



Building America Best Practices Series

Volume 16. 40% Whole-House Energy Savings in the Mixed-Humid Climate

Case Study: Urbane Homes

Various Locations | Greater Louisville, KY

Urbane Homes won an Energy Value Housing Award in 2009 for their energy-efficient prototype. They built the house in 2008 for just \$36 per ft² using materials and techniques available to all builders and achieved an energy savings of 44% compared to the Building America benchmark.

BUILDER PROFILE

Builder: Urbane Homes

Contact: Abe Gilbert
and Zane Underwood, Co-Owners
(502) 509-7373
www.myurbanehome.com

Founded: 2007

Where: Louisville, KY

Employees: 2 to 3, not including subcontractors

Number of homes per year: 5 plus

Size: 1,484 to 6,000 ft²,
3 to 5 bedrooms, 2 to 3.5 baths

Price Range: \$150,000 to \$450,000

When Abe Gilbert and Zane Underwood founded Urbane Homes in 2007, their goal was to build bigger, better, and more affordable houses than any other builder in the area. They are now one of the top 10 production home builders in Louisville.

At the time Gilbert and Underwood started Urbane, they could see the beginning of a downturn in the housing market and knew that their survival depended on building the most affordable houses in Kentucky. By working with the U.S. Department of Energy's Building America program, they discovered how to make their houses not just affordable but energy efficient—their homes achieve HERS scores of 57 to 62.

Gilbert says Urbane Homes sells every house they build, and they don't do any formal advertising.

"We just list the house about two weeks before it's done so people can come and see it. The longest we've had a house listed is 3 weeks. The last one we sold was on the market for just 2 weeks."

As they launched Urbane Homes, Gilbert researched ways to reduce costs by making their building practices efficient. This led him to Steve Bazek, a Boston architect who pioneers in efficient and green housing designs.

"Bazek said, 'Why don't you build really good homes that are also energy efficient and green?'" Gilbert remembers. He and Underwood were skeptical. How could they keep costs low while adding energy-efficiency upgrades? But Bazek thought they could do both.

Bazek worked with the builders to design their first house and introduced them to the National Association of Home Builders



Urbane Homes worked with the researchers from the National Association of Home Builders, a Building America partner, to develop a frost-protected shallow foundation that can reduce the cost of excavation and amount of concrete needed. The bottom of the footings can be placed 12" to 16" below grade instead of digging below the frost line (up to 48") because the foundation is protected from freezing by rigid insulation. Insulation used for below-grade application must be in compliance with ASTM C 578 Standard.



(Top) The walls use advanced framing with 2x6 studs at 24 inches on center and XPS rigid foam sheathing on exterior walls instead of OSB.



(Bottom) Ceiling trusses are designed to span the entire home. There are no bearing walls for the roof in the interior of the home. All ducts are located within conditioned space. The duct shown here is the fresh air intake for the house.

(NAHB) Research Center, a Building America research partner. The partnership helped them incorporate energy-efficient features and green building practices. The NAHB Research Center provided technical support for a frost-protected shallow foundation and for code approval of their prototype house.

“We set out to prove that we could build a really good house for an affordable price, and we built that first house for \$36 per square foot,” said Gilbert. The remarkably low cost per square foot of Urbane’s prototype model was verified by both the NAHB and DOE. A typical home in Louisville costs between \$55 and \$85 per ft² to build, not including the lot.

Urbane Home’s prototype model won three major building awards in 2009, including two NAHB Energy Value Housing Awards (for affordability and production), and it was runner-up for the NAHB’s Green Project of the Year.

By 2010, Urbane Homes built 10 production homes on custom lots in scattered locations within greater Louisville. Urbane’s six model home designs are one- and two-story, single-family dwellings ranging in size from 1,484 to 2,996 ft², with 2 to 5 bedrooms and 2 to 3.5 bathrooms. Prices range from \$150,000 to \$450,000.

The homes have calculated energy savings of 41% to 44% compared to the Building America benchmark (a home built to the 1993 Model Energy Code), and have HERS scores of 57-62, depending on the model. A typical new American home has a HERS score of 100 (lower scores indicate greater energy efficiency).

Energy-Efficiency Features

Urbane Homes worked with the NAHB Research Center to develop an energy-efficiency package using readily available off-the-shelf products. “We wanted to pick all the low-hanging fruit for green and energy-efficient design and put it in a standard package that made sense and was affordable,” said Gilbert.

Urbane’s standard package begins with the frost-protected shallow foundation. This method allows footing or foundation depth to be reduced from 48" to 12" to 16", saving about two-thirds the amount of concrete needed. Traditionally, foundations are protected from frost-heaving damage by placing the footing below the frost line, but the shallow foundation is protected from freezing by placing rigid insulation around the outside of the foundation. Urbane Homes uses 1" of R-5 extruded polystyrene (XPS) foam below the entire slab. The exterior foundation is protected by 2" (R-10) of recycled expanded polystyrene (EPS) foam, and the interior slab edge is insulated with 1/4" (R-5) of EPS foam.

The attic is insulated with R-50 blown fiberglass.

