

BrightLeaf Homes

Eco 3 Greenfill
LaGrange, IL



BUILDER PROFILE

BrightLeaf Homes, LaGrange, IL
Scott Sanders, scott@mybrightleafhome.com
630-254-9745, www.mybrightleafhome.com
Rater: Insight Property Services
Joe Konopacki
joe@insightpsinc.com

FEATURED HOME/DEVELOPMENT:

Project Data:

- Name: Eco 3 Greenfill
- Location: LaGrange, IL
- Layout: 5 bdrm, 3.5 bath, 2 fl + bsmt, 4,608 ft²
- Climate Zone: IECC 5A, cold
- Completion: June 2016
- Category: custom spec

Modeled Performance Data:

- HERS Index: without PV 36, with PV 26
- Projected Annual Energy Costs: without PV \$1,750, with PV \$1,316
- Projected Annual Energy Cost Savings (vs home built to 2015 IECC): with PV \$2,889
- Projected Annual Energy Savings: with PV 273 MMBtu
- Added Construction Cost: with PV \$18,000

Attention to detail has helped BrightLeaf Homes turn standard building materials and a straightforward design into an extremely high-performing home at a remarkably competitive price.

BrightLeaf has won their second straight Housing Innovation Award from the U.S. Department of Energy for a DOE Zero Energy Ready certified home in LaGrange, Illinois, that earned a Home Energy Rating System (HERS) score of 36. A typical new home built to code would score a HERS 80 to 100. BrightLeaf's high-performance homes cost about \$280/ft² (not counting land), while older homes around Chicago cost about \$270/ft². When electricity production from the 2.8-kW roof-mounted solar photovoltaic system is included in the analysis, the HERS score drops to 26, even closer to the coveted net zero score. For home owners of the BrightLeaf DOE 2016 award-winning home, this translates into calculated monthly energy bills of \$110 per month and energy cost savings of \$2,900 per year compared to a typical new home in Illinois. BrightLeaf packs five bedrooms, three and a half bathrooms and 4,608 ft² of living space into a 1,536-ft² footprint on the 50x130-ft lot, thanks to a simple rectangular shape including two stories above ground plus a full finished basement.

To achieve this exceptional performance, BrightLeaf followed the same DOE Zero Energy Ready Home recipe they have followed on five previous certified homes. All DOE Zero Energy Ready Homes must be certified to ENERGY STAR Certified Homes Version 3.0 and the U.S. Environmental Protection Agency's Indoor airPLUS. Each home must meet 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 future installation of solar panels.



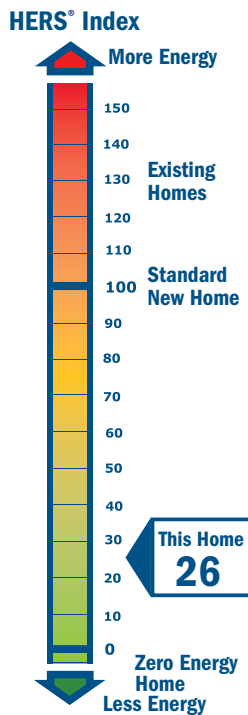
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0 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.

BrightLeaf Homes built this 4,608-ft² home in LaGrange, Illinois, to the performance criteria of the DOE Zero Energy Ready Home (ZERH) program. The home is equipped with EPA WaterSense certified plumbing fixtures, a tankless gas water heater, 95% LED lighting, ENERGY STAR appliances, and low- or no-VOC cabinets, flooring, and finishes.



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.



BrightLeaf used a wood-framed wall with 2x6 top and bottom plates, with 2x4 studs installed every 12 inches but staggered so that alternating studs align with the inside or outside edge of the plates. This allows the dense-packed cellulose insulation to fill the spaces between the studs as well as wrapping around the edges of the studs to stop thermal bridging through the wall, to provide an effective R value of R-25. The interior is surfaced with 5/8-inch drywall that is made airtight by applying sealant at the top and bottom plates and around all openings. The exterior is covered with 1/2-inch engineered sheathing with a plastic coating on the exterior side. The sheathing was not taped at the seams but it was covered with a house wrap that was very carefully air sealed at the edges and seams to provide a continuous weather-resistant barrier under the fiber cement lapped siding. “This is an assembly that almost every contractor could build but very few can or will do it with the attention to detail that we have,” said Scott Sanders, a partner at BrightLeaf. BrightLeaf tested several rain screen options before deciding on the coated untaped sheathing and sealed house wrap. “We ... concluded that we can achieve remarkable levels of airtightness at a fraction of the cost with common house wrap and careful attention to detail,” said Sanders.

