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

DOE ZERO ENERGY READY HOME™

U.S. DOE ZERO ENERGY READY HOME 2021 WINNER Housing Innovation Awards

Insight Homes

The Brenner
Felton, DE

BUILDER PROFILE

Insight Homes
Bridgeville, DE; itsjustabetterhouse.com
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FEATURED HOME/DEVELOPMENT:

Project Data:

- Name: The Brenner
- Location: Felton, Delaware
- Layout: 4 bdrm, 3 bath, 2 fl, 1,940 ft²
- Climate: IECC 4A, mixed-humid
- Completed: May 2020
- Category: Production

Modeled Performance Data:

- HERS Index: without PV: 51
- Annual Energy Costs: without PV: $1,950
- Annual Energy Cost Savings: (vs typical new homes) without PV: $2,100
- Annual Energy Savings: without PV: 7,800 kWh, 400 gallons gas
- Savings in the First 30 Years: without PV: $102,600

For the second year in a row, Insight Homes of Felton, Delaware, has garnered a Housing Innovation Grand Award from the U.S. Department of Energy for constructing the most homes certified to DOE's Zero Energy Ready Home criteria – by certifying 218 homes in 2021.The production home builder constructs about 200 homes a year, all of them to the requirements of DOE's Zero Energy Ready Home program, a commitment it made in 2018. According to Insight's Vice President of Operations, Kevin Brozyna, "The program lines up with the whole reason our founder started the company, to build a better and more energy-efficient home, and to challenge the rest of the builders in our area to build better homes above state code as well."

Every DOE Zero Energy Ready home must meet the requirements of the ENERGY STAR Certified Homes checklists. They must also be certified to the U.S. Environmental Protection Agency's Indoor airPLUS criteria and meet the hot water distribution requirements of the EPA's WaterSense program. DOE Zero Energy Ready homes must also meet above-code insulation requirements, be blower door tested for air tightness, comply with moisture management guidelines, have ducts inside conditioned space, and use ENERGY STAR-labeled windows, lighting, and appliances. Homes must also have solar electric panels installed or have the conduit and electrical panel space in place for future installation of solar panels.

Insight chose not to add solar panels at construction although the home is equipped for future installation of the panels. Even without the PV, homeowners who purchase Insight's Brenner model can expect energy cost savings of more than $2,000 per year compared to a home just built to code.

Insight Homes employs a panelized wall system consisting of 2x6 framing at 24-inch on-center stud spacing and other advanced framing techniques like insulated headers and two- and three-stud corners. Every panel is made in a climate-controlled indoor environment where materials are protected from the elements as they are precision

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. Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0/3.1/3.2 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.

MERV 13 filters and low-emission paints, adhesives, and carpeting; plus a sealed, conditioned crawl space help to keep the air clean in this production home, while a high-efficiency gas furnace and heat pump provide energy-efficient heating and cooling.

What makes a home a DOE ZERO ENERGY READY HOME?

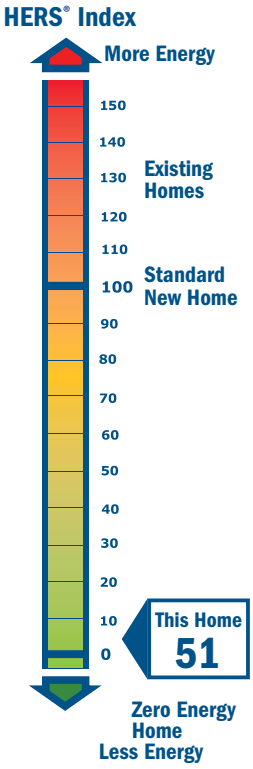
1 **BASELINE**
ENERGY STAR Certified Homes Version 3.0/3.1

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.

cut and attached with laser-guided pneumatic nailers and self-squaring roller tables so every panel is constructed with an accuracy within $\frac{1}{16}^{th}$ of an inch. The wall panels have a $\frac{7}{16}$-inch coated OSB exterior sheathing, which saves time and money by serving as the structural sheathing and the primary weather barrier when all seams between panels are taped. The wall cavities are insulated with R-23 of netted and blown fiberglass. No plumbing or HVAC is installed in the exterior walls. The walls are clad with vinyl siding.

The exterior walls sit on an unvented conditioned crawl space consisting of poured concrete walls that are protected on the exterior with a liquid-applied water proofing. An interior perimeter drain is installed and connected to a sump pit. The ground of the crawl space consists of 4 inches of clean gravel for a capillary break, topped by a 10-mil fiber-reinforced poly vapor barrier that is taped and sealed at all penetrations and wrapped 18 inches up the foundation wall. The crawl space walls are insulated with 2 inches (R-10) of extruded polystyrene rigid foam board that is applied to the interior from the top of the wall to the top of the footer. The band joist is insulated with R-19 of open-cell spray polyurethane foam.

