles two retail stores in the smaller building and is radiant. A Buderus G115x boiler and St200 indirect heater were chosen. The 363 runs the injection mixing system to give full setback to the radiant zones and partial setback to the convectors. Convectors are in the stairwells and basement. The radiant floor is gypsum over slab construction. Hardwood and ceramic tile are the floor coverings.

The award was based on photos of the project, along with mechanical and electrical drawings.

### White Fox Road

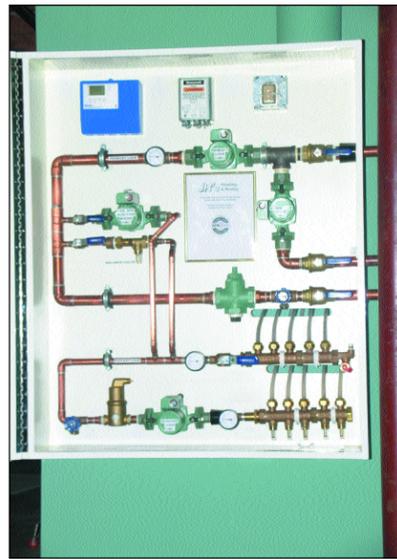
The 2004 White Fox Road residence project started out as a boiler replacement. The old boiler was oil fired at one time, and upgraded to a gas conversion burner. The old boiler was as old as the house — 45 years. The burner was about 20 years old. Ruhnke had done a combustion analysis and found 1,300 ppm of carbon monoxide (CO) in the  
(Turn to Contractor... page 68.)

## Contractor does it his way

(Continued from page 66.)

flue gas. The homeowners have two CO Expert Monitors on each floor of the house. The chimney draft was good so the CO was going up the chimney. Ruhnke was able to make adjustments and get the levels to under 100 ppm. The burner was in

512 dual stage thermostat connected to a slab sensor. The first stage ran the radiant. The second stage ran the existing hot water baseboard in the three radiant rooms as a backup. Surprising to Ruhnke, the second stage was never needed, even with the cold harsh winter of 2003-04. Ruhnke



For the White Fox Road retrofit winner, Ruhnke designed a cabinet with a shelf on the front to provide more storage space and hide the complexity of the controls.



The efficiency of the control panel/cabinet matched the efficiency of the radiant system.

bad condition. Ruhnke suggested that they have the boiler replaced.

The existing slate floor in three rooms was cause for one complaint — the floors were cold in the winter. Ruhnke told the owners he could solve the problem easily without disturbing the original floor. They wanted to keep the area rug in the dining room, too. JR's installed Radiant Engineering Heat Transfer Plates to the bottom of the sub floor, with 3/8 Uponor PEX Tubing. R-19 insulation was installed in the joist bays. Ruhnke was unsure if the aluminum plates would transfer the heat through the carpet, pad, slate and wood subfloor. He installed a Tekmar

used a Tekmar 363 universal reset control with variable speed injection mixing. The system has two temperatures of outdoor setback for the radiant and the baseboard zones. The system receives information from both an indoor and outdoor sensor. This keeps the water temperatures very consistent and allows the 363 to make exact water temperature adjustments automatically. The Wirsbo manifolds and the injection loop balance valve have flow meters.

Ruhnke built a cabinet with a shelf on the front to provide more storage space and hide the complexity of the controls. The basement is unfinished and unheated. The pipes were not insu-

lated to provide a little warmth to the basement. "We did a heating degree-day comparison of two 2003 winter months to two 2004 winter months. The homeowners saved 28%. I am sure with the outdoor reset controls that they will save even more in subsequent springs and falls," said Ruhnke.

### Current radiant cooling system

Ruhnke has installed a simple geothermal radiant cooling system into his house. It cools the floors of his addition over 1,000 square feet. The project started with well pump problems. "A few years back I noticed that my 40-year-old jet pump was starting to have problems. I then looked for a replacement. I spent a few years thinking about this project. I was told by my well guy that submersible pumps were more efficient cutting energy costs in half. I also liked the fact that you could get much better pressure," said Ruhnke.