Window and door openings and utility penetrations were carefully and properly flashed, primarily using a butyl tape sealant for the top and sides and a flexible water-proof fabric flashing for the sills. All openings were oversized by 1/2 inch and a piece of cedar bevel siding was placed on the bottom sill under the flashing to create a positive slope away from the interior of the house.

The simple gable roof has an un-taped 1/2-inch coated sheathing, 30-lb roofing felt, ice-and-water shield at the eaves, ENERGY STAR-certified shingles, raised-heel trusses, 24-inch overhangs, and ridge and soffit vents. To make room on the south-facing roof for PV, there are only six roof penetrations (a plumbing stack, a radon vent, two exhaust fan vents, and two solar tubes), all on the north side.

The second-story drywall ceiling serves as the primary air barrier in the vented attic. Before installing the 16 inches of R-60 blown cellulose attic insulation, BrightLeaf sealed the drywall to the top plates, spray foamed the interior drywall-to-top plate seams, taped and foamed any ceiling fixture electric boxes, and avoided holes by installing lights and smoke detectors on walls instead of ceilings wherever possible.



BrightLeaf designed the home on a 2-ft grid with a 32x48-ft footprint, wall studs staggered every 12 in., roof trusses every 24 in., and advanced framing with two-stud corners, ladder blocking, insulated headers, and windows aligned with studs. The roof has 13-in. raised heel trusses, baffles and wind dams for soffit-to-ridge venting without windwashing, 24-in. overhangs, and a 6.25/12 pitch that exactly fits five sheets of sheathing at an ideal angle for PV.

The house has a full basement with 8-inch-thick poured concrete foundation walls. The basement was positioned with 4 feet below ground and 4 feet above ground to allow for significant amounts of daylight through the 36-inch-tall basement windows. A strip of 10-mil polyethylene sheeting provides an inexpensive vapor barrier between the keyed concrete footing and the foundation wall to prevent moisture transfer from the footing up into the foundation wall.

The foundation walls are fully insulated on the exterior with 3 inches of rigid extruded polystyrene (XPS) insulation installed in two 1 ½-inch-thick layers with staggered seams for extra protection against water infiltration to the foundation wall. Before pouring the 4-inch-thick concrete basement slab, the builder laid down a base of crushed gravel to promote drainage, then topped this with a 2-inch-thick layer of rigid XPS insulation which extends out over the tops of the footing and has taped seams. On top of the foam insulation is a single continuous sheet of 10-mil polyethylene vapor barrier. Sanders noted that the Chicago area has a variable climate with temperatures that can get extremely hot and extremely cold. By completely insulating the basement along the exterior, the basement can be thermally connected to the interior of the home and the thermal mass of the concrete floor and walls can act as a large, thermal heat sink, helping to balance daily swings in outdoor temperature from day to night.

BrightLeaf found affordable triple-pane low-air-infiltration, highly insulated windows made by a European company in Bristol, Pennsylvania. The windows have foam-insulated vinyl frames, an argon gas fill, and a low-emissivity coating to minimize heat transfer, providing a U-factor of 0.22 for the double-hung units and 0.18 for the fixed-pane styles. In another example of how their attention to detail makes a difference, the window sizes are standardized as much as possible with most fitting exactly into rough openings framed to 3x5 feet or 2x3 feet. “This allows our carpenters to frame more quickly and minimizes mistakes for rough opening sizes since they are whole numbers and not something like 35 3/16 inches,” said Sanders. The home was designed with the bedrooms and living spaces along the south side of the house where most of the windows are for beneficial day light and solar heat gain.

