

SUNNY OAKS

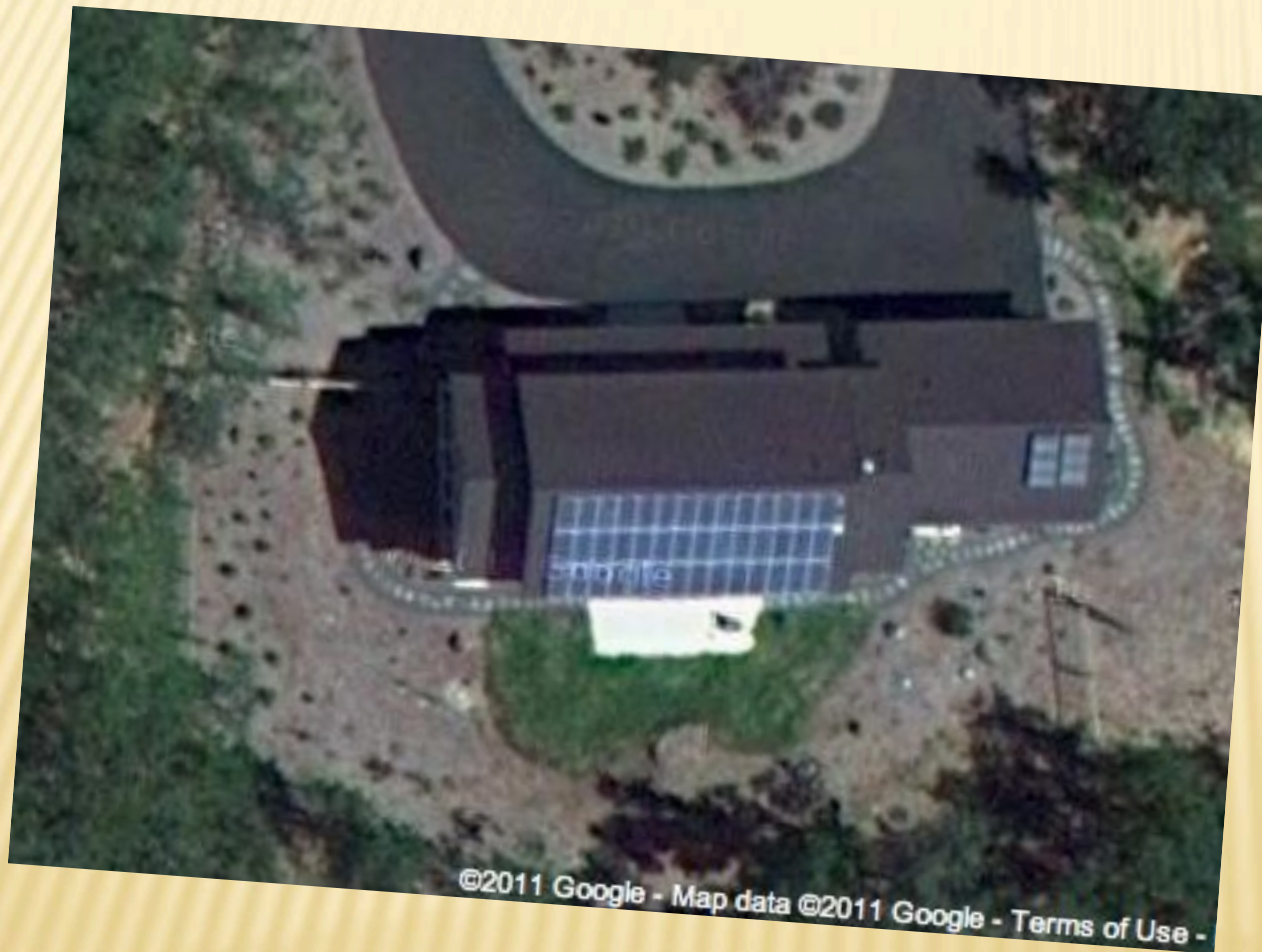
Home of Andy Kerr and Office of The Larch Company

A state-of-the-art, super-insulated, passive- and active-solar, net-zero energy, toxic-free and earth-, people- and pet-friendly habitat.

