

zHome

Issaquah, Washington

Partners:

- Project Manager: City of Issaquah
- Built Green of King & Snohomish Counties
- King County GreenTools
- Puget Sound Energy
- Washington State University (Energy Extension Program)

Resources

- zHome: www.z-home.org
- City of Issaquah www.ci.issaquah.wa.us
- Built Green: www.builtgreen.net
- GreenTools: www.greentools.us
- Puget Sound Energy pse.com/Pages/default.aspx
- WSU Energy Extension: www.energy.wsu.edu

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King County

Department of
Natural Resources and Parks
Solid Waste Division

zHome Reaches the Stars: a Built Green Emerald-Star case study

A Deep Green Vision

The zHome partnership team formed with a shared vision – to create an iconic, deep green, high performance development in the NW. The goal was to demonstrate not just a single deep green home, but a replicable model for future market rate, production homes and developments. As production homes represent the majority of the nation's housing starts, the impact potential of construction using the methods implemented at zHome is far beyond the occasional green demonstration project.

The partner team was led by the City of Issaquah and included a group of building professionals, government agencies and academia who acted as a technical advisory committee providing design, modeling and research assistance throughout the project. Their collaborative efforts delivered record results - zHome is the first net-zero, carbon neutral market rate housing development in the United States.



View of zHome complex.

About the Project

Project Background

zHome is a 10-unit townhome development in the center of Issaquah Highlands. The nearly half-acre site is part of a larger mixed-use area, adjacent to the neighborhood center. The one-, two- and three-bedroom units are clustered around a central courtyard, while common-area garages are accessed from a *woonerf* (pedestrian-oriented shared alley) along the rear of the site. A photovoltaic array covers almost every available roof surface, including the entry portal. Units are designed with space efficient layouts that are below local standards for unit sizes, but a loft aesthetic provides a spacious feel. Common, shared elements foster community, including the landscaped courtyard, a community gardening shed with a garden roof, and terraced rain gardens along the main street facade.

An 'Emerald-Star' Pilot

The project team established aggressive benchmarks focused on net zero energy, water, materials, site use, unit size limitations and target sales price goals. The benchmarks used at zHome created the basis for new Built Green "Emerald-Star" rating level – for net zero and holistic approaches. The Emerald-Star rating level exceeds the 5 Star level and LEED for Homes Platinum. zHome earned the highest Built Green rating for any multi-family project (850 points) and is the country's first production net-zero energy townhome project.

Collaboration Required

Project delivery was via a public-private collaboration that implemented an integrated design process. Systems-level thinking was critical

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Quote

"No one had ever gone so aggressive in all areas on a US residential project. What we learned here, we'll use and keep going forward. . . Ichijo is already building more, similar homes in Issaquah that should be net zero or close. Our goal is that all homes will have solar PV, with payback in around five years."

— Nick Neid, Ichijo USA

to the project's success. Details mattered – all the way down to materials choices. For example, with advanced framing the team needed to increase insulation at interior junctions between exterior SIPS walls and interior advanced framing walls. With the knowledge that insulation can be one of the most toxic products installed in a home, the team used a systems-level approach to review potential impacts across multiple categories such as energy, indoor air quality, cost, end of life disposal, etc. Ultimately, the team went with rock wool insulation, rather than fiberglass batts, to balance IAQ and energy impacts with end-of-life recyclability.

As a result of this attention to detail, zHome offers a glimpse of the future in energy, water, waste, materials, landscaping and density approaches that allow for growth, diversity and high-performance sustainable design – while using a practical combination of replicable best building practices and cutting edge technologies.

Site Design

zHome is the first Salmon-Safe certified residential project in Washington – with a site design that mimics the ecological function of the site's forest floor prior to development. With a comprehensive low-impact development (LID) approach, the site design creates a lovely, lawn-free, bird-friendly landscape amenity that is also a rainwater workhorse, reducing site run-off by 60 percent. Underground cisterns capture water for interior uses, then a series of rain gardens, featuring native Mahonia, sword fern, vine maple, dogwood and bunch grasses, to absorb overflows. Pervious paved sidewalks and drive areas slow and filter runoff, easing stress on local waterways. Parking

stalls on-site are sized for micro-cars (typically seating only two people), reducing the overall paved area. Even the little community shed has a part to play, with a vegetated roof. There's a lot of LID in a tight site; demonstrating that low impact development for more urban conditions is possible.

Water Smart

An excellent example of using easy-to-find, off-the-shelf fixtures, the water reduction approach combines efficient design with rainwater harvesting. Water smart features include drought-tolerant landscaping, dual flush toilets, high efficiency clothes washers and dishwashers, and low flow faucet aerators and showerheads. In addition to that, the homes use the wet Pacific Northwest climate as resource. Rainwater catchment tanks from 1,000-1,700 gallons per unit, capture and store enough water from the roof to flush the toilets and wash clothes year-round! Overall the high efficiency homes use 60 percent less water than comparable homes which helped zHome become the first U.S. Environmental Protection Agency WaterSense certified residential project in Washington. These strategies also supported the Salmon Safe certification requirements for water consumption reduction.

Energy Self Sufficiency

Zero energy multi-family? Yes! First, slash energy use by two thirds with a practical combination of current best building practices and cutting edge technologies. Next, achieve net zero energy use and net zero CO₂ emissions over the course of a year through the use of Solar panels that generate and offset the remaining energy needs. . This is the toughest Emerald-Star benchmark – even determining the analysis process was a challenge.



Photos counter clockwise from left: Rain water site plan, rain water garden, and photovoltaic array on roof surface.



