

# Clifton View Homes

Whitewebs Lane House  
Coupeville, WA



## BUILDER PROFILE

Clifton View Homes, Coupeville, WA  
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## FEATURED HOME/DEVELOPMENT:

### Project Data:

- Name: Whitewebs Lane House
- Location: Coupeville, WA
- Layout: 3 bdrm, 2 bath, 2 fl, 1,852 ft<sup>2</sup>
- Climate Zone: IECC 4C, marine
- Completion: October 2015
- Category: affordable

### Modeled Performance Data:

- HERS Index: without PV 50
- Projected Annual Energy Costs: without PV \$881
- Projected Annual Energy Cost Savings (vs home built to 2012 WSEC): without PV \$881
- Projected Annual Energy Savings: without PV 10,078 kWh
- Added Construction Cost: without PV \$4,000

When David Mead returned to Washington State after two years working as an archaeologist in the Amazon jungle, he knew he wanted to build a home for his young and growing family that provided all the comforts he had done without, but he needed to do it on a budget. An internet search led him to Ted Clifton, founder of Zero Energy Home Plans and a builder whose Clifton View Homes office happened to be just a few miles away from Mead's home site on Whidbey Island, near Seattle.

Clifton completed the Mead home in October 2015 on time and under budget at just \$115 per square foot for the 1,852 ft<sup>2</sup> structure, meeting Mead's request for an affordable home. The home is also highly energy efficient, meeting all of the requirements of the U.S. Department of Energy Zero Energy Ready Home program.

Clifton builds two to four homes a year certified to the DOE Zero Energy Ready Home program, although he now designs and consults on many additional homes each year through his Zero Energy Home Plans website. Seven of his homes have been Housing Innovation Award winners, including the Mead house on Whitewebs Lane on Whidbey Island and another 2016 home built by PepperTree Homes in Waitsfield, Vermont, for which Clifton designed and consulted.

The DOE Zero Energy Ready Home program requires homes to meet all of the requirements of ENERGY STAR Certified Homes Version 3.0 and the U.S. Environmental Protection Agency's Indoor airPLUS, as well as the hot water distribution requirements of the EPA's WaterSense program and the insulation requirements of the 2012 International Energy Conservation Code. In addition, homes are required to have solar electric panels installed or have the conduit and electrical panel space in place for future photovoltaic panel installation.



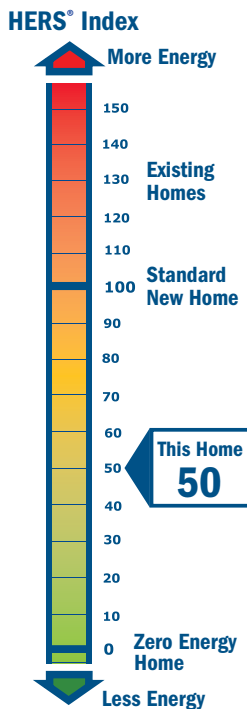
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program (formerly known as Challenge Home). Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0 for an energy-efficient home built on a solid foundation of building science research. Advanced technologies are designed in to give you superior construction, durability, and comfort; healthy indoor air; high-performance HVAC, lighting, and appliances; and solar-ready components for low or no utility bills in a quality home that will last for generations to come.

Clifton View Homes built this 1,852-ft<sup>2</sup> home in Coupeville, Washington, to the performance criteria of the DOE Zero Energy Ready Home (ZERH) program. The home is equipped with a high-efficiency ENERGY STAR-rated refrigerator, dishwasher, clothes washer, and dryer for energy and water savings.



### What makes a home a DOE ZERO ENERGY READY HOME?

- 1 **BASELINE**  
ENERGY STAR Certified Homes Version 3.0
- 2 **ENVELOPE**  
meets or exceeds 2012 IECC levels
- 3 **DUCT SYSTEM**  
located within the home's thermal boundary
- 4 **WATER EFFICIENCY**  
meets or exceeds the EPA WaterSense Section 3.3 specs
- 5 **LIGHTING AND APPLIANCES**  
ENERGY STAR qualified
- 6 **INDOOR AIR QUALITY**  
meets or exceeds the EPA Indoor airPLUS Verification Checklist
- 7 **RENEWABLE READY**  
meets EPA Renewable Energy-Ready Home.



