



Building America Case Study Whole-House Solutions for New Homes

Winchester Homes and Camberley Homes

Silver Spring, Maryland

PROJECT INFORMATION

Construction: New home

Type: Single-family

Builder: Winchester Homes and
Camberley Homes

Size: 3,228 ft² (4,441 ft² including
conditioned basement)

Price Range: Unavailable

Date completed: 2011

Climate Zone: Mixed-humid

PERFORMANCE DATA

Projected annual energy cost savings:
\$1,100

Incremental cost of energy-efficiency
measures: \$9,600

Incremental annual mortgage: \$620

Annual cash flow: \$580

Billing data: Not available

Production builders face unique hurdles for meeting performance targets while containing costs. Winchester Homes and Camberley Homes, in the mixed-humid climate of Maryland, worked with the U.S. Department of Energy Building America team Partnership for Home Innovation to design a new enhanced model for comfort and efficiency. This house met the team's goals of reproducibility on production scale while cutting whole house energy use by 30% and adding less than \$10,000 to costs.

At the core of the redesigned home was the framing system, which accommodates R-24 wall insulation, eliminates drywall corners at exterior walls, and encloses all ducts in conditioned space. After a year of operation, the house maintained its tight construction (2.0 air changes per hour at 50 Pascals [ACH50]). The builder considers the permanent design features—optimized framing, insulation, windows, plumbing system, and heating, ventilating, and air-conditioning (HVAC)—cost effective, and has subsequently employed similar design strategies in other homes in the development.



Offset interior walls allow for continuous drywall along exterior walls, which helps reduce air leakage below 2 ACH50 in this Maryland production home.

KEY ENERGY EFFICIENCY MEASURES

- Single seasonal energy efficiency ratio 15 AC; 2-stage 92.5% annual fuel utilization efficiency furnace with electronically commutated motor (ECM) blower
- Continuously operating ECM air handler motor
- Duct system entirely in conditioned space. Duct leakage to outside = 43 cfm @ 25 Pa
- Supply-only ventilation; fresh air introduced in return ducts, damper programmed to open 60% of time

ENVELOPE

- 2x6 frame, 24-in. on-center with structural rim headers, R-24 blown fiberglass insulation and continuous drywall method
- R-49 blown ceiling insulation in vented attic with raised heel roof trusses to create 2-foot overhangs
- Double-pane, low-e, vinyl windows. U = 0.31, solar heat gain coefficient = 0.28
- Tightly sealed house, ACH50 = 2.0

LIGHTING, APPLIANCES, AND WATER HEATING

- 80%+ compact fluorescent lighting
- 50-gallon, power vent, natural gas water heater, energy factor 0.74; PEX manifold piping

For more information, see the Building America report, *Performance Verification of Production-Scalable Energy Efficient Solutions*, at www.buildingamerica.gov

Image credit: All images were created by the PHI team.



Factory cut floor joists were part of a comprehensive strategy for getting ducts in conditioned space.



Spray-applied elastomeric air sealing materials simplified air sealing the complex framing design and resulted in tight construction.

Serving as a model home, the house showcased energy efficiency and high performance through numerous displays and videos throughout the model. Long-term monitoring shows predicted and actual energy consumption track closely, and ongoing moisture monitoring does not indicate any durability concerns within the wall cavities.

Lessons Learned

- Offsetting interior partition walls to eliminate drywall corners at exterior walls was a successful design change. Framing and sheetrock crews adapted easily to this design modification.
- Integrating the duct and floor system required a big effort during design and a high level of precision during construction. This precision and attention to detail was very challenging and may preclude its use in the builder's future homes.
- A single HVAC system with a continuously operating, low-speed air handler maintained consistent temperatures throughout the four-level home. Careful system design, installation, and testing was paramount to achieving high performance.
- Total duct leakage doubled after equipment installation.
- Lower-than-expected fresh air intake in the supply-only ventilation system may have been caused by return ducts that were sized to reduce noise according to industry standards. Further design engineering may be required to achieve target ventilation rates.
- Commissioning and testing was valuable for new construction test house performance and is recommended for heating and cooling systems, duct air delivery, ventilation fans, and whole house air leakage in subsequent houses.