The vented attic is constructed with engineered roof trusses that include an 18-inch raised heel design to allow for full depth insulation over the top plates of the exterior walls. Insulation baffles are installed in each attic bay to prevent wind washing from the soffit vents and to provide a path for ventilation air to flow up to the ridge vents. In the mixed-humid climate, this air flow helps to provide several benefits; it helps pull heat and humidity out of the attic in the summer and in the winter it keeps the deck surface cooler, which helps to prevent the ice dams that can occur when snow melts on a warm roof deck then refreezes at the roof's edge. The attic is insulated with 16.25 inches of loose blown fiberglass insulation to achieve R-49 across the full ceiling plane. For any vaulted ceiling areas, R-38 fiberglass batts were used. Attic hatches that are located in the side walls or the ceiling plane are insulated with multiple layers of extruded polystyrene rigid foam board and are gasketed for air sealing. No mechanical equipment or HVAC ductwork is permitted in the attic. All top plates along interior walls are sealed with canned foam, as are any penetrations for light fixtures, exhaust fans, etc., through the ceiling plane.

Every home certified through the DOE Zero Energy Ready Home program is inspected by a HERS rater and tested for air tightness. Insight's home achieved an air tightness of 1.9 air changes per hour at 50 Pascals (ACH50). Air sealing occurred in two stages. The first stage occurred before drywall was installed and after mechanical

The panelized 2x6 24-inch on-center advanced-framed walls with coated OSB sheathing arrive at the site ready to set into place and fill with R-23 of blown fiberglass. The sheathing seams are taped to provide a weather-resistant barrier and drainage plane behind the vinyl siding.

rough-in when all penetrations through the subfloor to the crawl space, through the top plates and chases to the attic, and through the exterior walls were sealed using expanding foam sealant and rough openings around the windows and door frames were sealed with low-expansion foam sealant. The second stage occurred after drywall was installed when spray foam was used to seal the back side of the ceiling drywall, along the top plates of all interior partition walls, and any penetrations through the ceiling drywall and partition walls (e.g., light fixtures, exhaust fans, plumbing stacks, etc.).

The home is heated and cooled with a 97.5 AFUE modulating gas (propane) furnace and heat pump with a variable speed compressor and a heating efficiency of 9.3 HSPF and a cooling efficiency of 18.8 SEER. The indoor equipment is located in the conditioned crawl space. The duct system trunk lines are rigid round metal ducts while branch takeoffs are insulated flex ducts with a manual balancing damper at each branch. Two dedicated 4-inch supply lines provide air to condition the crawl space. The MERV 13 air filter is located in a central return box placed in a wall of the living space to provide ease of access for replacement. All systems are equipped with a Wi-Fi-enabled thermostat. Ventilation is provided by exhaust fans located in the bathrooms.

Given the longer shoulder seasons in the mixed-humid climate, space conditioning demands for sensible load may be minimal. Coupled with the high-performance windows, 6-inch exterior walls, and larger overhangs, the heating and cooling load is significantly reduced for a home of this size. When the space conditioning system is not calling for heating or cooling, the homes are designed to have the central air handler fan (with an ECM motor) run in manual mode at 30% fan capacity for a set period each hour, between 15 and 45 minutes. Ceiling fans are installed in the central living spaces, including the living room, loft, morning room, and main bedroom.

The periodic cycling of the air handler, coupled with the standard ceiling fans, can help to ensure mixing of the air throughout the home and prevent stratification from occurring when there is no demand for heating and cooling.

All of the home's lighting fixtures use LED light sources. The home's refrigerator, dishwasher, and tankless water heater are all ENERGY STAR rated. The home's plumbing system consists of a central manifold with PEX piping. The homerun distribution system supply lines are sized for each specific end use, and shut-off valves are installed at each point of use. The fixtures are EPA WaterSense-labeled. Landscape irrigation was installed with weather sensors to prevent system operation during periods of rainy weather.

