



Building America Efficient Solutions for New Homes

Case Study: Final Report – Hood River Passive House

Hood River, Oregon

PROJECT INFORMATION

Construction: New Home

Type: Single-family, custom

Builder:

Root Design Build of Hood River,
Oregon

www.rootdesignbuild.com/

Size: 2,004 ft²

Price Range: \$320,000

Date completed: August 2012

Climate Zone: 5 – Dry

PERFORMANCE DATA

HERS index: 40

Projected annual energy use
reduction of 62% below benchmark
saving: \$943/year

Billing data based on 9 months
shows a 69% reduction in energy
use, resulting in annual savings of
\$1,140

Incremental cost of energy-
efficiency measures: \$50K

Incremental annual mortgage:
\$2,500

Annual cash flow: -\$1,360

Project Description

The Washington State University (WSU) Energy Program – a member of the Building America Partnership for Improved Residential Construction (BA-PIRC) – has worked with builders in the cold and maritime climates of the Pacific Northwest for over 30 years to develop exceptionally efficient residential construction practices.

BA-PIRC and the WSU Energy Program approached this project as an opportunity to:

- Evaluate the Passive House design approach and process outcomes,
- Document home performance, and
- Track costs and determine obstacles to moving the Passive House into a cost-effective production environment.

The Hood River Passive Project, developed by Root Design Build of Hood River, Oregon, incorporates all features of the Passive House Planning Package (PHPP) and meets all of the requirements for certification under the European Passive House standards.

The Passive House design approach has been gaining momentum among residential designers for custom homes. BEoptE+ modeling indicates that these designs may actually exceed the goal of the BA program to reduce home energy use by 30% to 50% (compared to 2009 energy codes for new homes).

The Hood River project was initiated in 2009, but market conditions delayed completion until August 2012.

KEY ENERGY-EFFICIENCY MEASURES

HVAC:

- Ductless mini-split heat pump with electric resistance baseboards as backup
- HSPF/SEER = 11/22
- Ventilation: HRV that meets ASHRAE 62.2 2010
- Shading: movable exterior panels

Envelope:

- Wall R-value = 50.5*
- Slab-on-grade R-value = 43.5*
- Ceiling R-value 76.6*
- Windows U-value = 0.09*
- Doors U-value = 0.13*
- Air sealing, ACH50 = 0.3 (tested)

**Values as derived in the Passive House Planning Package (PHPP)*

Lighting, Appliances, and Water Heating:

- DHW: solar thermal with electric resistance backup
- 100% CFL and LED

For more Information, please visit:

www.buildings.energy.gov



The Shift House, built by Root Design Build in Hood River, Oregon, meets all of the requirements for certification under European Passive House standards.

Lessons Learned

- Incremental costs of building enclosure enhancements (air sealing, insulation and fenestration) were \$50,687.
- Many of the measures implemented in this project did not meet the BA standard for cost neutrality.
- The ductless mini-split heat pump, lighting and advanced air leakage control were the most cost-effective measures.
- The single point source space conditioning from the mini-split heat pump did require some electrical zonal resistance heat to maintain comfort in extreme conditions (6.5% of heat load).
- Overheating has not been a problem with adequate shading.
- Comparisons between Passive House design development using PHPP and modeling with BEoptE+ and other simulation programs suggest sizable discrepancies, possibly because PHPP uses different conventions than BEoptE+ to determine conditioned floor area and house volume.
- Monitored energy use was 27.6 % less than Modeled in BEoptE+
- Monitoring to date indicates that space conditioning represents less than 25% of total energy use.