The Whitewebs Lane home is Clifton’s first Housing Innovation Award winner in the “affordable” category. Regardless of the home’s level of luxury, however, Clifton follows his same 12 essential steps to net-zero-energy home design. He begins with the orientation of the home, positioning it on the lot so the roof has an east-west oriented ridge line, with uncluttered south-facing roof space optimally angled for solar gain. Clifton keeps the design simple to minimize exterior surface area and keep materials costs down. Most of the windows are located on the south side of the house for beneficial winter solar heat gain with overhangs to limit summer heat gain. Clifton maximizes thermal mass in the home with exposed concrete floors. This thermal mass absorbs heat during the day and releases it slowly into the home at night for passive heating and cooling. A tight envelope prevents air leakage; Clifton uses structural insulated panels (SIPs) for the roof and walls to provide an air-tight shell. The SIPs, combined with high-efficiency windows and an insulated floor slab, provide consistently high levels of insulation around the whole structure. Balanced ventilation is provided by an exhaust fan that pulls stale air out of the home while another fan located on a cool side of the house pulls air into the home through a HEPA filter. This balanced ventilation provides fresh air and pulls excess heat out of the home on summer nights. High-efficiency heating and cooling, water heating systems, appliances, and lighting complete energy savings. With all of these energy saving measures in place, an average sized roof will have more than enough space to hold all of the solar photovoltaic panels needed to meet the home’s electric power usage over the course of the year. Clifton usually designs the solar system for what he calls a “positive energy” home, one with enough PV panels to power the house plus an electric car or two.

The Whitewebs Lane house is a simple, box-shaped, 1,852-ft<sup>2</sup> two-story home with three bedrooms, two bathrooms, an asymmetrical roof to provide a larger south-facing roof area, and a cathedral-ceilinged great room.

“The house was designed to offer the maximum interior space at the lowest possible cost, with the highest possible energy efficiency,” said Clifton. By using a simple square shape and some design tricks, exterior surface area was minimized; for example the north wall is only 5 feet tall at the back of the upstairs bedroom closets. The great room area, which faces south, is open to the second-story ceiling, allowing daylight into all areas of the home and allowing a natural stack effect to occur, which creates a space with self-regulating temperatures, according to Clifton. Sunlight warms the main floor’s stained concrete flooring. This heat



The home's walls are constructed of 6.5-inch structural insulated panels (SIPs) with an insulation value of R-25. SIPs sandwich a block of foam insulation between two panels of oriented strand board. Taping the seams where SIPs join helps block air leaks and provides draft protection.

warms the air, which rises up to the top of the ceiling at the center of the house. The air then cools as it comes into contact with the roof on a cold winter day and gradually slides down past the cooler windows on its way back to the floor, where it is warmed again. During the warmer summer months, the process reverses itself, with the warmer air rising up the south wall past the windows, drawing the cooler air along the thermal-mass floor up into the space.

The concrete slab-on-grade foundation was poured inside the stem walls. Four inches (R-20) of XPS rigid foam board provides an insulating layer under the entire slab. Two inches of XPS insulation covers the inside of the stem walls down to the footing, wrapping the sides of the slab in R-10 of rigid foam. Under the slab and foam, a two-inch layer of pea gravel is topped by 6-mil poly sheeting to provide a capillary break.

The above-grade walls were constructed of 6.5-inch-thick SIPs with an R-25 insulation value. Over the SIP wall panels, Clifton installed a corrugated house wrap that provided a narrow ventilation gap under the fiber cement siding. Clifton used 10.25-inch SIPs for the roof. These provided R-40 worth of insulation for the roof assembly, while also providing a sturdy platform for photovoltaic panels. Careful sealing of the joints between the SIP panels allowed Clifton to achieve an air tightness of 0.9 air changes per hour at 50 Pascals pressure difference (well below the 3 ACH50 required by code). Beyond the efficiency features, the SIPs construction is fully engineered to withstand severe weather events and up to an 8.0 earthquake.

“Clifton View Homes has been building with SIPs panels for over 23 years and has become an industry leader in our market. Our blower-door tests are usually well below 1.0 ACH 50, without having to go back and tweak anything. Getting it right the first time is a hallmark of our success,” said Clifton.

