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REPRINTED FROM SPRING 2011

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Old stone home uses modern heating technology

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Radiant Professionals Alliance

RPA
Integrating Energy and Comfort

THE OFFICIAL PUBLICATION OF THE RADIANT PROFESSIONALS ALLIANCE

BY LISA MURTON BEETS

OLD STONE HOME USES MODERN HEATING TECHNOLOGY

Radiant was the perfect choice to accompany this home's wood gasification boiler.

Nearly 75 years ago, 35 Italian stone masons built a house in the woods for a civil engineer who worked for the NYC reservoir system. Fast forward to the present and you'll find one happy family living in the house after having lovingly restored it to bring it up to date.

The stones used to build the home came from old, one-lane bridges that needed to be torn down to make way for steel two-lane bridges to transport materials during reservoir construction back in the 1930s. The civil engineer guaranteed the Italian stone masons the contracts to build the new bridges if they would deliver the stones to his property and use them to build the house. The engineer and his

wife ordered the plans from a 1948 edition of *House Beautiful* magazine.

Through the years, there was little to no investment in the home's upkeep. When the present owners bought the home, it was uninhabitable.

"We wanted something weird and we found it," laughs the homeowner, who served as the GC. The house had serious drainage and mold problems – among numerous others – and had to be completely gutted; the process was time-consuming, considering the family was still living in New Jersey for the first three years after the purchase. "At that point, we took a family vote and decided to sell our New Jersey home so we could move full-steam ahead with



Tubing is embedded in gypsum over pour on the first floor.

the renovation. We lived in an apartment space over the garage for 18 more months, and just recently moved into the main house.”

The three-level, 3,000-sq.-ft. house, which is located in upstate New York, had a 1960s-era oil-fired hot air furnace in place at the time of purchase. To even try to heat the home to 55°F at that point cost \$1,400 for one month.

“Given the existing conditions and the client’s desire for efficiency and comfort, we knew we could provide a custom solution to meet their needs,” says John Abularrage, owner of Advanced Radiant Design, Stone Ridge, N.Y., the heating contractor for the project. Advanced Radiant Design won first place for the project in the Retrofit category for the RPA 2011 System Showcase.

The homeowners knew they wanted radiant, not only for comfort, but also because they had to condition one very large living space – a room measuring 36 ft. x 30 ft. – on the main floor. Wanting to be as green as possible, and after having ruled out many other options that wouldn’t be feasible, they selected a Froling FHG-L wood gasification boiler as the primary heat source.

Froling boilers are made in Austria and distributed in the United States by Tarm Biomass. Tarm referred the homeowners to John Abularrage, who is the trained and authorized Froling dealer in the Hudson Valley area of New York. Abularrage first became acquainted with wood gasification boilers in the mid-1980s. Since becoming a dealer, he’s successfully installed many of the systems and is now a passionate proponent of them as an alternative to fossil fuels.

The Froling boiler has two combustion chambers. The primary chamber burns the wood to produce unburned gases, which are then combined with additional pre-heated combustion air in the secondary chamber to burn gases at temperatures between 1,800°F and 2,000°F, Abularrage explains. The boiler is microprocessor-controlled with an oxygen sensor and temperature sensor on the flue outlet. Using these readings, the control then continually adjusts the primary and secondary combustion air via servo motors to provide the maximum combustion efficiency throughout the burn cycle.

The wood boiler system is connected to three 220-gal., pressurized storage tanks, which are included as part of the system. The storage system allows the boiler system to run at maximum efficiency and output. When the house load is less than the boiler output, the excess heat is stored



The wood gasification boiler stores excess heat in tanks, greatly increasing the wood heat utilization in the shoulder seasons.

in the storage tanks. The system is then able to use this stored heat later, greatly increasing the wood heat utilization in the shoulder seasons.

