

FORT LEWIS ARMY BASE

Washington State

Energy-Efficient Housing for Our Nation's Military

More than 850 new homes are rising from the misty landscape of the Ft. Lewis Army Base in western Washington State, and all of them are energy efficient, thanks in part to support from the US Department of Energy's Building America program.

High-efficiency 90% AFUE furnaces, high-performance windows, extra attention to caulking and sealing, and ENERGY STAR® appliances and lighting will help the homes achieve energy savings of at least 20% to 30% over the Pacific Northwest's already strong building energy codes, according to Michael Lubliner of the Washington State University Energy Office, part of Building America's Industrialized Housing Partnership.



Figure 1. Equity Residential and Champion Homes have started construction on 864 energy efficient homes on the Ft. Lewis Army Base in Washington State.

Military Housing Privatization a Boon to Energy Efficiency

The 864 homes are being built by Equity Residential as part of a 50-year housing privatization contract Equity has entered into with the US Army to assume ownership of all 4,000 existing houses and future homes including the 458 now under construction and another 404 slated for construction starting in 2007. "The Army strongly encourages energy-efficient construction as part of its push for sustainability," said Boyd Lucas, Equity's executive development manager for the project.

"Building America's building science practices help improve our project's energy efficiency, indoor environment, and durability. This is very important to us since we own the houses. Equity will be maintaining and operating these houses in partnership with the US Military over the next 50 years. But we will be paying the utility bills, so energy efficiency is definitely to our benefit" said Lucas.



Figure 2. The Ft. Lewis project is the first military housing project to use modular construction. With modular construction energy efficiency can be implemented cost effectively on a large scale.

"The military has a tremendous program nationwide to improve sustainability. Energy efficiency is not required but it is always encouraged."

Boyd Lucas,
Equity Residential, Executive
Development Manager for the
Ft. Lewis project

INTRODUCTION

Taking action in your community



HOMEOWNERS

Shopping for value, comfort, and quality



MANAGERS

Putting building science to work for your bottom line



MARKETERS

Energy efficiency delivers the value that customers demand



SITE PLANNERS & DEVELOPERS

Properly situated houses pay big dividends



DESIGNERS

Well-crafted designs capture benefits for builders, buyers, and business



SITE SUPERVISORS

Tools to help with project management



TRADES

Professional tips for fast and easy installation

CASE STUDIES

Bringing it all together



CASE STUDY: FORT LEWIS ARMY BASE

WSU staff conduct blower door and duct blaster testing on the homes, test insulation density, and verify installation of ENERGY STAR appliances and lighting on site to certify that the homes meet Northwest ENERGY STAR requirements, the energy efficiency level the project chose to meet. WSU also trained the HVAC subcontractor in proper installation, sealing, and testing of the ducts and helped solicit rebates with Puget Sound Energy and locate ENERGY STAR appliance suppliers.

Initial testing and duct leakage estimates by the WSU Energy Office using Energy Gauge software showed that the energy-efficient homes would use 377 therms/year for space heat, compared to similar standard construction homes, which were estimated to use 442 therms/year for space heat. So the improved sealing of ducts could net savings of 65 therms per year. “And in future construction, if the ducts were put in conditioned space, rather than in the crawl space or attic,” said Lubliner, “we estimate savings could approach 100 therms per year.”

WSU Energy is working with the Oregon Department of Energy who provided initial technical assistance to Champion and Equity and assisted with heating system design on the project. ODOE staff also inspect the components of each home at the factory to make sure that all of the energy efficiency specifications are implemented, according to ODOE energy analyst Tom Hewes. WSU and ODOE are working with Champion and Equity to evaluate further energy improvements for future project phases, with US DOE Building America support.

Fort Lewis was one of the first four bases in the country to privatize its housing in response to the Military Housing Privatization Initiative established by Congress in 1996. This is the first military base project for Equity Residential, which is one of the country’s largest real estate investment trusts, with more than 225,000 units nationwide according to Lucas.