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Development/Design Team:

- Builder: Howland-Ichijo USA
- Land: Port Blakely Communities
- Architect: Vandervort Architects
- Energy Engineer: Stantec
- Structural Engineer: Harriot Smith Valentine
- LID: 2020 Engineering
- Civil: Core Design inc.
- Landscape Architect: Dar Webb Landscape Architects
- Interior Design: LH Design

Energy features include:

- Extensive solar PV system
- Energy Detective monitoring system
- Water Furnace ground source heat pumps for combined heat and hot water
- In-floor radiant heat
- R-38 walls with EPS in-wall insulation and 3 inch EPS on exterior
- R-60 ceiling
- Double-pane windows for solar heating
- Advanced wall framing with tight seals
- Prefabricated exterior wall panels
- Energy Star appliances
- Efficient CFL and LED lighting
- Electric Vehicle Charging Station

These homes scored from a 0 to minus 12 HERS Rating – the lowest three scores in the nation, earning Ichijo USA the winning spot in the 2012 U.S. Department of Energy Builders Challenge.

Health & IAQ

Residents get a breath of fresh air every time they enter their homes, which feature exposed concrete and FSC Certified bamboo floors, non-toxic composite wood products, low-toxicity finishes, radiant heat and heat recovery ventilators. Rain-screen walls and below-grade drain mats allow exterior moisture to drain, preventing mold issues. Attached garages are sealed off from the homes and ventilate to the outside to keep car-related pollutants outside. Skipping wall-to-wall carpet in a production homes market was considered a risk, but instead the solid flooring, along with the open, modern aesthetic have become big selling points. Little touches like shoe storage and walk-off mats at home entrances reduce tracked-in dirt and pollutants.

Construction practices also ensured the homes started off well: extensive water testing of windows and flashing verified tight seals, and use of green cleaners, exhaust window fans during sanding, and masking of ductwork avoided pollutants.

Materials

Mining, manufacturing, transportation and end-of-life disposal of building materials all have big eco impacts. Impacts during construction were reduced, with more than 90 percent of construction waste recycled, and the units integrate a spectrum of best-in-class sustainable materials:

- Recycled content: Sheetrock, concrete, siding, roofing, countertops
- Local: roofing, siding, concrete, drywall, MDF trim, cabinets, and sheathing produced within 500 miles
- Durable: Long-life roofing, fiber cement siding, concrete floors, bamboo
- FSC wood for 90 percent of total wood
- Salvaged lumber: pallet wood and reclaimed timbers
- Advanced wall framing and panelized wall and roof system materials efficiency
- Materials' embodied energy is offset by tree planting program (I don't get this one... is it the energy required to produce, transport and install the materials used in the homes that we're offsetting? Also, where is the tree planting program? If it's nearby, we should mention.
- Minimal vinyl

Finding affordable vinyl alternatives was a major challenge, but the team succeeded, with the exception of interior PVC conduit and piping.



Photos counter clockwise from left: electric vehicle charging station, ground source heat pump, Energy Star appliances and FSC Certified bamboo floors.



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This material will be provided in alternate formats upon request.

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Marketing Deep Green

So, do green homes sell? As of September 2012, five of the 10 units have sold, at a price of about 25-30 percent above market rate, to account for the high performance upgrades. Buyers to date have been either people specifically looking for a green home or in some cases those who just like

the clean, modern design. The target market is still a niche; homeowners have to be committed to living green after buying green in order to realize the savings potential of the design and systems. But each homeowner receives a big incentive – a tax credit of \$19,000 to \$22,000 per year (?), along with a projected annual savings of \$3,000-\$4,000, including solar power resale to the local utility.

Awards

Local

Year	Award	Grantor	Recipient	Subject
2012	Innovations in Issaquah	Issaquah Chamber of Commerce	City of Issaquah	zHome public private partnership
2011	Community Leadership in Green Building	King County Green Globe Award	City of Issaquah/YWCA	Partnership
2010	What Makes it Green? Honorable Mention	American Institute of Architects, Seattle Chapter	David Vandervort, Architect	zHome design

Regional

Year	Award	Grantor	Recipient	Subject
2009	Smart Partnership Award	Washington State Governor	City of Issaquah	Planning and development

National

Year	Award	Grantor	Recipient	Subject
2012	US DOE/BASF Builders Challenge	US DOE	Ichijo USA	zHome energy rating
2012	Northwest Energy Star Project of the Year	Energy Star	Ichijo USA	zHome energy performance
2011	Residential Project of the Year in North America	Forest Stewardship Council	Ichijo USA	zHome

Reflections & Lessons Learned

- Use Integrated Design Process
- Establishing project goals and team roles early in the process was critical to success, as was having an integrated design point person on a team with a shared vision.
- High performance projects using new technologies demand an educated team, including a builder and design team familiar with advanced framing, SIPs, high performance wall details, construction waste management, etc.
- Review material and systems specifications on a quarterly basis until purchased; the industry is constantly changing and zHome benefitted from all the new materials that entered the market post specification writing.
- Do comparative bids for waste recyclers! Waste recyclers have different rates, and variations in those rates must be accounted for in construction waste management calculations.
- Some potential buyers, such as retirees, were attracted to zHome's zero or low utility bills, but were not as excited about multi-floor living that required the use of stairs. Use universal design techniques in future projects.
- Analyze best incentives for builders and homeowners. There is a split incentive between builders and owners; Washington-made PV allows owners to sell power to the utility for two to three times the rate as out of state photo voltaic panels. Buy local panels early in project to maximize benefits.