The home is equipped with a highly efficient ductless heat pump that has a heating season performance factor (HSPF) of 10 and a seasonal energy efficiency ratio (SEER) of 21 for cooling. (The federal minimum standards for heating and cooling equipment are HSPF 7.7 and SEER 13.) However, Clifton notes that the air conditioning feature is unlikely to be needed due to the home's passive heating and cooling design. Ventilation to meet the code-required home ventilation standard is provided by a continuously operating exhaust fan in the bathroom. The range fan also operates to provide spot and whole-house ventilation. The home is also equipped with a ducted fresh air intake that pulls in outdoor air

## HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.0

EPA Indoor airPLUS

“We have been building zero-energy and zero-energy ready homes for so long, it is just normal for us. Making a house power itself has not been an issue with us for years; it is how many thousands of miles we can power the owner's electric car that interests us today.”

—Ted Clifton, owner, Clifton View Homes



Every DOE Zero Energy Ready Home combines a building science baseline specified by ENERGY STAR Certified Homes with advanced technologies and practices from DOE's Building America research program.





The home is equipped with a high-efficiency ductless heat pump for heating and cooling, but with the home's passive solar design, heating and cooling bills should average \$75 or less per month.

through a HEPA filter. The dampered air intake can be kept open to passively allow air into the home. It also has a 204-cubic-foot-per-minute fan that is electronically controlled to pull air into the home whenever the range hood fan is operating, to keep air pressures balanced in the ultra-tight home while providing fresh air. This balanced ventilation system can also be operated during hot summer weather to pull cooler night-time air into the house and exhaust hot air to prevent overheating from the thermal mass.

Water heating is provided by an efficient electric resistance domestic hot water heater located inside the conditioned space of the home. The windows are triple-pane with low-emissivity coatings and an insulation U-factor of 0.20. All of the home's lighting is provided by high-efficiency LEDs or CFLs. All appliances are high efficiency and all faucets and plumbing fixtures are efficient low-flow fixtures.

The home has been designed with enough south-facing clear roof area for 10.26 kW capacity of solar photovoltaic panels – enough to power the house and at least one electric car for over 10,000 miles per year. A circuit is provided in the main electrical panel for a future car-charging station, which would be back to back with the main panel so no further rough-in is required. The owners' very limited budget kept them from spending more money on tree clearing on the heavily wooded lot, but over the next few years, they plan to clear enough trees for favorable roof exposure to install solar panels. All trees cleared so far have been stacked on-site for use in the wood stove, which will augment heat for the next several years. Even without PV, the home's monthly utility bills were calculated to average \$75 per month and have actually been closer to \$50 per month through the first year of occupancy.

Clifton conducts extensive energy analysis on his homes. This home achieved a Home Energy Rating System score of 50 without solar, well below the 80 to 100 HERS score typical of new homes. The score was confirmed by a certified home energy rater, as required by the DOE ZERH program.

Clifton's company created spreadsheets that analyze virtually every measure they implement in a home, enabling them to compare one strategy against another, so they can give customers the best advice on what is and is not cost-effective. A few years ago Clifton added a "case study" tab to the energy calculation spreadsheet, allowing them to calculate the estimated energy savings over time for each strategy under consideration to see which approaches offer the most solid returns over time.

"The owner can review all the options, and choose them in order of cost-effectiveness until they have exhausted their available investment monies," said Clifton. "Our returns are higher, with less risk, than is usually achieved through the stock market, or by any other means. We should be licensed as investment counselors!"

## KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** R-25: 6.5" SIP walls, draining house wrap, fiber cement plank siding.
- **Roof:** R-40: 10.25" SIPs, 30# felt, comp. shingles, R-40 assembly.
- **Attic:** Cathedral ceilings, small mechanical attic above upstairs bath in conditioned space.
- **Foundation:** Slab-on-grade, 4" R-20 rigid foam under slab, 2" R-10 rigid foam on inside of stem wall down to the footing, over 2" pea gravel and 6-mil poly vapor barrier.
- **Windows:** Triple-pane, low-e, U=0.20.
- **Air Sealing:** 0.9 ACH 50.
- **Ventilation:** Continuous bath exhaust, fresh air intake with HEPA filter, timered range fan.
- **HVAC:** Ductless heat pump, 10.0 HSPF, 21 SEER.
- **Hot Water:** 94% efficient electric water heater.
- **Lighting:** 100% LED or CFL.
- **Appliances:** ENERGY STAR refrigerator, dishwasher, clothes washer, clothes dryer.
- **Solar:** Pre-wired for PV.
- **Water Conservation:** All low-flow faucets & fixtures.
- **Energy Management System:** "None required, this house manages itself!"
- **Other Measures:** Designed and wired for 10.26-kW PV and electric car charging station. SIPs will withstand an 8.0 earthquake.

*Photos courtesy of Clifton View homes*