The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE’s Zero Energy Ready Home program (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0 for an energy-efficient home built on a solid foundation of building science research. Advanced technologies are designed in to give you superior construction, durability, and comfort; healthy indoor air; high-performance HVAC, lighting, and appliances; and solar-ready components for low or no utility bills in a quality home that will last for generations to come.
Heirloom Design Build constructed this two-story home in Atlanta’s historic Inman Park neighborhood to the criteria of the U.S. Department of Energy’s Zero Energy Ready Home program. The home is equipped with ultra-efficient LED-based lighting and ENERGY STAR appliances.

Radlmann started doing energy-efficient construction in 2003 and was soon managing and developing green and New Urbanism projects totaling in excess of $350 million. He was in the middle of several LEED industrial projects and a large-scale mixed-use urban renewal project in Atlanta when the economy tanked in 2008. Looking for opportunities in the chaos, he decided to put his talents to use helping people with home renovation projects.

This was Radlmann’s first house built to the DOE Zero Energy Ready Home program criteria. The DOE Zero Energy Ready Home program requires homes to meet all of the requirements of ENERGY STAR Certified Homes Version 3.0 and the U.S. Environmental Protection Agency’s Indoor airPLUS, as well as the hot water distribution requirements of the EPA’s WaterSense program and the insulation requirements of the 2012 International Energy Conservation Code. In addition, homes are required to have solar electric panels installed or have the conduit and electrical panel space in place for it.

Construction of the two-story plus basement, 4,840-ft² home began with construction of the basement, which is 8 feet below grade. Radlmann installed 1 inch (R-5) of closed-cell rigid foam under the slab. After the concrete foundation walls were poured, 2x4 walls were framed on the interior with a 1-inch gap between the framing and the concrete. This gap and the wall cavities were filled with 3 inches (R-13) of closed-cell spray foam.

Radlmann used advanced framing techniques on the 2x6 above-grade walls including California (3-stud, open) corners, ladder blocking, insulated headers, and single top plates although he spaced the studs at 16 inches on center rather than 24 inches on center because of concerns about Georgia’s occasional tornados. According to Radlmann, he spent days caulking all of the top and bottom plates, all of the stud joints, and every stud to the sheathing. After all of this prep work was done, his crews filled the wall cavities with R-19 spray foam insulation. To ensure that the air sealing was done properly, Radlmann had his energy rater do two blower door tests—one prior to sheet rocking and one prior to siding. “The first test gives us a chance to seal holes before sheet rock encloses the walls,” said Radlmann. The walls were sheathed with OSB, then covered with house wrap, then sided with fiber cement plank siding.

Radlmann also used spray foam in the attic. The attic is insulated on the underside of the roof deck with R-28 open-cell spray foam to provide a sealed
conditioned space for HVAC ducts and for storage. Over the plywood decking, Radlmann installed ice and water shield as an underlayment over the entire roof. He then covered the roof with ENERGY STAR-rated asphalt roofing shingles.

The home is equipped with a central air-to-air heat pump ducted for four zones. The heat pump has a heating efficiency of 12.5 HSPF and a cooling efficiency of 22.8 SEER, far exceeding the federal minimum of 7.7 HSPF and 13 SEER. The heat pump has a MERV 16 filter and UV filtration for hospital quality indoor air.

Radlmann also installed a UV filtration system for the water. He actually installed two systems so that it would not reduce the water pressure. He installed them on the line coming into the home, which is split into two lines, each coming in at 14 gallons per minute. There are four intermediate steps with filters that are changed every 6 months then a big container with a filter that is changed every 2 years. “A lot of people have asthma and a lot of people who have asthma also have eczema, so I felt, if we could filter out contaminants in the city water, it would provide an all-around better health experience.” The added cost for the water filtration system was under $2,000.

For ventilation, Radlmann installed an energy recovery ventilator (ERV). ERVs pull stale air from a home while bringing in an equal amount of fresh air from separate ducts. The ERV supplies fresh air that is distributed by the central air handler while returns on each floor and in the basement continually exhaust stale air from the home.

The home also met all of the EPA Indoor airPLUS criteria including no- and low-VOC paints, stains, and finishes, woods, and carpets.

The home is equipped with a conventional electric hot water heater with an 85-gallon tank and 0.92 efficiency factor.

All of the home’s lighting is ultra-efficient LED-based lighting and the home’s refrigerator, clothes washer, and dishwasher are ENERGY STAR rated.

In addition to meeting the DOE Zero Energy Ready Home criteria, the home was also constructed to the DOE Zero Energy Ready Home Quality Management Guidelines. The home also met the National Association of Home Builders’ National Green Building Standard, gold level.
Radlmann worked with his architect, Cooper Pierce of Jones Pierce Architects, to design a carriage house with a living unit above the garage. Radlmann noted that as the neighborhood has evolved, several big homes that had been multifamily were converted back to single-family. By adding a living unit on top of the garage, he increased the population density and provided a potential income source for the home owners. This unit was also built to the DOE efficiency criteria. It has a 27 SEER ductless heat pump and an ERV.

Southface Energy awarded the home the EarthCraft House Project of the Year award for 2014. The NAHB’s Greater Atlanta Homebuilders Association awarded the home two 2014 OBIE awards: for Best EarthCraft House—2000-ft²+ and for Best Home—2000-ft²+.

For Radlmann, one of the rewards is how well the home blends into the 1890s neighborhood. “People walk by this house and say ‘I love that old house.’ Nobody knows it’s a brand new high-performance house. It doesn’t look like a “green” house. The interior was designed to look like an old house that has been renovated. There is a one-story bump-out that looks like an addition; we even changed some trim and flooring details inside and outside to imply a transition. It has 11-foot ceilings throughout, so people feel like they are in an old, traditional Atlanta home. I did some things like secret doors that might have been in an older home. I have architects that come in and they have no idea it is new. They guess 1920s neoclassical,” said Radlmann. The home has even fooled the camera; it has been used in several period films shot in Atlanta.

Radlmann was so pleased with the results of the home that he bought it himself. He now uses it as a model home that he can bring clients to, so they can experience a green DOE Zero Energy Ready home first-hand.

Radlmann shared some important benefits to the home from a home owner’s perspective. “Since moving into the Zero Energy Ready Home, we have found a vast improvement in indoor air quality. One of the occupants suffers from asthma. The symptoms have been dramatically reduced, enough to where daily medication has been eliminated. Our previous house was an 1893 Victorian bungalow that was about 1,800 ft² compared to this home, which is 4,840 ft². Our electric bill is about the same while our water bill is about one-third of the previous bill.”

Photos courtesy of Heirloom Design Build