U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

DOE ZERO ENERGY READY HOME™

U.S. DOE ZERO ENERGY READY HOME 2015 WINNER Housing Innovation Awards

# Dwell Development

## Reclaimed Modern
## Seattle, WA


## BUILDER PROFILE

Dwell Development LLC, Seattle, WA
Anthony Maschmedt, Anthony@dwell-nw.com
206-683-7595, www.dwelldevelopment.com
Rater: Evergreen Certified
Tadashi Shiga, tadashi@evergreencertified.com

### FEATURED HOME/DEVELOPMENT:

**Project Data:**

- Name: Reclaimed Modern
- Location: Seattle, WA
- Layout: 4 bedrooms, 3.5 baths, 3 floors
- Conditioned Space: 3,140 ft$^2$
- Climate Zone: IECC 4C, marine
- Completion: November 2014
- Category: Production

**Modeled Performance Data:**

- HERS Index: without PV 55, with PV 25
- Projected Annual Utility Costs: without PV $1,097, with PV $685
- Projected Annual Energy Cost Savings (compared to a home built to the 2012 IECC): without PV $523, with PV $936
- Builder's Added Cost Over 2012 IECC: NA
- Annual Energy Savings: without PV 54.9 MMBtu, with PV 82.7 MMBtu

Builder Anthony Maschmedt is taking something old to make something new in Seattle. His award winning Reclaimed Modern home is a perfect marriage of old and new, blending recycled and reclaimed materials with a modern design and the leading edge high-performance features of the U.S. Department of Energy's Zero Energy Ready Home program for a home that is both visually interesting and highly efficient.

"We tell home buyers all about the energy efficiency when we walk them through the home. It's true that more people are coming to us because of the efficiency. Buyers are smart, they do their homework, they want efficiency and health," said Maschmedt. But he acknowledges that many people who buy his homes, which he refers to as custom spec because they are often purchased after construction has started, are buying because "they like the cool finishes, the floor plan, and the interesting look."

The Reclaimed Modern home certainly has an interesting look from the curb. The exterior cladding includes corrugated metal roofing from an old barn in central Oregon. Reclaimed barn wood was used for fencing.

On the interiors, they included woods repurposed from fallen trees that were cut at a mill in Montana. The counter tops are 85% post-consumer recycled glass and aggregate concrete made in a local factory that was housed in the old Rainier brewery building. Cabinets are from a local manufacturer and have no added formaldehyde or VOCs. "My wife Abbey has really made the push toward reclaimed materials inside and out. It provides a unique aesthetic, mixing the old and the new in the modern design, that brings up some fun conversations with prospective buyers," said Maschmedt.

ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

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.

Dwell Development built this modern 3-story home in Seattle to the performance criteria of the U.S. Department of Energy's Zero Energy Ready Home program. Solar panels meet much of the home's electric needs. An exterior cladding of fiber cement siding and reclaimed barn metal sheds water from the sides of the high-performance home.

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

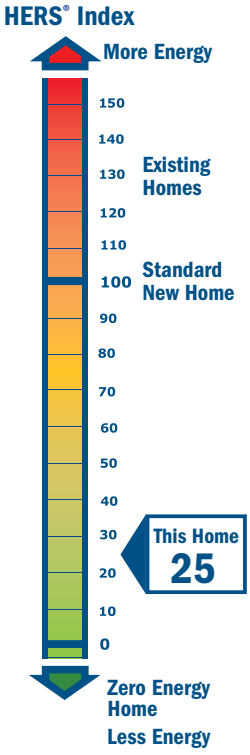
1 **BASELINE**
ENERGY STAR Certified Homes Version 3.0

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.