The advanced wood framing (2x6 at 24-inch on center) uses less lumber and leaves more room for the R-19 fiberglass batts on the interior walls. One-inch (R-5) XPS rigid foam is used for sheathing instead of OSB on the exterior walls. The sheathing is taped at the seams and braced at the corners and then covered with a water-resistant barrier (house wrap) that is fastened and taped. The exterior is finished with vinyl siding. Blower door tests show air tightness of less than 3.6 air changes per hour at 50 Pascals of pressure (~0.15 ACHnat infiltration).

The heating, ventilation, and air-conditioning (HVAC) system includes an 8.4 HSPF, 14.5 SEER heat pump. A runtime positive ventilation system is dampered with programmable exhaust ventilation. Ducts are installed within the conditioned space in open-web floor trusses and are tested for leakage to achieve less than 5%.

The hot water system uses a 0.92 energy factor (EF) electric tank hot water heater. All other appliances are ENERGY STAR. Windows are vinyl-framed, double-glazed low-e with argon fill (U-value=0.32, SHGC=0.31), and the lighting is 100% hardwired compact fluorescent lighting.

Innovation

Urbane Homes incorporates improvements to its energy-efficiency package on a yearly basis.

To ensure adherence to quality standards, Urbane Homes holds pre-construction meetings to coordinate trade contractors and ensure buy-in from the site superintendent. They provided training sessions for their subcontractors on the use of newer products like exterior rigid foam and they developed a framing manual for the special techniques they expect their framers to use.

“Our framers do the majority of our air sealing, so when we make changes to our process, they get an updated manual and do a great job with it,” said Gilbert.

All of Urbane’s houses meet the Building America 40% savings standard and are five-star ENERGY STAR certified. ENERGY STAR provides third-party testing for energy efficiency.

Health, Durability, Sustainability

Greater Louisville gets 44 inches of rain annually. Moisture and mold are a common problem for homes in the area. Urbane Homes builds from the ground up to keep moisture from getting into their houses. Instead of the oriented strand board (OSB) that many builders use, Urbane uses XPS rigid foam sheathing for exterior walls. OSB can absorb and trap moisture in a mixed-humid climate.



The XPS rigid foam sheathing is taped at the seams and covered with house wrap to provide a drainage, air barrier, and thermal barrier.

Key Features

- Advanced 2" x 6" wood framing at 24" on center
- Attic insulation: R-50 blown fiberglass
- Wall insulation: 1" (R-5) XPS foam sheathing with R-19 fiberglass batts
- Foundation insulation: 1" (R-5) XPS below slab, 2" (R-10) EPS exterior foundation, 1¼" (R-5) EPS interior foundation
- Homes with basements: 2" (R-10) EPS exterior, R 13 fiberglass batts in interior walls
- Windows: Vinyl-framed, double-glazed, low-e with argon fill (U-0.32, SHGC=0.31)
- Blower door test: Less than 3.6 ACH@50PA (-0.15 ACHnat infiltration)
- 8.4 HSPF, 14.5 SEER heat pump
- Runtime positive ventilation system
- 0.92 EF electric tank hot water heater
- Ducts in conditioned space with less than 5% leakage
- 100% hardwired CFLs
- ENERGY STAR appliances
- HERS scores: 57-62

For More Information

www.buildingamerica.gov
 EERE Information Center
 1-877-EERE-INF (1-877-337-3463)
 eere.energy.gov/informationcenter



Dollars and Sense

The energy-efficiency upgrades cost about \$1,465 per house, which adds about \$129 a year to a mortgage (based on a 30-year term and 7% interest). But the homeowner enjoys an estimated \$713 a year in energy savings, for a net annual gain to the homeowner of \$584.

Urbane Homes is working with the NAHB Research Center to design a building envelope with a much higher level of insulation. They are also researching alternative HVAC strategies. These should help Urbane Homes achieve 50% savings over the Building America benchmark while maintaining affordability.

Table 1. Added Costs and Savings of Energy-Efficient Measures for Urbane Homes' 2,184 Slab Model

Total Energy Savings*	44%
Total Added Builder Costs**	\$1,612
Annual Mortgage Payment Increase***	\$129
Annual Utility Savings	\$713
Annual Net Cash Flow to the Homeowner	\$584

*Compared to the Building America benchmark.
 **Costs are based on builder estimates and manufacturers' data. These costs do not include solar photovoltaic systems and do not reflect rebates, incentives, and subsidies.
 ***The annual mortgage payment is an estimate based on a 30-year mortgage with a 7% fixed interest rate.

The Bottom Line

Urbane Homes has become a leader in high-performance homes in a remarkably short time, receiving industry honors for design and construction approaches that raise the level of energy efficiency and green building beyond the typical practices of the area.

Urbane has built five or more homes per year since their original community of 10. Urbane Homes' dollar sales volume has doubled every year since they started building, and they've already had repeat buyers who sold their original Urbane homes at a significant profit.

The builders admit that most of their customers initially are more interested in price and location, but as homeowners learn how much money the house will save them on energy costs, they get excited about the energy-efficiency features.

"We're very passionate about what we do and people can see that," said Gilbert. "We just keep getting busier and busier."