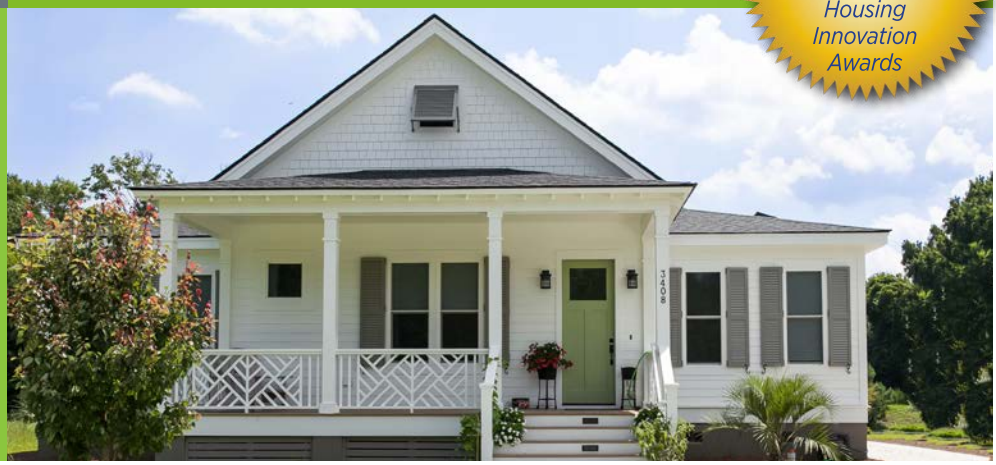
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

DOE ZERO ENERGY READY HOME™

U.S. DOE ZERO ENERGY READY HOME 2014 WINNER Housing Innovation Awards

Amerisips Homes

Custom Designed Residence
Johns Island, SC



BUILDER PROFILE

Amerisips Homes, LLC, Charleston, SC
Tina Bostic, tina@amerisips.com
843-352-2370, www.amerisips.com
Rater: Coastal Training Consultants
Robert Bolus
rbolus@coastaltrainingconsultants.com

FEATURED HOME/DEVELOPMENT:

Project Data:

- Name: Custom Designed Residence
- Location: Johns Island, SC
- Layout: 3 bedrooms, 2.5 baths, 1 floor
- Conditioned Space: 2,085 ft²
- Climate Zone: IECC 3A, hot-humid
- Completion: April 2014
- Category: Custom

Modeled Performance Data:

- HERS Index: without PV 30, with PV 1
- Projected Annual Utility Costs: without PV $1,600, with PV $313
- Projected Annual Energy Cost Savings (compared to a home built to the 2009 IECC) without PV $2,887, with PV $3,200
- Annual Energy Savings: 24,058 kWh

A desire to find a better way to build led the husband and wife team of Tina and Steve Bostic to SIPs home construction and to the U.S. Department of Energy's Zero Energy Ready Home program. The Bostics completed their first DOE Zero Energy Ready-certified home on Johns Island, South Carolina, in April 2014, and they have committed to certifying all of their new homes to the program. They have built to other green programs but "we like the fact that the DOE program is focused more on the house itself, not where it's built. It's really focusing on what we care about," said Tina.

The Johns Island home, like the 14 other homes the Bostics have completed or started since moving their company to Charleston in 2011, is made of structural insulated panels (SIPs). The Bostics discovered SIPs in 2009. They had started a traditional stick-built construction company in 2003 building $5-$10 million homes, then opened the successful Island Design & Architectural Center serving high-end clients and builders near Sea Island, Georgia. When they decided to go back into home building, Steve began researching better ways to build. They discovered SIPs and experimented with green construction methods during the economic downturn in 2008 and 2009. In 2011 they moved their company, Amerisips, to Charleston in search of a more active residential market. They found homebuyers were very interested in green construction but few local builders were familiar with high-performance home construction. To control the building quality process, the Bostics began providing in-house architecture, mechanical engineering, interior design, and construction. They are also a direct distributor for over 200 major products from plumbing to solar panels.

The Bostics have embraced the solar-ready requirement of the DOE Zero Energy Ready Home program. They offer solar photovoltaics and solar thermal water heating as optional upgrades on all of their homes and 18 of their 20 current clients have asked for the solar upgrade package.

ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

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.

Amerisips uses structural insulated panels (SIPs) to construct the entire building shell, including the roof, walls, and floor of the home. The panels are manufactured and precision cut in the factory and come to the site ready for quick assembly. The continuous insulation layer provides superior thermal, acoustic, and air sealing performance. The super-sturdy construction can withstand hurricane-force winds.