WHAT TO EXPECT

- The Basics
- What Green Means
- My Deliberative Process
- Views of Each Side of House
- Design, Construction, Mechanical and Products Details
- Supplemental Heating and Active Cooling
- Other Green Features
- Random Thoughts
- Take Home Points
- Next on the Quest for Net Zero Energy
- More Information
- Sage Advice (not mine)

THE BASICS



- Ashland, Oregon
- $42^{\circ} 07' \text{ N}$ Latitude
- 2,300' Elevation
- ~2,400 Square Feet

WHAT GREEN MEANS

- ✘ In his book, *Your Green Home*, Alex Wilson, the publisher of www.buildinggreen.com, uses the term “green building” to describe building design and construction that has some or all of the following characteristics:
- ✘
 - Minimizes adverse impacts on local, regional, and global ecosystems
 - Reduces reliance on automobiles
 - Uses energy efficiently
 - Conserves water
 - Built environmentally responsibly, with low-impact, durable, and low-maintenance



MY DELIBERATIVE PROCESS (1)

I was neither the designer nor the builder of Sunny Oaks; I was the conceiver and producer, which meant that I

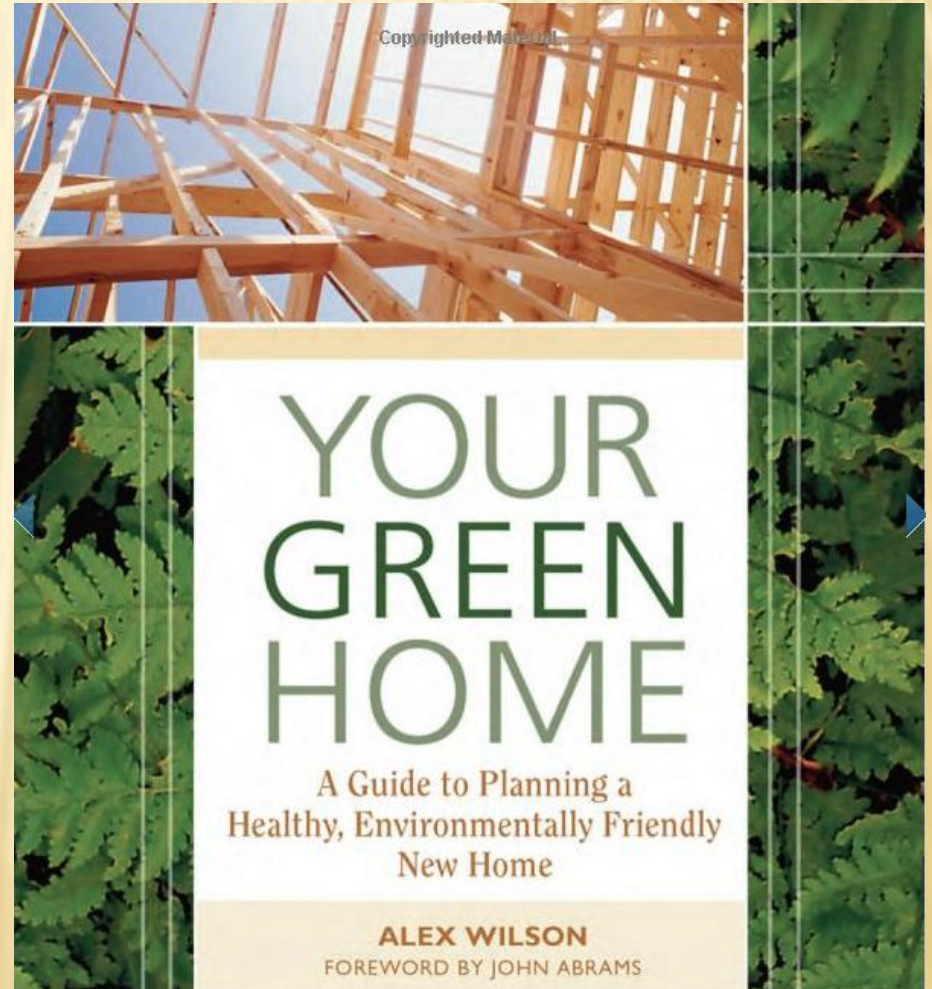
- read books;
- looked at other houses;
- surfed the web; and
- consulted and/or retained experts.



MY DELIBERATIVE PROCESS (2)

Invaluable Book #1:

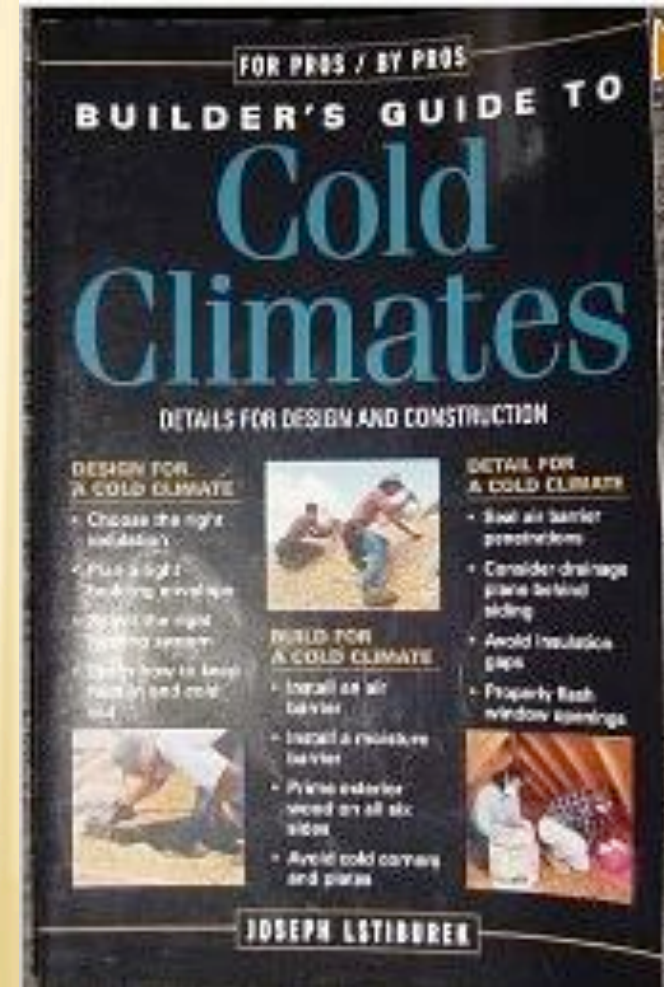
- *Your Green Home: A Guide to Planning a Healthy, Environmentally Friendly New Home* by Alex Wilson



MY DELIBERATIVE PROCESS (3)

Invaluable Book #2:

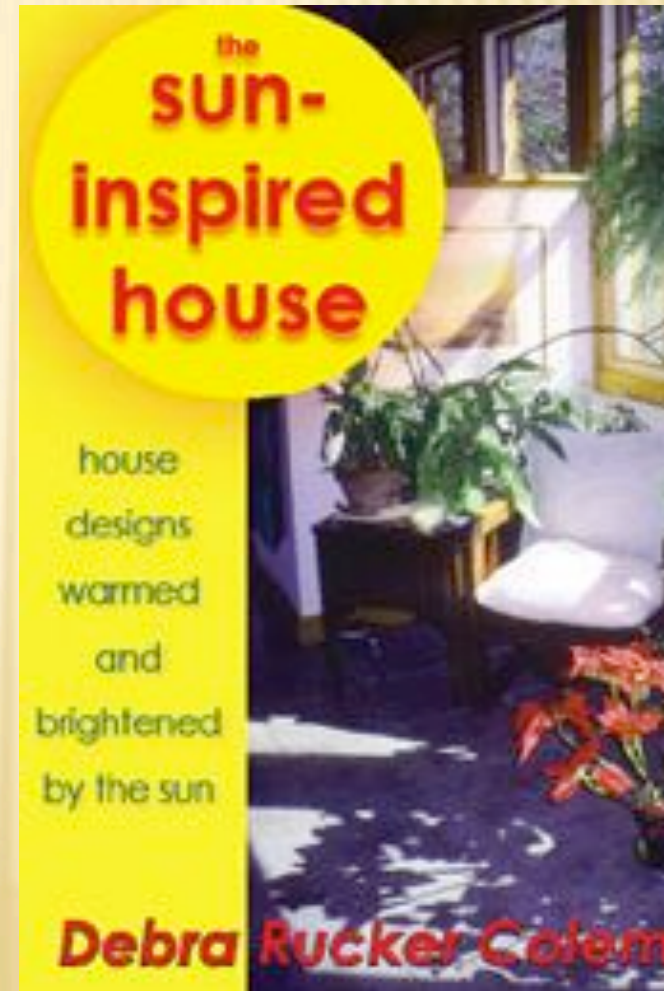
- *Builder's Guide to [X] Climate* by Joseph Lstiburek (where “X” is “Cold, “Hot-Humid,” “Hot-Dry and Mixed-Dry” or “Mixed-Humid”)



MY DELIBERATIVE PROCESS (4)

Invaluable Book #3:

