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](http://www.buildingamerica.gov)

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

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.