What makes a home a DOE ZERO ENERGY READY HOME?

1 **BASELINE**
ENERGY STAR Certified Homes Version 3.0

2 **ENVELOPE**
meets or exceeds 2012 IECC levels

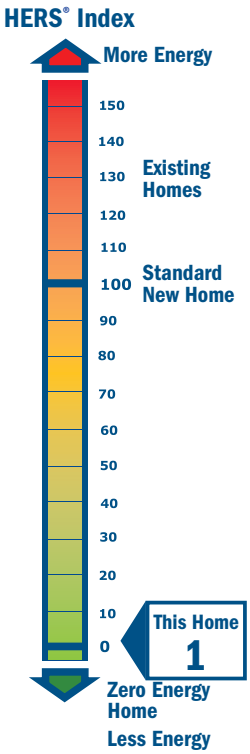
3 **DUCT SYSTEM**
located within the home's thermal boundary

4 **WATER EFFICIENCY**
meets or exceeds the EPA WaterSense Section 3.3 specs

5 **LIGHTING AND APPLIANCES**
ENERGY STAR qualified

6 **INDOOR AIR QUALITY**
meets or exceeds the EPA Indoor airPLUS Verification Checklist

7 **RENEWABLE READY**
meets EPA Renewable Energy-Ready Home.



In addition to requiring homes to have solar PV installed or have the conduit and electrical panel space in place for it, the DOE Zero Energy Ready Home program also 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.

The SIP construction of the Bostic homes makes meeting the program requirements a simpler task. Structural insulated panels are composed of two OSB or magnesium oxide (MGO) panels sandwiching an expanded polystyrene (EPS) foam layer typically 4 to 9 inches thick. The panels are manufactured at a factory then prepared to order for the job, with wall dimensions and cut-outs for doors, windows, electrical, and plumbing chases precision cut in the factory so the panels come to the job site ready for quick assembly. The sturdy panels are earthquake resistant and can withstand winds of 200 mph. Because the walls are more airtight than stick-built walls and because the insulation is a near continuous layer through the wall, SIPs have superior thermal and sound insulating properties.

Amerisips uses SIPs for the entire building envelope, including the roof, walls, and floor, to construct what it refers to as the "EcoShell" of the home. In the Johns Island home, the walls are 6.5-inch-thick SIPs with an R-value of R-24. The roof is made of 8.25-inch SIPs with an R-value of R-32. Having the insulation integrated with the roof deck simplifies the construction of cathedral ceilings and provides insulated attic space above flat-ceilinged rooms. The floor is also made of 8.25-inch SIPs over a vented crawl space, with a girder system as required by their structural engineering team. The underside of the SIP floor system is coated with a water-proofing vapor barrier product.

The home's windows are double-pane, impact-resistant glass with low-emissivity coatings to minimize heat transfer. About 90% of the lighting is ENERGY STAR-rated and/or uses LED lights. The refrigerator, dishwasher, and washing machine are also ENERGY STAR-rated. All of the plumbing fixtures are EPA WaterSense certified.

High-efficiency ENERGY STAR-rated appliances, high-performance windows, and LED lighting contribute to the energy savings in the home. The home meets the EPA Indoor airPLUS requirements to ensure fresh and healthy indoor air. An energy recovery ventilator, low- or no-VOC finishes, a detached garage, and careful water management details all contribute to keep contaminants and mold out of the home.

The home is equipped with an air-to-water heat pump, which provides both heated and cooled air and hot water for domestic use. The heat pump has an efficiency of 4.5 COP for heating and 17.5 SEER for cooling. The heat pump supplies 42°F water to the fan coil system, which is extremely efficient at removing humidity from the virtually airtight enclosure. Normal thermostat settings are maintained at 77-78°F in Charleston's hot, humid summers while indoor humidity ranges between 40% to 50% all summer long. The home meets the requirements of the EPA's Indoor airPLUS certification for healthy indoor air. Clients appreciate the near dust-free home interiors. The heated and cooled air is distributed via a high-velocity, small-diameter ducting system known for very low duct leakage. The ducts in the Johns Island home were located in narrow soffits built along the great room and in the walls. The HVAC system incorporates an outdoor air intake for fresh air delivery to the home. The Bostics offer optional heat recovery ventilator (HRV) systems to their clients, especially those who have respiratory or medical issues.