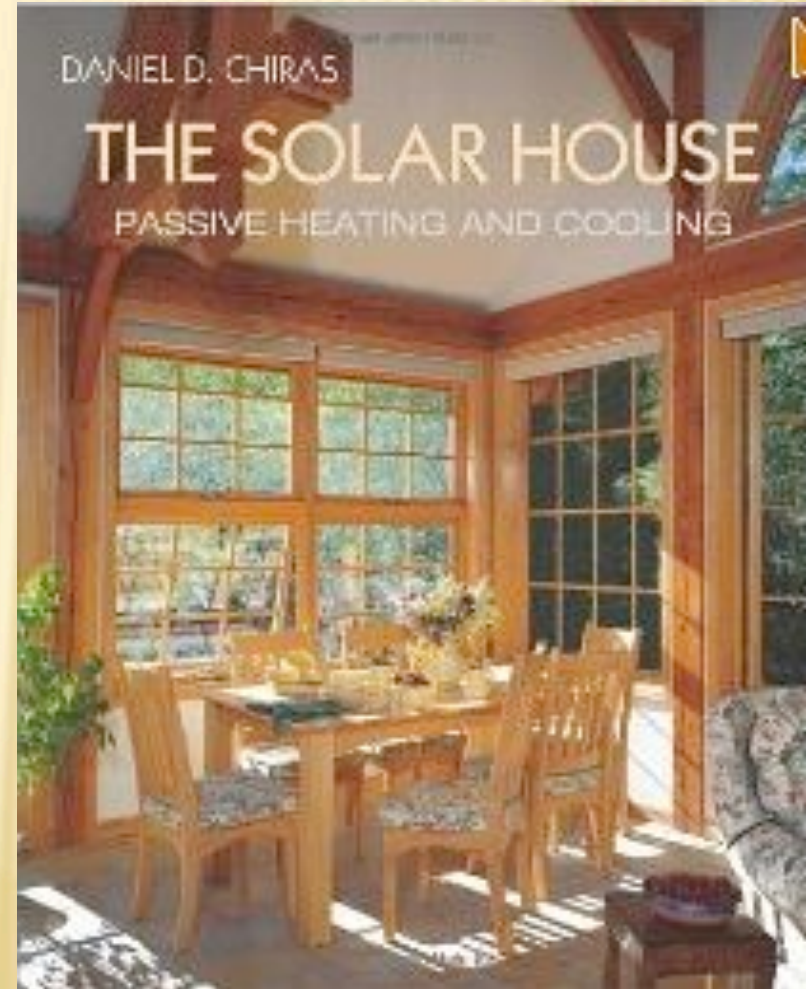
- *Sun-Inspired House: House Designs Warmed and Brightened by the Sun* by Debra Rucker Coleman



MY DELIBERATIVE PROCESS (5)

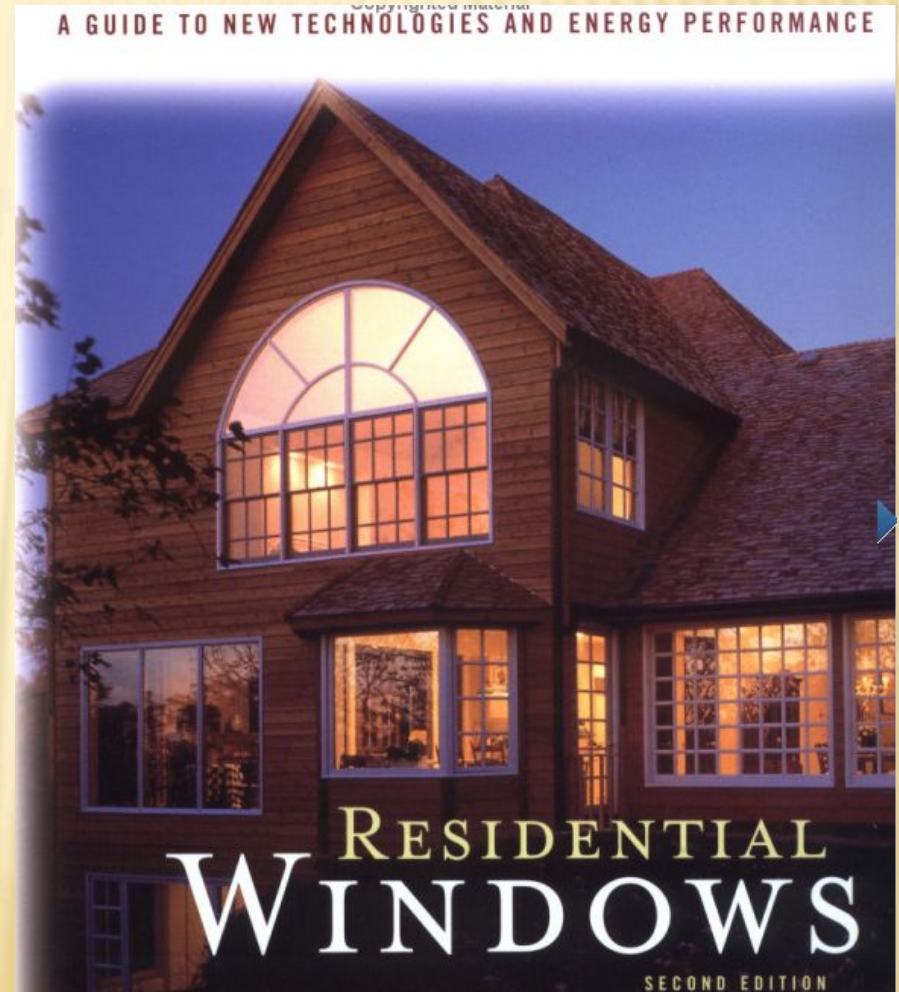
Invaluable Book #4:

- *Solar House: Passive Heating and Cooling* by Daniel D. Chiras.



