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Frank Lloyd Wright built in his Passion for Radiant Heat

“Bachman Wilson” House Moved; Heating System is First Order of Business

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Common Ground

Frank Lloyd Wright’s passion for radiant heat—for its comfort and invisibility—is well known among architects. However, it was his flair for open designs that were “in harmony with humanity and its living environments”—a philosophy he called “organic architecture”—for which he is best recognized.

Among his most famous designs are Falling Water, a magnificent home in rural Pennsylvania, the Dwight D. Martin House and the Price Tower.

Wright’s Bachman Wilson House was originally built in 1954 along the Millstone River in the National Historic District of the Borough of Millstone, NJ. It was one of his “Usonian” style homes—a distinctly American style house that was available and affordable to all, yet with an open floor plan.

Wright designed Usonian homes to be built by just four tradesmen: a plumber, an electrician, a mason and a

carpenter. He brought the Bachman Wilson House to life with only concrete block, concrete, glass and mahogany.

An architect/designer team—Lawrence and Sharon Tarantino—purchased the house in 1988. They restored it meticulously. The Hillsborough Township, NJ-based firm of Tarantino Architect has led the restoration of numerous other Frank Lloyd Wright houses.

In August of 2011, Hurricane Irene hit the Northeast like a runaway freight train. The Tarantino property received six feet of river water through the home, damaging it extensively. In order for the Bachman Wilson House to live on as a historic monument, it had to be moved.

The Tarantinos decided that selling the house to an institution willing and able to relocate it was the best option for its preservation. Following several years of research for a potential buyer, they sold the home to Crystal Bridges Museum in 2013, which would turn it into a year-round, historical exhibit.

In April of 2014, Wright’s masterpiece was carefully disassembled. Each section was laboriously inventoried, labeled and wrapped for transit.

Two giant shipping containers made the 1,235-mile trek, delivering the entire house—in pieces—to teams at the new home-site at Crystal Bridges’ 120-acre property in the Northwestern corner of Arkansas. Director of Operations, Scott Eccleston, orchestrated its reassembly.

The home’s front façade, with concrete block and mahogany trim, has a nearly fortress-like appearance that ensured privacy from the street in its original suburban location.

Inside, 14-foot-tall, floor-to-ceiling plate glass windows tower over the open floor plan with red concrete floors, imprinted to show the grid work pattern that Frank Lloyd Wright used to design his homes—another architectural facet Wright loved to incorporate.

Even though Wright designed the home in 1954, it was wildly futuristic at the time. Aside from modern aesthetic characteristics, the Bachman Wilson House is equipped with green building components, such as passive solar through abundant use of natural light, and in-floor hydronic radiant heat.

The museum team used the same methods Frank Lloyd Wright used in the original design for the reconstruction process—even down to using the same nail and screw holes.



The only exception was not an alteration; it was an addition. A basement area was added to the new design so that a mechanical room could be installed out of sight. Metal decking fastened to steel joists was chosen to support the concrete floor.

Reacquainted with radiant heat

Wright was one of the very first architects to use hydronic radiant heat as a key to clean, uncluttered design, chiefly because it eliminated visible heating elements such as ducts and a variety of terminal units. While the original hydronic system used copper piping, the museum knowingly avoided that because of the frailty of copper when embedded in concrete. PEX tubing was chosen to transport heated fluids in the floors.

Using a grid system to build the house, Wright cast the grid lines right into the concrete – creating blocks that measure four-foot by four-foot. The grid lines (lettered horizontally and numbered vertically) show where all the home’s major elements align, so that when it was built (and then rebuilt) workers knew, for example, that the fireplace would start exactly on grid D13 and end on E13.

“Every element in the home is on the grid or half-grid,” explained Bill Faber, President of Bentonville, AR-based Bill Faber Construction, the general contractor.

“Reconstructing a house that’s been built and disassembled once before is like a jigsaw puzzle. We’re using the original boards and material to rebuild it, so everything has to piece together perfectly—including the new concrete floors—down to less than a sixteenth of an inch.”

Workers first installed Watts RadiantPEX+ tubing in alternating sections, with terminations in the basement below, leaving other sections untouched so that they could work in the areas without causing damage.

Snowmelt, too

“Another tricky piece to the puzzle was the home’s large patio,” said Faber. “Because of year-round visitors from the museum, Crystal Bridges needed to ensure a safe and dry environment, especially for snow removal.”

“The patio was heated with radiant snowmelt. Wright designed the home so that the entire structure—patio and all—would have one big concrete slab foundation,” said Cary Pestel, owner of Tulsa, OK-based Boone & Boone Sales, the manufacturer’s representative firm for the job.

To accommodate those plans, the 1,400 sq ft patio was included in the sections to be poured. The interior sections of radiant are served by ½-inch Watts RadiantPEX+ that will have a steady 126°F flow of water going through it. According to Pestel, the patio is warmed with 5/8-inch RadiantPEX+ with a 50% glycol/water mix running at a constant 136°F.

A rarity, for sure

The Bachman Wilson House was designed with a second story—rare for a Wright home. Adding to the oddity are the home’s original, built-

in mahogany beds, which appear to grow out of the mahogany flooring.

A basement mechanical room is now the main area of operations for all things mechanical and hydronic. A modulating 104 to 285 MBH Viessmann Vitodens boiler provides heat for all radiant heating and snowmelt.

To conserve space and on-site mechanical fabrication time, Pestel specified the installation of three Watts Radiant Hydronex panels. The preassembled, pre-engineered hydronic control panels include a PM-4-PO primary panel, a DD-2-2 direct panel for distribution to the snow-melted surfaces and a D-Mix, DM-2-2 for the inside floors.

“We also specified the tekmar 664 snow-melt control with its outdoor slab sensor to control the snow-melt,” said Pestel. “Also, Tek519 thermostats were hidden for inside zones; they were mounted in the basement so they aren’t seen on the walls upstairs.”

Humidity woes

Arkansas summers can reach highs in excess of 100°F, with sweltering humidity. Winter temperatures can dip into the negatives, all while holding that same humidity level. To reduce the possibility of sweating, thin vents in the concrete floor below the authentic single-pane glass walls and windows constantly bathe the windows in dry air.

“Because this area is so humid, we also installed a whole-house dehumidifier system in the basement,” said Jeff Handley, owner of Seligman, MO-based Handley Heating. “An open plenum return pulls air from several different locations in the house to the basement, where it is dehumidified before being introduced back into the HVAC system.”

Masterpiece comes back to life

“For everyone involved in the process of rebuilding the Bachman Wilson House, it was a job unlike any before it. Disassembly, relocation and reconstruction of a historical masterpiece—saving it from what otherwise would have been its certain demise—was an amazing feat,” said Eccleston.

The Bachman Wilson House was opened to the delight of museumgoers last summer. Crystal Bridges Museum draws more than 500,000 visitors a year.

Somewhere, up above, the master architect is smiling. ICM