To provide balanced whole house ventilation to the tight home, BrightLeaf employs a cost-effective strategy using an electronically controlled dampered fresh air intake interlocked with a high-performance exhaust fan on the second floor. The air-cycler controller is integrated with the variable-speed furnace motor to

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.1

EPA Indoor airPLUS



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.



Plastic drain mat protects basement walls from water infiltration.

ducts going directly out the roof or an exterior wall. The ventilation is controlled manually by a standard switch but is set to continue for 6 minutes after the switch in the room is turned off.

The HVAC system is a conventional, sealed-combustion 96% AFUE gas furnace paired with a 14 SEER air conditioning condenser and coil. The furnace is rated at 60,000 BTU. The dual-stage gas valve and variable-speed ECM motor allow the furnace to run at partial capacity to minimize short cycling. All ductwork is un-insulated and located completely within the conditioned envelope through the use of open-web floor trusses. Even though there would be no leakage to the outside, all joints were completely sealed with both mastic on the exterior and a spray sealant on the interior of the ducts after the return plenum was installed.

BrightLeaf Homes firmly believes in the motto “Proper planning prevents poor performance.” They start each home with a complete set of architectural plans (“that is continuously improved with every iteration of the homes we build”) and fully detailed project and phase-specific specifications. Preconstruction and on-site meetings are held with trade partners whose work overlaps with each other. The site supervisor is required to be on site for the first day of work for each major trade to review details, changes, and those “things that BrightLeaf does that they probably didn’t do on the last job they worked on for another builder,” said Sanders. Trade partners are required to complete jobsite readiness checklists that confirm their phase of work is completely done and the site is 100% ready for the following trade partner. “Our site supervisor does occasional double checks on these completed checklists to verify that no upcoming trade partner is delayed or has to come back another day because the prior trade didn’t finish his job. Most of our trade partners and crews have worked on our homes before and, since all of our homes are built to the ENERGY STAR and DOE ZERH specifications, they are familiar with the specific ‘quirks’ and attention to detail that we require,” said Sanders.

“We are building homes this way because we believe it is the right thing to do,” said Sanders.

Photos courtesy of BrightLeaf Homes

provide fresh air as needed based on the occupant load, total conditioned space, and run time of the HVAC system. When the controller opens the fresh air damper, outside air is pulled into the return side of the plenum and the multi-speed exhaust fan on the second floor is automatically turned on. The fresh air damper is also tied into the 400-CFM range hood so that when the range hood turns on, the damper is automatically opened to allow pressure relief. Bathroom spot ventilation is provided in each of the three full bathrooms with exhaust fans connected to 6-inch exhaust

KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** Staggered 2x4s 12” o.c. on 2x6 plates, 2-stud corners, ladder blocking at wall intersections, right-sized insulated headers, window and door framing aligned with 12” o.c. wall studs, R-25 dense-packed cellulose, ½” coated OSB sheathing, air-sealed house wrap, fiber cement. Window and door openings get flexible flashing and beveled sills.
- **Roof:** Coated OSB sheathing, 13” raised-heel trusses, 24” overhangs, 30-lb felt, ice-and-water shield at eaves. ENERGY STAR light asphalt shingles.
- **Attic:** Vented: all top plates foamed, 16” R-60 blown cellulose, few penetrations.
- **Foundation:** Basement only 4-ft deep for daylight, insulated on exterior with 3” rigid XPS, 2” XPS beneath slab, drain mat over exterior insulation.
- **Windows:** Vinyl-frame triple-pane, low-e, U=0.22-0.18, SHGC=0.24.
- **Air Sealing:** 0.98 ACH 50.
- **Ventilation:** Air-cycler-controlled fresh air intake balanced to timered exhaust fans.
- **HVAC:** 96% AFUE gas furnace, 14 SEER AC. Ducts un-insulated, in conditioned space.
- **Hot Water:** Tankless gas EF .97.
- **Lighting:** 95% LED.
- **Appliances:** ENERGY STAR dishwasher, clothes washer.
- **Renewables:** 2.8-kW PV.
- **Water Conservation:** 100% WaterSense fixtures.
- **Energy Management System:** None.
- **Other:** No-/low-VOC primer, paint, cabinets, flooring. Pre-wired for electric car charger.