MY DELIBERATIVE PROCESS (6)

When I put down this volume, I knew I had read enough books.



MY DELIBERATIVE PROCESS (7)

Home - BuildingGreen.com

9/5/11 14:06

Invaluable Website:

- www.BuildingGreen.com
- \$199/year or \$19.95/month.
- “Comprehensive, practical information on a wide range of topics related to sustainable building—from energy efficiency and recycled-content materials to land-use planning and indoor air quality.”
- GreenSpec product listings, high-quality articles about green buildings, peer-to-peer comments, and more than 275 project case studies.

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How to get what you need from GREEN PRODUCT CERTIFICATIONS



Easy Access to LEED Online Forms

LEEDuser has added another essential tool you've been asking for: sample LEED Online forms. Through a special arrangement with USGBC, LEEDuser has integrated these sample forms into the member toolkit we provide. [Read more](#)

What does LEED certification cost, credit by credit? "The Cost of LEED" report breaks it down. [Read more](#)

Looking for LEED documentation? LEEDuser's Documentation Toolkits offer credit-by-credit samples and templates. [Read full article...](#)



Solar Thermal Hot Water, Heating, and Cooling

By creating heat instead of electricity, solar thermal achieves three times the efficiency of photovoltaics at a lower price. [Read full article...](#)

Gifford Lawsuit Against USGBC, LEED Dismissed

The judge issued a strongly worded dismissal, but Henry Gifford is considering an appeal in a case brought over alleged false advertising of energy savings in LEED-certified buildings.

Passive House Schism Leaves U.S. in Limbo

Passive House professionals and projects in the U.S. are wondering about the status of their certifications after the international Passive House Institute dropped its U.S. affiliate.

Composting Is Winner in Food Waste Disposal Study

What's the greenest way to deal with food waste? If you really can't eat it, compost it.

Want a Net-Zero Home? Be a Net-Zero Family

A superinsulated house with PV is a great start, but whether you achieve net-zero depends on how you live in it.

Warm Globally, Flood Locally: Water Crises Loom for U.S. Cities

— NRDC

The Level on BIFMA's Furniture Certification

— BIFMA's multi-attribute standard offers a high bar for certifying furniture, but its success depends on its transparency moving forward.

Forest Products Certification: How It Works

— Many wood and paper products now come with an eco-label. But what happens behind the scenes before a product gets the seal of approval?

LEED 2012 Second Public Comment Period Opens

— Responding to thousands of comments on the first draft, USGBC made major changes to LEED 2012, especially in materials. We walk you through the highlights.

Interior Painting

— **Occupant health and performance** are the key consideration when choosing an...

Wood Products Certification and

Credit EQ 4.1 (NC)

In NC v2.2 EQc4.1: Low-Emitting Materials—Adhesives and Sealants
~110 minutes ago

Unlabeled fenestration visible light transmission(VLT)

In NC 2009 IEQc8.1: Daylight and Views—Daylight
~3 minutes ago

Midrise 4-6 Stories

In LEED for Homes (LEED-H) Forum
Sunday, 9:41 PM

Sourcing Roof Shingles with SRI 70 or more

In NC v2.2 SSc7.2: Heat Island Effect—Roof
Sunday, 7:24 PM

<http://www.buildinggreen.com/?>

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MY DELIBERATIVE PROCESS (8)

Invaluable Bureaucracy: Oregon Department of Energy:

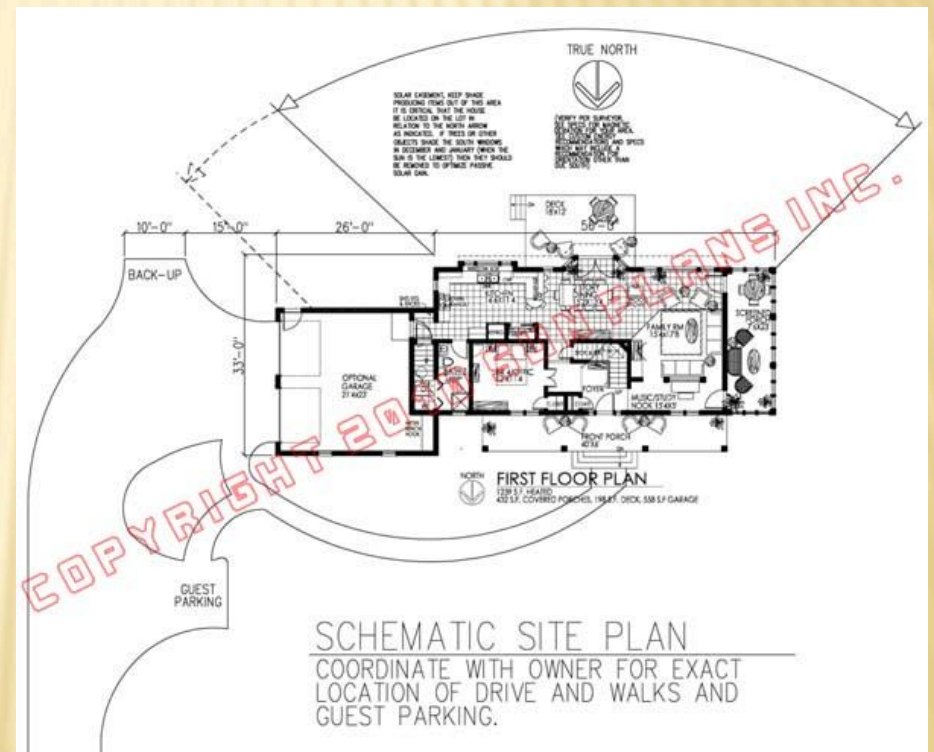
- Lots of money to give to subsidize solar energy and energy efficiency.
- Very good information on the most efficient appliances, including ERVs and HRVs.
- My choices for appliances were made by cross referencing ODOE efficiency ratings and subsidies with *Consumer Reports*.
- <http://oregon.gov/ENERGY/RENEW/>



MY DELIBERATIVE PROCESS (9)

Bought a customizable
plan from
www.sunplans.com and
have a local designer:

- conform them to local codes;
- customize them to your desires; and
- improve upon them.



MY DELIBERATIVE PROCESS (10)

Contract with an excellent general contractor, you want it:

- built right;
- on time; and
- within budget.



MY DELIBERATIVE PROCESS (11)

Consult a Professional Engineer:

- Confirms your designs, assumptions and suppositions;
- Provides evidence to designer and builder that no central heat or air conditioning necessary.
- *Energy-10*: a building analysis program that factors in passive solar heating and cooling, natural lighting and ventilation, windows, wall insulation, shading, mechanical equipment, and other variables.



NORTH VIEW

No obvious giveaways that it is a passive & active solar house. The north-facing porch only gets direct sun early and late (and not that much) on summer days.



SOUTH VIEW

Besides the PV and SHW panels on the roof, it doesn't otherwise scream SOLAR house.

Hints:

- higher proportion of windows than usual; and
- latitude-defined overhangs on every window.



EAST VIEW

- Limited windows to avoid morning heat gain in summer.
- Garage, while insulated, is not part of the super-insulated conditioned space of the house, but insulates the main house from exterior elements



WEST VIEW

- Limited windows to avoid afternoon heat gain in summer.
- Screen porch provided bug-free outdoor habitat.
- Porch shades the two doors into house.



DESIGN STRATEGIES

- Sited for solar access, with the long axis of house oriented east-west.
- Passive solar floor plan with 10% south-facing glazing and 4 inches of thermal mass in the concrete floor, poured over 8 inches of XPS rigid-foam insulation (R-value of 40; local code is R-15).
- Sized-for-latitude overhangs allow winter sun in for solar heating, but keep it out in the summer.
- Windows strategically placed to take advantage of natural ventilation.
- Windows minimized on east and west walls to avoid heat buildup from early- and late-day summer sun.

CONSTRUCTION DETAILS

- 2 x 6 stick-frame construction, spaced 24 inches on center, Forest Stewardship Council-certified wood.
- Walls insulated with polyurethane foam boards and spray foam within the walls; 1-inch-thick polyisocyanurate board serves as a thermal break between the outside of the studs and the siding for a total of R-40 (code is R-22).
- Ceiling insulated with 12 inches of polyurethane board and polyurethane foam for a total of R-71 (code is R-38).
- Standing-seam metal roof.
- Triple-pane, argon-gas-filled, fiberglass-frame windows. South-facing windows have SHGC of 0.63 and a U-value of 0.16.

MECHANICAL ASPECTS

- No air-conditioning: Opening windows at night and closing them during the day is typically sufficient.
- Two Tamarack Technologies whole-house attic fans can flush out hot air when needed.
- Ceiling fans throughout aid cooling in summer.
- Panasonic WhisperGreen bathroom fans.
- High-efficiency energy recovery ventilator provides adequate exchange between indoor and outdoor air.
- Solar hot water system offsets about 68% of the electrical water heating.
- 7.2 kW grid-tied PV system with battery backup provides 100% of electricity needs.