Submersible pump it was to be. Ruhnke looked at the two pipes and thought to himself, "What am I going to do with the spare pipe?"

"I thought about the radiant heating system I was installing into my home. I made a few phone calls and then designed a simple radiant cooling supplemental system. This system works with the existing heat pump system in my attic. The radiant cooling system will handle an estimated 10% to 15% of the cooling load."

Ruhnke cut out the jet pump and pulled up the well piping. He then dropped a submersible pump to the bottom of the well. He cut off the return pipe about 10 feet below the top of the well cap. Ruhnke borrowed a trencher and buried the wire about a foot. Inside he tied in a heat exchanger to the secondary loop of the second floor radiant heating system. The well water runs through the other side of the heat exchanger. A solenoid valve opens and discharges the well water through the heat exchanger and back to the well. On the system side of the heat exchanger, an injection pump moves water from the heat exchanger through a set of close spaced tees. A system pump moves the water around the secondary loop and through the

radiant floors.

This is a simple system with no compressor. The well pump is 1/2 hp. The well water entering the heat exchanger is about 56 degrees. Ruhnke ran the system full out. After running it for eight hours, he read the return and feed temps on the system loop that leads to the radiant floors — 63 degree feed temps and 67 degree return temps. Ruhnke does not feel a need for humidity controls as the surface temps never went below 68 degrees. They seemed to average about 70 degrees. The well water does cause condensation on the copper pipe when it runs through in the basement, though no condensation after the heat exchanger. There is no condensation upstairs, either.

Ruhnke has wires in the wall for future humidity control. Currently, there is no humidity control. "My thinking is that the output of the system is not high enough to cause the floors to condense. If this is the case then I won't need the humidity controls. Since this is my house, I can keep an eye on things," said Ruhnke.

Ruhnke is running just two Taco pumps 007 and 008, plus a half horse well pump — no compressor! Ruhnke has a traditional AC system run through ducts in the attic, but he feels that the radiant cooling might handle 15% of the load and save 10% in electricity costs.

### Making the auto/plumbing connection

How did Ruhnke's plumbing career begin? Ruhnke traces his mechanical work to his teenage years. At the age of 16, Ruhnke was given his grandmother's car. He immediately fooled with it, installing a new stereo first and an alarm system later. Because the car was old, he did all of the repairs, learning auto mechanics from books. Ruhnke also helped friends fix their cars, too.

On weekends, close friend Fred Cuttitta and Ruhnke were invited to other friend's homes to swap engines out of old broken down cars. After high school, Cuttitta went to work for an auto machine shop and became one of

(Turn to Car engines... 70.)

### Ruhnke's resume

- Past vice president of the SW chapter of the CT-PHCC.
- Past chairman of the Energy Efficiency Action Group for the RPA
- Webmaster of Inventors Association of Connecticut (IACT)
- Current president of IACT
- Current treasurer of the CT chapter for the RPA
- Current member of IACT, RPA, Assoc of Energy Engineers, ASHRAE, Remodelers Assoc. of CT and the Home Builders Assoc of CT.
- Ruhnke has more training in the field of hydronics than anyone else near his territory. He is a certified installer and designer of radiant by the RPA. His associate Fred Cuttitta is a certified installer by the RPA, too. Fred and John are certified for Combustion Analysis by the National Comfort Institute.