Figure 3. Researchers from Washington State University are evaluating how the bumps and vibrations of highway travel affects the settling of attic insulation installed in the factory.

THE ENERGY PACKAGE IS:

- Insulation:
 - R21 batt insulation in walls
 - R33 batt insulation in floors
 - R38 loose fill cellulose in ceilings
- Windows: double pane- low-emissivity, vinyl framed windows with a U value of 0.35
- Doors: metal, foam core with thermal break and U value of 0.2 doors.
- HVAC: 90% AFUE condensing natural gas furnace located in mechanical room
- Ducts: located in attic and crawlspace, insulated to R8
 - Ducts tested at below target, with total leakage of less than 6% CFM/ft² @50 PA (field tests indicate tighter).
 - Blower Door testing: less than 7.0 air changes per hour at 50PA (field tests indicated tighter)
- Domestic Hot Water: Powered vent natural gas with an efficiency rating of 0.61
- Crawlspace Ventilation: Humidity controlled, fan in vented crawlspace
- Whole-house Ventilation: Quiet exhaust fan in central hallway.
- ENERGY STAR compact fluorescent lamps (CFLs) in 50% of fixtures
- ENERGY STAR Dishwasher

BUILDER PROFILE

Lewis Communities

Where:

Fort Lewis Army Base,
Washington State
(south of Seattle, between Olympia
and Tacoma)

Owner:

Fort Lewis Communities LLC

Developer:

Equity and Lincoln Properties

Modular Builder:

Champion Homes of Oregon

Number of Homes:

864

Project Start:

January 2005

Project Complete:

Spring 2008

Home Models:

“The Lincoln”

3 BR, 2-1/2 bath, triplex,
2 story, 1776 SF/unit,

“The Madison”

4 bedroom, 2-1/2 bath, duplex,
two story 1016 SF

“The Monroe”

3 bedroom, 2 bath, “adaptable”
1 story 1635 SF/unit.

“The Roosevelt”

4 bedroom 2 bath “adaptable”
1 story 1784 SF/unit.

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Steve Matus,

Champion Silverton’s

Quality Control Manager

CASE STUDY: FORT LEWIS ARMY BASE

Energy-Efficient Modular Construction a First for Base Housing

Fort Lewis is probably not the first base to invest in energy-efficient housing under the Defense Department's recent push toward sustainability. But the project is the first to use ENERGY STAR modular construction for energy efficient housing, according to Lucas. House components are being built by Champion Homes at their Silverton, Oregon plant.

Lucas said Equity chose modular construction for several reasons. With so many units going up at one time, wall and roof components can be put together in the factory with significant economies of scale, the preassembled components make for faster set up time on site, and assembling components inside the factory helps them stay drier for less likelihood of damage and mold in Washington state's moist marine climate.

Modular construction was also a first for Champion's Silverton plant, although other Champion plants do a considerable amount of modular construction. The Silverton plant builds primarily manufactured homes and according to Steve Matus, Champion Silverton's quality control manager, Champion has been offering energy-efficient manufactured homes for several years. "For us it's no more difficult to build energy efficiently than our standard construction process. There was a learning curve, but now it's just part of our normal production process."

"There is no question energy-efficient construction is catching on. Maybe 5 or 6 years ago it made up 1% to 2% of our total sales, now its one-fourth to one-third of sales, and some months it's up to half," said Matus.



Figure 4. Modules are numbered for placement. Housewrap and window flashing has been carefully applied at the factory to exterior walls. Housewrap flaps are provided for overlap with surrounding modules. The housewrap is overlapped shingle-style to create a drainage plain beneath exterior cladding. The foundation wall for the crawlspace can be seen at the base of the walls.

The Bottom Line

Equity's Lucas said the whole experience of building energy-efficient homes has been a positive one. "We are always looking to make a better product, in terms of energy efficiency, architecture, design, and cost or value engineering. We know this was the right move for us on this project."

"There are 4000 units on post, we own them, we pay the utility bill. So energy efficiency is to our benefit."

Boyd Lucas,
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