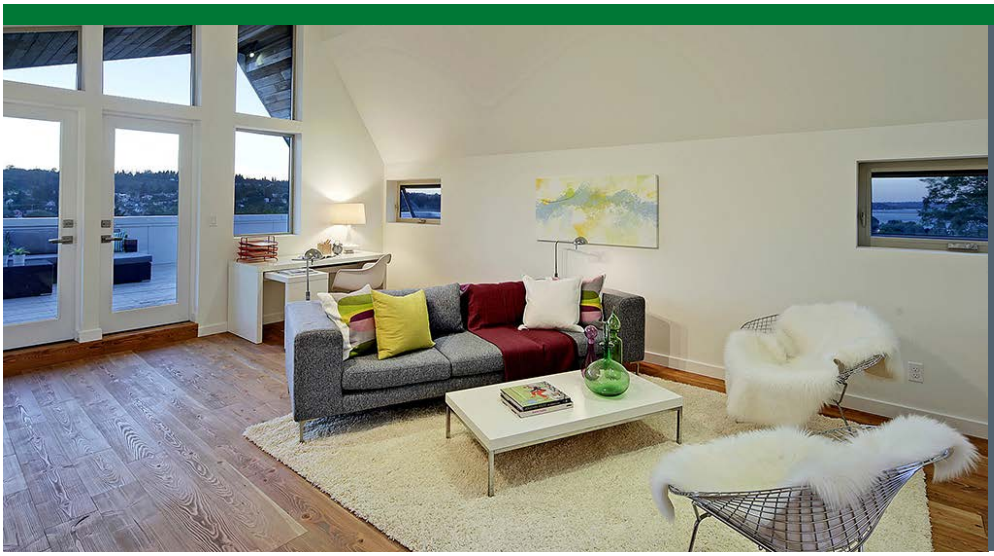
Even the lot is recycled. Dwell purchased an oversized lot with one home already on it in South Seattle. They remodeled the existing home, then designed the new home to fit on the shared space while maintaining some privacy for both homes despite the extensive use of outdoor areas in the new home.

All of Dwell's homes to date have been in Seattle and King County but Maschmedt has recently started working in Kirkland and Mercer Island because he notes there is not much high-performance construction in those communities although homes are at a higher price point there. Maschmedt acknowledges, "We're in one of the best markets in the country for green development." He added that "all of the neighborhoods we build in are high-density urban neighborhoods with nearby grocery stores, post offices, and parks, where you can walk or take mass transit. You don't need to drive."

Maschmedt started Dwell Development in 2005 building single-family detached homes, duplexes, triplexes, and town houses. He's gotten progressively more energy efficient and built his first DOE-labeled home in 2013. He is on the Built Green committee for the Master Builders Association of Snohomish and King Counties (the largest home builders' association in the United States in terms of membership) and now builds to their Emerald Star level which, he said, is four times harder than the Built Green 5-star level. Maschmedt has taken one home through Passive House certification and now builds to the Passive House level (except for the windows) although he doesn't certify to it because of the cost and uncertainty. He has certified to LEED in the past as well but did not on this house. "Now we are really geared to the DOE Zero Energy Ready Home certification program. The program helps support what we are doing," said Maschmedt.

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 a solar electric system installed or have the conduit and electrical panel space in place for it.

Maschmedt has committed to building to the DOE Zero Energy Ready Home program criteria and is now starting to install solar on more of his homes. He



Reclaimed wood floors add visual warmth to interiors that are also wrapped in 2x8 cellulose-filled walls. The home's multiple decks and patios increase living space while bringing in natural daylight through triple-pane glass windows and providing opportunities for cross ventilation. A heat recovery ventilator ensures energy-efficient round-the-clock ventilation as well.

noted he will have solar photovoltaics on three of the 25 homes he builds in 2015 and all will be solar ready to take advantage of Washington state's generous solar incentives. "It's a tiered incentive, so after subtracting the amount of power used by the house, anything that goes back to the grid is 54 cents per kWh if the PV panels and inverters are Washington-made. Our home owners are getting back about $4,500 per year. These systems have a pay back of 4 or 5 years. The program ends in 2020," said Maschmedt.

With solar electric panels on the roof and the highly efficient building envelope and equipment required by the DOE program, Maschmedt's 2015 home achieved a HERS score of 25 and is projected to have utility bills of just $685 per year.

The home started with slab-on-grade construction with the slab wrapped in R-20 of XPS rigid foam insulation both under the slab and at the slab edges. The home is framed with 2x8 24-inch on-center walls, allowing plenty of room for the R-27 worth of dense-packed cellulose. Maschmedt employs an airtight drywall approach, caulking every stud before putting on drywall to create a tight seal with the drywall. He also uses sill seal where the top plates meet the drywall. The walls are sheathed with OSB then covered with a fluid-applied asphalt-based product that takes the place of house wrap to provide a seamless weather-resistant barrier, adding to the home's airtightness. They apply it with a roller to the walls and to the inside of window and door openings as pan flashing. With this coating applied, "we can keep going even in the rain," which extends the construction season in frequently damp Seattle. Over the coating is installed a rain screen product then the siding of reclaimed metal and fiber cement panels.