“The storage tanks coupled with radiant enable us to use much lower temperatures – down to 100°F or lower, versus the 140°F to 160°F that would be required with



The excess stored heat coupled with radiant enable the system to use much lower temperatures.

baseboard,” Abularrage says.

The radiant distribution consists of six zones. Tubing is embedded in gypsum over pour on the first floor. On the second floor, the tubing is installed from below the sub-floors with extruded aluminum heat transfer plates. There is a single room in the basement that is heated with radiant walls installed with a pre-manufactured radiant underlayment. Also, there is a radiant wall in one of the bathrooms to provide additional heat.

“Because so much of the house is built from stone, there were many challenges in routing the supply and return piping,” Abularrage says. “In one case, a layer of bricks was removed from the chimney in order to conceal piping that was installed in the cavity and insulated.



The homeowner describes the mechanical room as “absolutely beautiful.”

The removed bricks were then cut to a ½-in. thickness and set back in as a veneer."

The fully networked Tekmar Tn4 radiant control system features indoor temperature feedback, weather-responsive control and variable-speed-injection mixing. It can be set to wood only, back-up only or auto, which allows for auto back-up when burning wood – should the fire not be maintained. The backup boiler is a Triangle Tube, Prestige Solo, LP gas-fired, fully condensing boiler.

"The Tn4 enables us to deliver the lowest temperatures possible and helps us leverage all the heat in the system," Abularrage says. "There's a real synergy between the wood boiler/storage system, in combination with the low-temperature delivery of radiant, and the controls. Radiant is a terrific choice for use with this boiler."

Because the homeowner wanted an incredible amount of programmability and adjustability with the system, he requested that Abularrage add a second layer of control to give greater flexibility for calling for the secondary boiler. Secondary thermostats in each zone can be set to a "room minimum." When the main system is set to auto backup, the backup boiler is not allowed to fire until a zone falls below the "room minimum" – this enables the homeowner to push the depletion of the storage tanks as far as "comfortably" possible.



Bricks were removed from the chimney to conceal piping, then were cut down and set back in as a veneer.

The domestic hot water functions in much the same way. There is an electronic programmable primary



The family uses wood from their own property to fuel the boiler system.

Tekmar aquastat set for 140°F in order to heat the DHW storage tank from the wood system. Additional thermostats interrupt the primary aquastat if the wood storage is below 150°F or the wood boiler supply is below 160°F. If the wood system is insufficient to maintain the DHW and the temperature falls to 120°F, a secondary Tekmar aquastat calls in the backup boiler to heat the DHW.

The domestic hot water storage tank has dual coils in order to "future proof" the system for the installation of solar domestic hot water panels in the future.

The homeowner is very satisfied with the comfort the system provides, as well as with the wood gasification boiler itself. "A little wood makes a lot of heat, fast," he says. "We only have to put in wood maybe twice a day on very cold days...then you put two pieces of paper in, and light it. It's the easiest thing. We clean it out maybe once every two weeks."

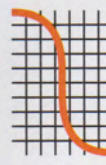
The family uses wood logs from fallen or sick trees on their property to feed the boiler. "It's healthy management of the forest...they're harvesting fuel right from their own land," Abularrage says.

Abularrage, who has been designing and installing radiant systems for more than 30 years, says that working with this particular homeowner gave his team the opportunity to stretch in terms of design and instal-

lation. "This homeowner was heavily involved in every aspect and he wanted the best. Not only did he want green comfort, he also wanted the ability to personally manage and fine-tune the use of the system. He had us take the control system to a level of sophistication that most clients wouldn't be looking for. It was a great experience."

The homeowner certainly recognizes and appreciates the effort. "Advanced Radiant Design did a first-class job with the design – it's brilliant and it works great," he says. "They were prompt, reasonable, and the work was seamless. The quality is top notch – the mechanical room is absolutely beautiful."

Lisa Murton Beets is a Cleveland-based freelance writer specializing in HVAC-related topics and a frequent contributor to Radiant Living.

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