The air-to-water heat pump heats water for the domestic hot water system as well. Hot water also comes from the roof-mounted solar water heating panels. Both sources feed into an 80-gallon stainless steel tank. Water is distributed through PEX piping from a home-run distribution manifold.

The home is also equipped with a 6-kW solar photovoltaic roof-mounted system. With these solar panels, the home achieves a Home Energy Rating System score of 1, making it a true net zero energy home. Without the PV, the home still achieves a HERS score of 30, far better than the HERS 100 of typical code-built custom homes.

The Bostics, who come from business management and entrepreneurial backgrounds, recognize that high-quality construction doesn't just happen but requires having great quality design and management processes in place. In addition to meeting all of the checklists that are part of the DOE Zero Energy Ready Home certification, they also have certified all of their Amerisips homes with the LEED program at the platinum level. In addition to winning a DOE Housing Innovation Award in the custom home category, they were recently awarded the Best Small Contractor/Builder Award as part of the U.S. Green Building Council's national Best in Building Awards. To control the design/manufacture/build process, they conduct multiple team meetings from design through construction; prepare comprehensive engineering documents,

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.0

EPA Indoor airPLUS

EPA WaterSense

LEED for Homes, platinum

Steve and Tina Bostic, president and managing partner of Amerisips, LLC, received a 2014 Housing Innovation Award from Sam Rashkin, chief architect of the DOE Building America program, for their DOE Zero Energy Ready certified home.

Every DOE Zero Energy Ready Home combines a building science baseline specified by ENERGY STAR Certified Homes with advanced technologies and practices from DOE's Building America research program.

SIPs provide simplified construction for an insulated cathedral ceiling. Two-inch-diameter high-velocity duct registers are barely noticeable in the soffits bordering the great room.

construction drawings, and quality management plans; and schedule team and client reviews throughout construction. An in-house architectural, engineering, and interior design team helps to ensure clients meet their budgets and are happy with the finished product.

The Bostics are so confident of their product that they offer a 20-year warranty on the SIPs panels and a 2- to 10-year homeowners warranty program for overall customer satisfaction. They market the homes as "Free Energy Living™" because they provide freedom from utility bills and also freedom from allergens, dust, and VOCs. They also market the design freedom that comes from constructing with SIPs. Because the exterior walls can carry the entire structural load of the roof, there is much more freedom for designing interior layouts exactly as the homeowner wants them. And because SIPs come together quickly on the job site, depending on the size and complexity of the house, Amerisips can put together a home from start to finish in as little as four to six months.

In fact the Bostics are so enamored of SIPs they have decided to open their own SIP manufacturing plant with the capacity to build 250 Zero Energy Ready homes annually. The factory will produce SIPs with magnesium oxide (MGO) rather than OSB panels. Magnesium oxide is being used in place of gypsum in drywall in Europe, Asia, and third-world countries because of its superior loading, fire ratings, and bug and moisture resistance. With an interior face of MGO on these SIPs, drywall can be eliminated, reducing the time and cost of construction. The exterior surface of the MGO SIPs can be painted or coated with a synthetic stucco finish, lap siding, brick veneer, stone, or a host of other suitable exterior finishes. A major goal for their new SIPs plant is to achieve a 2-hour fire-rated wall for the health care, education, and hospitality markets. If all goes well they hope to expand their state-of-the-art ZERH factory to twenty new markets over the next five years.

Photos courtesy of Amerisips Homes, LLC.

KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance
- **Walls:** 6.5-inch (R-24) OSB SIPs
- **Roof:** 8.25-inch (R-32) OSB SIPs, 40–year shingles
- **Foundation:** Vented crawl space, 8.25-inch (R-32) OSB SIPs flooring with vapor barrier coating on underside
- **Windows:** Low-e, double-pane, windows: U=0.32, SHGC=0.27
- **Air Sealing:** 2.3 ACH 50
- **Ventilation:** Fresh air ducted to fan coil
- **HVAC:** Air-to-water heat pump with fan coil for heat, ventilation, and hot water 4.5 COP; 17.5 EER air conditioner; small-diameter, high-velocity 2-in. ducts
- **Hot Water:** Air-to-water heat pump integrated with solar-thermal water heater, 80-gal tank
- **Lighting:** 90% LED
- **Appliances:** ENERGY STAR refrigerator, clothes washer, dishwasher
- **Solar:** 6-kW PV
- **Water Conservation:** All EPA WaterSense faucets
- **Other:** Energy management system, low-VOC paints and sealants

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