FINISHES AND PRODUCTS

- PaperStone countertops made from recycled paper and nonpetroleum binders (mistake)
- Cabinets of FSC-certified wood and formaldehyde-free plywood
- No-VOC paints, adhesives, and finishes used throughout
- FSC-certified Oregon white oak flooring
- Humabuilt (www.humabuilt.com) doors, made with wheat hull (interior) and FSC wood veneer (exterior) (out of business)
- FSC-certified wood trim and molding
- Insulated WindowQuilt (www.windowquilt.com) shades
- Ridgeline, gable, and soffit vents keep attic area cool and dry
- Delta H2O Kinetic technology low-flow showerheads
- Caroma low-flush (1.6 gpm) toilets

SUPPLEMENTAL HEATING

- 11 500-watt electric convection (resistance) heaters strategically placed around house for comfort (could get by with 5 or six).
- If grid down, then a small propane heater with electric fan.
- Equivalent of three toasters running to heat house on coldest days.



ACTIVE COOLING

- Air conditioning is evidence of design failure.
- High windows near high ceilings on second floor to maximize “stack effect”.



RANDOM THOUGHTS (1)

LEED Certification:

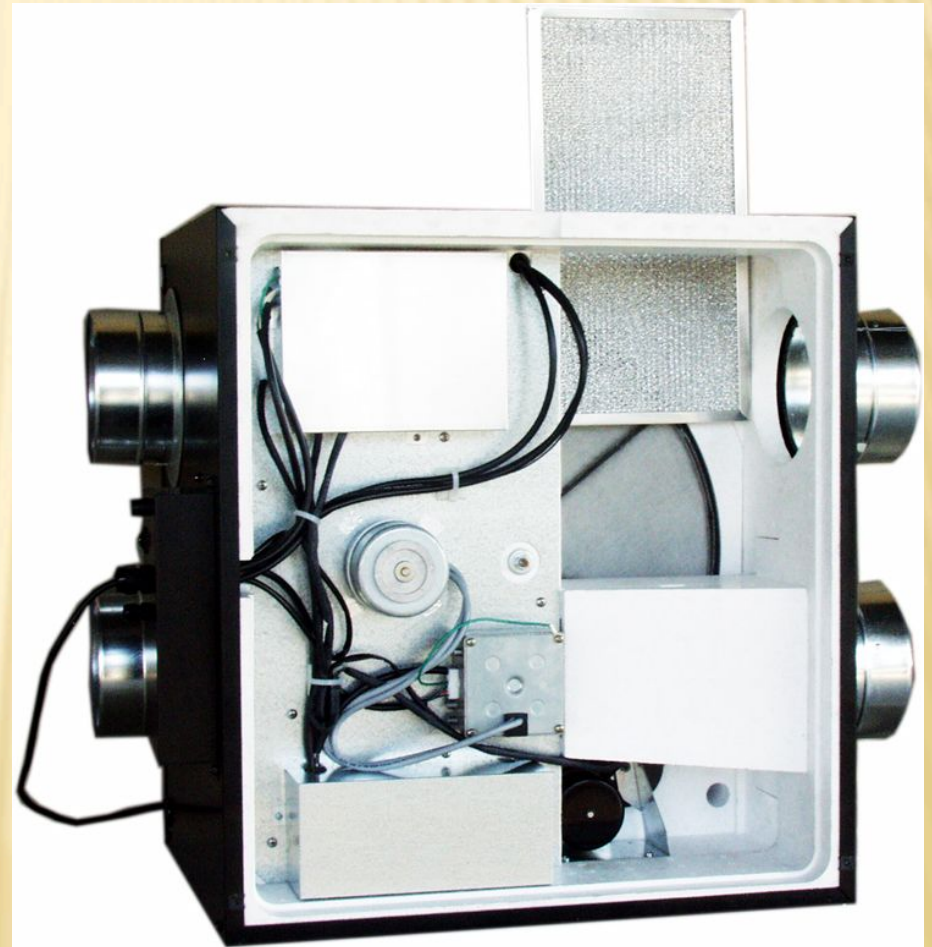
- Didn't seek it as lots of paperwork.
- Annoyed by rule limiting points to 30% of PV offsetting grid energy.



RANDOM THOUGHTS (2)

"X" Recovery Ventilators:

- Heat Recovery Ventilators (HRV) don't do humidity.
- Energy Recovery Ventilators (ERV) do.
- ERVs more efficient and get high tax credits.