The vented attic is insulated with R-70 to R-90 blown cellulose, which is dense packed in the cathedral ceilings. The plywood roof deck is topped with a metal roofing or a thermoplastic polyolefin (TPO) single-ply roofing membrane.

Windows are triple paned, with an argon gas fill between the panes adding to the insulation value. The windows have PVC frames and low-emissivity coatings to slow heat losses. They have an insulating U-factor of 0.22.

A heat recovery ventilator runs continuously, supplying fresh air to all living spaces through individual ducts while pulling exhaust air from the bathrooms and laundry. The system has booster switches for the bathrooms so no separate exhaust fans are needed.

## HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program, 100% commitment

ENERGY STAR Certified Homes Version 3.0

EPA Indoor airPLUS

EPA WaterSense

Built Green Washington,® five star

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.

All of the home's plumbing fixtures are EPA WaterSense-labeled.

The home's heating system includes in-floor radiant heat with hot water provided by an on-demand gas-fired boiler. No air conditioner was installed because it will not likely be needed in the highly insulated home, which has windows and doors on all three levels for cross ventilation. However, conduit was roughed in for refrigerant should the home owners wish to install it in the future.

A tankless on-demand water heater with an energy efficiency of 0.93 provides domestic hot water. An on-demand recirculation pump speeds hot water to faucets to reduce usage. Outside, pervious driveways and walkways allow rainwater to recharge the soil while two bio planters catch rainwater run off.

To maintain quality, Maschmedt held weekly construction meetings and frequently brought in his energy rater and consultant, Tadashi Shiga. He also selected an architect who specializes in 5-star Built Green certified homes and consulted with him throughout the project. Maschmedt followed waste management and safety protocols and recycled 100% of the construction debris and leftover building materials.

The home is equipped with an energy management system that was actually developed by the home owner who bought Maschmedt's 2013 DOE Zero Energy Ready Housing Innovation Award winning home. The software runs on an iPad and tracks the usage of nearly every electric use in the house. It also tracks temperatures and HVAC operation.

The home won Seattle Designs Awards' Best in Design and Best in Green Design for 2015. The home was featured in several local media articles and was the site of four public open houses and two realtor open houses. Dwell hired a professional photographer for ground and aerial shots. They also organized a "Farm-to-Table" themed party for prospective buyers. The house sold in 14 days and according to Maschmedt "any additional cost per square foot over to-code construction was made up by the increased sale value of the home so the profit margins stayed consistent with a code-built home, if not higher."

The home owners are very happy with their new home. "We are really proud of all the environmental considerations taken into account in its construction, from the use of reclaimed materials to the efficiency considerations with the extra insulation, triple-pane windows, and heat recovery ventilation system. We expect to have almost no net electricity usage for the year due to the solar panels on the roof but even in the darker months, when we are hardly generating any solar, our electricity bill is not much more than in our old house, built in 2008 and about 40% smaller, said the home owners."

## KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** 2x8 stud walls; dense-pack cellulose (R-27); OSB sheathing; smart house wrap; partial rain screen; reclaimed metal and fiber cement panel siding.
- **Roof:** Metal roofing; thermoplastic polyolefin membrane.
- **Attic:** R-70-90.
- **Foundation:** Slab on grade; concrete stem walls; XPS under slab (R-20).
- **Windows:** Triple-pane; PVC framed; argon-filled; low-e; U=0.22.
- **Air Sealing:** 2.0 ACH 50.
- **Ventilation:** Continuously running HRV.
- **HVAC:** Tankless on-demand gas-fired boiler (EE 0.93); in-floor radiant heat.
- **Hot Water:** Tankless on-demand gas-fired boiler.
- **Lighting:** 20% LED, 80% CFL; exterior motion sensors.
- **Appliances:** ENERGY STAR-rated refrigerator, freezer, clothes washer, dishwasher, and ceiling fans.
- **Solar:** 7.39 kW
- **Water Conservation:** All EPA WaterSense-rated fixtures; on-demand recirculation pump; bio-retention planters.
- **Other:** Energy management system; repurposed materials; detached garage; no-VOCs.

*Photos courtesy of Dwell Development*



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