## Car engines = boiler mechanics

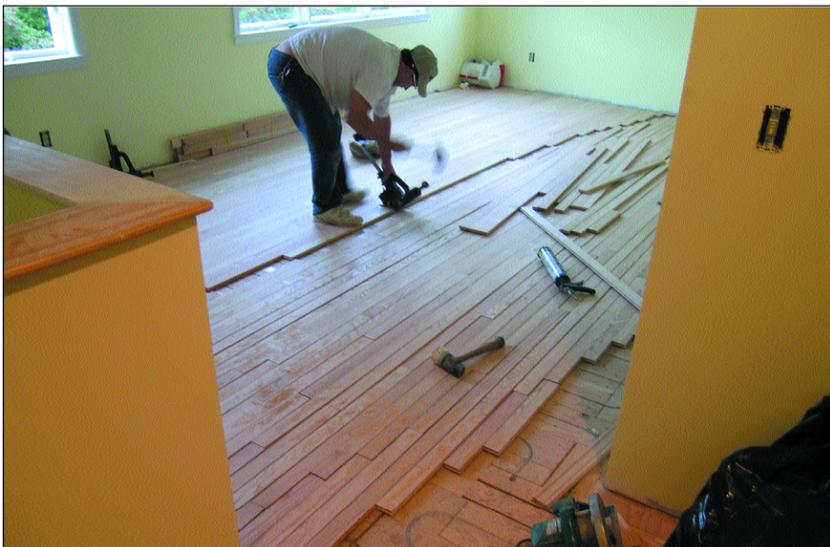
(Continued from page 68.)

the best engine guys around. Ruhnke went to work as an apprentice plumber in 1983. In 1985, Ruhnke started taking his Trans Am to the racetrack. In '87 he started racing. Inevitably, in 1988, he won an amateur racing championship with the Sports Car Club of America. Also in '88, Ruhnke received his journeyman's license from the state of Connecticut. Ruhnke developed a valuable method of learning from experienced racers at the track. Boilers and heating systems were much more like cars and engines to Ruhnke. He carried over this method of learning into his plumbing

hydronics and radiant heating. They also worked on some old steam systems. Radiant heating made hydronics popular again and JR's Plumbing & Heating soon gained a reputation for being experts in hydronics.

### Turning ideas into reality

Ruhnke is also an amateur inventor with two patents issued and two patents pending. All of his patents are related to hot water heating. Since 2003 Ruhnke has devoted a lot of time studying the field of energy efficiency for heating systems. This has greatly improved the efficiency of heating systems that he is designing today.



Hardwood flooring is being installed over the geothermal radiant cooling system in the addition of Ruhnke's home.

and heating business. He loved cars and soon he fell in love with hydronics, too. Ruhnke also has the ceaseless ambition to always be better in his craft — which equates to improving on his plumbing projects.

In 1990 Ruhnke started JR's Plumbing and Heating. In the early stages of the business, Ruhnke mostly did plumbing, but started to dabble into more hydronics. Hot air dominated the industry at that time and hydronic jobs just were not done in new construction. He did work on and repair some older systems, though. Ruhnke claimed his interest in radiant heating was piqued when a client raved about the comforts of the systems in 1995. As a result, he studied the technology, and discovered it was very similar to the hot water baseboard systems that he had been installing for years.

Meanwhile, Cuttitta came to work for Ruhnke as an apprentice in the mid '90s. In 1995, they installed their first radiant heating system and in 1997, JR's Plumbing & Heating joined the Radiant Panel Association. After '97, JR's started to do more and more

Ruhnke developed a mathematical formula in '03 that can calculate the overall efficiency of a heating system. Ruhnke is patent pending on the use of the algorithm in software. With the formula one can calculate the overall efficiency of a heating system and use it to compare one system vs. another. This will allow for the proper steps to fine tune and improve efficiency in heating systems. Once this comparison is done, vast improvements in future heating system designs will become evident. Accurate measurement is important to overall efficiency. Ruhnke has developed a plan for monitoring houses for a full year. He plans to use Onset Data Loggers, a weather station and other related items to do so. "In 2004, I applied for a grant with the Dept. of Energy for \$350,000.00 to complete my monitoring project. I did not receive the Grant and the project has stalled. In 2006 I joined with the Assoc. of Energy Engineers. Many people in the organization have experience with Grant projects. I plan to spend some time networking and learning about the grant process, form a team

and apply for another grant sometime in the future. Energy efficiency is very important to slowing down the global warming effect, so I have developed a

outdoor and indoor reset.