RANDOM THOUGHTS (3)

Battery Backup:

- No electricity no water from well.
- Battery bank not enough for 240 VAC loads (and no running the vacuum cleaner either!)
- Also powers fan in backup propane heater.



RANDOM THOUGHTS (4)

Major Regrets:

- Paperstone® Counters
- Gutter Alternative (they suck)
- Should Have Downsized Floor Plan
- Whole House Fans Unnecessary



RANDOM THOUGHTS (5)

Insulation *and* Air Sealing:

- Hard to have too much insulation.
- As important is sealing potential air leaks.



RANDOM THOUGHTS (6)

Small Is Beautiful:

- Even a sloppily and unsustainably built small house can cause less environmental damage than a thoughtful and more sustainably built large house. A small house typically consumes fewer resources during its construction and requires less energy to operate.



RANDOM THOUGHTS (8)

Cost of Going Green:

- Investing in efficiency and renewable energy is tax free because it's money you don't have to spend, which means money you didn't have to pay taxes on.
- Rule of 72 (doubling time or simple payback)



TAKE HOME POINTS

- Invest in the envelope (windows, doors, insulation, air-sealing) upfront and save by lower operating costs.
- Design from the beginning (e.g. orienting any house with the long axis East-West saves 10-20% of heating costs). Many of the right design decisions don't cost any more money.
- Compromises and trade-offs inevitable. The best single choice for energy efficiency, human health and air quality (inside or outside) may not be the same choice for all.

NEXT ON THE QUEST FOR NET ZERO ENERGY (1)

- Net Zero Energy
*Personal
Transportation:*
- Easier said than done.
- Space reserved on the roof for more PV panels.
- Looking for the right electric vehicle.



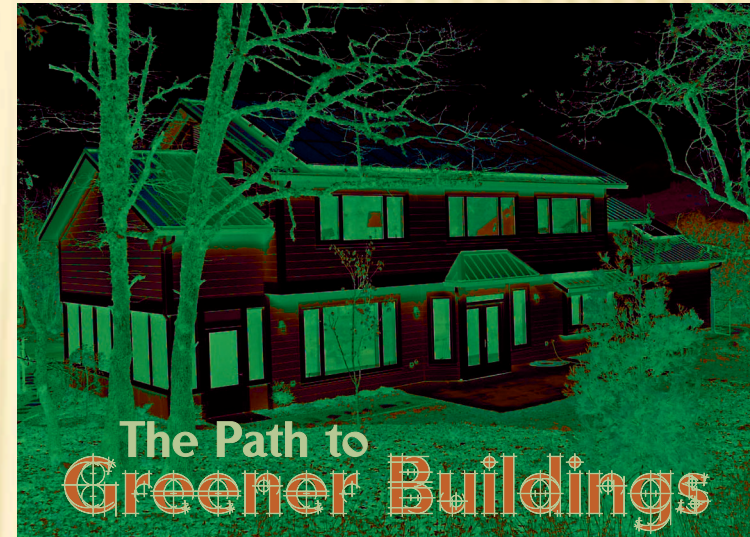
NEXT ON THE QUEST FOR NET ZERO ENERGY (2)

- Introducing SHW with the Sunnovations “Geyser Pump”:
- No pumps, motors or sensors to fail (no moving parts)
- Pex not copper piping for lower cost and easier installation.



MORE INFORMATION

- Andy Kerr, Czar, The Larch Company, 503.701.6298, andykerr@andykerr.net
- www.andykerr.net/solar (has link to download PDF of this PowerPoint presentation) and the article in *Home Power* magazine.



Once you decide to build green, don't look back. But before you go this route, know where you're going—and who you'll be bringing along for the ride. Here are some tips for navigating along the ever-evolving path of green building.

Even if you've hired a good architect, designer, and/or builder, it will be helpful to know as much or more about green building than they do. They might know more about basic building design and construction, but you will need to become the green building expert. The more you know, the easier it will be for you to communicate your preferences and priorities effectively—and to observe whether your wishes are being carried out during construction.

Research Fully

Once I decided that building "green" was something that interested me, I hit the books and the Web. I read, and I read, and I read some more—probably 50 or more books altogether. (See "Green Building Resources" sidebar.)

However, when it comes to green building, books can fast become outdated, since new materials and designs are revolutionizing green building quickly. The single best investment in my learning process was a \$199 annual subscription to www.buildinggreen.com, an independent source for information on green products and news about the green building industry.

Expect to build your green building library before you build your green house.



THE SAGE OF MENLO PARK

“We are like tenant farmers chopping down the fence around our house for fuel when we should be using Nature's inexhaustible sources of energy — sun, wind and tide. ... I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that.”

-- Thomas Edison chatting with Henry Ford and Harvey Firestone (full citation on Wikipedia)

