Building America Efficient Solutions for New Homes

Case Study: Quadrant Homes

Kentlake Highlands | Kent, WA

PROJECT INFORMATION

Construction: New home

Type: Single-family

Builder:
Quadrant Homes, Washington State
(866) 784-6637
www.QuadrantHomes.com

Size: 1,500 to 3,500 ft²

Price Range: starting at $248,900

Date Completed: 2010

Climate Zone: Marine, IECC Zone 4

PERFORMANCE DATA

HERS Index: 68

Projected annual energy cost savings: $951

Added first cost of energy-efficiency measures: $2,000

Annual mortgage increase: $159

Annual net cash flow to homeowner: $791

Billing data: Not available

Quadrant Homes, a Weyerhaeuser real estate company and Seattle-area builder, offers buyers of its "custom" production homes over 300 house plans and 10,000 feature options to choose from. With technical assistance from DOE's Building America program in 2007, Quadrant developed an energy-efficient option: Quadrant's Energy Sound™. This package achieves energy savings of 50% over standard practice at the time (i.e., 2006 IECC), as modeled by the Washington State University (WSU) Extension Energy Office (a member of Building America's Building Industry Research Alliance) research team. As the first ENERGY STAR production builder in Washington State, Quadrant already built homes 15% better than code. Also, its pre-sold, custom-built homes adhere to factory-like lean production and quality assurance inspections, resulting in a company infrastructure and culture receptive to significant energy-efficiency improvements.

Quadrant starts with an air-tight enclosure that often tests at under 3 air changes per hour (ACH50 Pa). All walls are custom designed and assembled inside a factory, so wood is dry, measurements and angles are precise, and waste is minimized. After the panels are assembled at the house site, trained vendor partners air seal all penetrations and fill the 2x6 16-inch on-center frames with R-21 fiberglass batts.

The WSU Energy Office determined through computer modeling three big-gain opportunities for Quadrant Homes to achieve even higher energy efficiency. The first involved upgrading the 80% AFUE (annual fuel utilization efficiency) furnace to a 94% AFUE furnace. Second, Quadrant moved the HVAC system into conditioned space.

(Photo top left) When the economic downturn hit in 2008, hundreds of builders were left sitting on thousands of unsold new homes, but not Quadrant. In 1996, Quadrant quit building homes on speculation and moved to a lean-production policy with pre-sales only. Buyers don't wait long for their new home though—just 54 working days from start of framing to the day Quadrant hands them the keys to their finished home. Quadrant involves homebuyers in every step of this finely tuned construction process, from choosing the site, to picking the floor plan (from among 300 options), to selecting the options (from among 10,000 choices). Homebuyers even get to participate in on-site inspections during construction.

Building America® U.S. Department of Energy

KEY ENERGY-EFFICIENCY MEASURES

(based on the Olympic 2011 model with an Energy Sound upgrade)

HVAC:

- 94% AFUE gas furnace, 13 SEER AC, furnace and air handler in conditioned utility closet
- Ducts inside conditioned space within open-web trusses between the 1st and 2nd floors
- Ventilation 100% ASHRAE 62.2; upgraded bathroom exhaust

Envelope:

- 2x6 16-inch on-center framed walls insulated with R-21 batts
- R-49 blown-in cellulose attic insulation
- Vented crawlspace with R-30 batts in the floor joists
- Low-emissivity, vinyl-framed, double-pane U-0.29 windows
- All enclosure penetrations air sealed
- 3.4 ACH@50 infiltration

Lighting, Appliances, and Water Heating:

- 50% hardwired compact fluorescent lighting
- ENERGY STAR® refrigerator, dishwasher, and clothes washer
- 62% efficient gas tank water heater
- Northwest ENERGY STAR and 3-Star Built Green™ certified

For more information, please visit:
www.buildingamerica.gov

Building America recommended that Quadrant put the furnace and ducts in conditioned space to increase energy savings.

The ducts are located within open-web trusses between the first and second floors, and for most homes the air handler and furnace are in an insulated utility closet on the second floor. Third, as a package, Quadrant increased the blown-in cellulose attic insulation from R-39 to R-49, hardwired 50% of the light fixtures to only accept compact fluorescent light bulbs, and provided ENERGY STAR refrigerators, dishwashers, and clothes washers as options.

Lessons Learned

- The WSU Energy Office calculated utility bill savings of $951 per year on a 2,000-square foot Quadrant Energy Sound™ house. After subtracting $159 in increased mortgage costs to cover the energy package, homeowners would still gain $791 in net savings each year.
- Quadrant's existing quality and lean-production improvement processes enable energy innovations to be financially analyzed, tested, and consistently implemented with appropriate training and inspections.
- During the building turndown starting in 2008, Quadrant's business model of pre-selling homes that buyers design prevented the company from getting caught, as many other production builders did, with large amounts of unsold inventory.
- For all homes, Quadrant adheres to sustainable building practices. Carpet is Carpet and Rug Institute (CRI) labeled for adhesives that have the lowest volatile organic compounds (VOCs) in the industry and is installed by tacking instead of glue. Low-toxic interior paints and finishes are used on major surfaces.

"Our buyers are often first-time homebuyers. One of the things we find surprising is how little knowledge there is still out there about energy and energy efficiency and green building in general. So, we actually do a lot of educating in our showrooms about why a product is green or energy efficient."

Quinn Wyatt, Assistant Design Manager at Quadrant Homes

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Energy Efficiency & Renewable Energy

www.buildingamerica.gov

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The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.