- The clients who have the unit installed rave about how comfortable the heating system is with Exquisite

$$\left( \frac{\text{Heatloss (Btu)}}{\text{Indoor Temp.} - \text{Outdoor Temp.} \times 1\text{HP}} \right) \times \left( \frac{\text{Heating Degree Days} \times 24 \text{ hrs}}{\text{CCFs of Gas} \times 100\text{k Btu}} \right) \times 100 = \% \text{Efficiency}$$

The goal is to develop technology around the overall efficiency formulas.

strong passion for it," said Ruhnke.

Another project dear to Ruhnke's heart is the Exquisite Heat reset control, which was invented by local inventor, John Cockerill. Ruhnke is the licensing agent for Cockerill. He has a patent that issued back in 2001. Exquisite Heat reset involves a unique and very valuable algorithm used in boiler controls.

Cockerill developed an algorithm that reads the thermostat activity and adjusts the water temperature up or down based on the heatload of the room. This algorithm adjusts the boiler water temperature based on the run time of the thermostat. The control produces similar results as outdoor reset except it accomplishes the task much easier. It resets the temperature of the water setback based on the run times of the thermostat. This results in the water being cooler when it is warmer out and hotter when it is colder out just like with outdoor or indoor reset. It doesn't need an outside bulb and can work with any existing thermostat. The control has the capability of being installed in less than two hours. This will produce an installed price for the control that is much less than current outdoor reset controls. This will broaden the marketplace for such controls and have a huge impact on energy savings. This will help to reduce the impact of global warming.

"We are currently talking to a few companies that have a high level of interest. I am very excited about this project because it has the ability to hit the market quickly," said Ruhnke.

Twenty nine units and counting are installed and beta tested right now.

Exquisite Heat features:

- Installs in less than two hours
- No outside bulb needed.
- Any thermostat can work with Exquisite Heat without any extra relays.
  - The whole control involves only 24-volt wiring. No need for tough UL 110 volt testing. Twenty-four volt wiring is fast and easy for contractors to wire up.
  - Responds to solar gain, wind speed changes and more. Outdoor reset doesn't.
  - For every two to three degrees you drop in water temperature you save 1% in heating efficiency. Exquisite heat adjusts the water temperature just like

Heat installed.

- The easy installation will broaden the impact boiler controls have on the market place and save the world billions in fuel bills.

### Vision for overall efficiency

Ruhnke's dream is to save the world an average of 80 billion dollars in fuel bills annually. Goal #1 is to develop technology around the overall efficiency formulas to make using them much easier so that contractors and homeowners will use them much more regularly. One way could be to improve the accuracy of heat loss through the development of real-time information. Another way could be to have monitoring equipment installed into heating systems to measure overall efficiency. Goal #2 involves scientific level monitoring. A database of different heating systems and its corresponding OEF numbers could be created. A form to fill out could be developed describing all aspects of the heating system being entered into the database. Categories and subcategories can be entered into the database. These categories of overall efficiency numbers can be averaged to find out which methods of system design are more efficient.

A contest can be created to build the most efficient heating system. Info and results are into the database and later shared with everyone. The winner can benefit from winning an award. Everyone else can benefit from learning new efficiency methods to use in their own future designs. Papers can be published and seminars developed and taught to other contractors, engineers and homeowners. Every year systems and technology will improve.

Is radiant heating more efficient than hot air? This is the question that will be answered by overall efficiency formulas. It is important to promote competition in developing efficient heating systems to see improvement. "This is a race to build more efficient heating systems. Two thousand years from now people will still be improving efficiency in heating systems or at least achieving efficiency at a less expensive price. I want to create competition between radiant and hot air guys and also with radiant vs. different radiant installation methods," said Ruhnke. ■