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Quality Management Guidelines

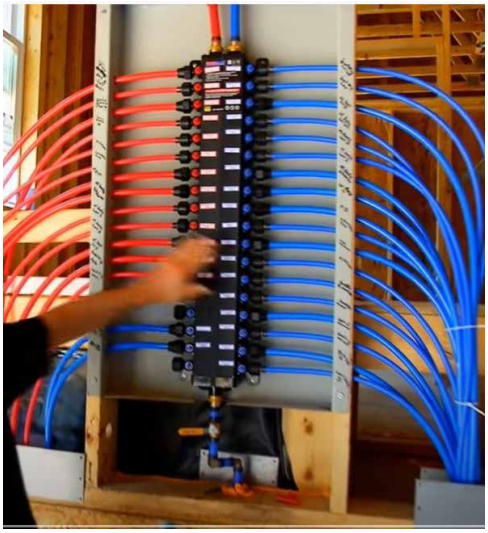
DOE Zero Energy Ready Home Program - 100% Commitment

ENERGY STAR Certified Homes Version 3.1

EPA Indoor airPLUS

National Green Building Standard

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.



The piping and central manifold plumbing distribution system help ensure that hot water speeds directly to its destination for shorter wait times.

All homes certified through the DOE Zero Energy Ready Home program must meet the requirements of EPA Indoor airPLUS. Insight Homes uses low-VOC paints and construction adhesives, non-VOC carpeting made from recycled 2-liter bottles, and other materials that allow the home to achieve the gold level of certification under the National Green Building Standard.

In addition to meeting the DOE Zero Energy Ready Home designation, which includes ENERGY STAR and Indoor airPLUS certification, Insight Homes has also committed to building all its homes to be certified to the National Green Building Standard. These performance programs require third-party inspections, as well as performance testing at several stages of construction to ensure compliance with strict guidelines. In addition, Insight Homes' HVAC suppliers require system commissioning and air flow testing prior to occupancy.

Insight Homes is unique among Mid-Atlantic home builders for dedicating the majority of its website and marketing literature to explaining the science and performance features that go into its homes. Insight also converted the garages of several of its model homes into building science demonstration centers. These building science centers include mock-ups of building sections, explanations of the high-performance home features through graphic and interactive displays, and video explanations of the science that makes the homes unique. To ensure that the high-performance aspects of its homes are consistently explained, Insight uses only in-house sales staff that are specially trained in giving high-performance home tours and explaining the features and benefits of health and comfort that come with living in an Insight Home. "No other builder in this region dedicates this level of effort to educating the customers and explaining why they should be demanding high performance from their builder," said Brozyna.

Insight's efforts have not gone unnoticed. In addition to the DOE ZERH Housing Innovation Award and Grand Award, in May of 2021, Insight Home's Brenner model was awarded "Best Green Community Home up to 2,000 ft^2" as well as "Best Single Family Community Home up to 2,000 ft^2" for a production builder constructing 75 or more homes per year by the Builders and Remodelers Association of Delaware.

While awards are great, according to Brozyna, "Our biggest reward is hearing from our customers a year later, 5 years later, or more etc., and they are still amazed at how low their energy bills are and they are still happy they made the decision to build 'justabetterhouse.'"

KEY FEATURES

- **Walls:** Panelized, 2x6 at 24" o.c., R-23 total: advanced-framed, R-23 blown fiberglass, 7/16" coated OSB taped, vinyl siding.
- **Roof:** Truss gabled roof: 7/16" OSB sheathing, 15# felt, self-adhered membrane in valleys; composite shingles, doubled at rakes; ridge and soffit vents; 15" overhangs.
- **Attic:** Vented attic: R-49 total: 16.25" blown fiberglass, 18" raised heel trusses, spray foam over all top plates, attic hatches gasketed and insulated with XPS.
- **Foundation:** Unvented conditioned crawl space: 4" clean gravel, 10-mil vapor barrier, 2" R-10 XPS on interior, R-19 open-cell spray foam in band joist. Interior footing drain to sump.
- **Windows:** Double-pane, argon-filled, vinyl frame, double-hung, U=0.28, SHGC=0.19.
- **Air Sealing:** 1.9 ACH50, ceiling penetrations spray sealed.
- **Ventilation:** Exhaust-only, MERV 13 filters, 100 CFM, 12.5 Watts.
- **HVAC:** Gas furnace, 97.5 AFUE, AC variable-speed compressor, secondary central air source heat pump, 9.3 HSPF, 18.8 SEER; manual damper at each branch.
- **Hot Water:** Tankless propane water heater, 0.97 EF.
- **Lighting:** 100% LED.
- **Appliances:** ENERGY STAR refrigerator, dishwasher, tankless propane water heater.
- **Solar:** N/A
- **Water Conservation:** Low-flow fixtures, central manifold with PEX piping.
- **Energy Management System:** Wi-Fi connected thermostats.
- **Other:** Low-VOC paints, adhesives, carpeting; National Green Building Standard Gold.

Photos courtesy of Insight Homes

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