



## Zenger Farmhouse Green Systems

Information and resources compiled by Charles Stephens and Jacqueline Fuller

When the Zenger farmhouse was remodeled, it was designed to minimize resource use and to be energy neutral on an annual basis. To achieve these broad goals, the design team focused on three main areas – energy use, water use and materials. This project was completed in September 2007, thanks to the generous donations and services from many local businesses.

### Solar

**Solatubes:** Three Solatubes have been installed. The Solatube Daylighting System captures light through a dome on the roof and channels it down through an internal reflective system. This tubing is far more efficient than a traditional drywall skylight shaft, which can lose over half of the potential light. The tubing will fit between rafters and will install easily with no structural modification. At the ceiling level, a diffuser that resembles a recessed light fixture spreads the light evenly throughout the room.

**Solar Panels:** A solar PV system has been installed. This system includes 36 panels at 165watts each (for a total of 5.94 kW of capacity, or 5,940 watts of capacity). With all systems running we should generate a total of 6,400kWh of energy making us a NetZero property.

PV = photovoltaic

kW = kilowatt

kWh = kilowatt hours

### Lighting

**Lightbulbs:** Compact fluorescent lamps (CFLs) use about a quarter of the energy that typical incandescent lamps use for the same light output.

### Water

**Rainwater harvesting system:** It collects and stores water that runs off the recycled metal roof and into the gutters on the farmhouse. Not that we are starved for water around here, but its more sustainable to use what is falling into our hands than to tap into the ground water.

**Cisterns:** Water from the gutters run into two 4,800-gallon above-ground, galvanized steel storage tanks.

**Rainwasher:** The water collected is filtered at multiple stages of its travel from the sky to your sink, shower and toilet. First it is course-filtered as it enters the tanks. It then goes through a special system that further filters it, and then through an ultraviolet lamp purification unit to prepare it for use in the farmhouse.

**Low-flow toilets:** Toilets in both the upstairs and downstairs bathrooms are low-flow and have a dual button flush (1.6 / 0.8 gallon per flush). They are capable of saving up to 80% of previous annual water usage.

## Reclaimed/recycled materials

**Roofing:** The metal is made of recycled steel, needs no maintenance, and will last 50 years or more.

**Siding:** made from cement and waste wood fiber.

**Window Frames:** windows have a fiberglass frame that needs no maintenance.

**Flooring:** Some of the wood flooring was original and refinished. Other flooring is OSB, a low embodied energy and local product that doesn't have another layer of material over it.

OSB = Oriented Strand Board, compressed wood chips, very low emissivity

**Trim:** Much of the wood trim in the farmhouse was reclaimed and re-milled.

**Countertops:** The kitchen countertops are made from resin and recycled newsprint.

**Cabinets:** Most of the kitchen cabinets are from the Rebuilding Center, which reclaims used building materials for reuse. The kitchen range is a reconditioned used model.

Vinyl was avoided wherever possible.

## Insulation

The walls and roof were completely covered with a layer of high R-value insulation (nailbase) and the wall and rafter cavities were filled with new insulation. All the windows were replaced with modern fiberglass-framed units that have a low-e coating on outer surface of the inner pane of glass to reduce heat loss. The new back door is a well-insulated model that needs very little maintenance.

R-value = resistance to heat loss

## Heating/cooling

The farmhouse is heated and cooled by a hydronic (water-based) forced air system. An air-to-water heat pump unit outside provides hot water in the winter and chilled water in the summer (heat pumps are reversible). This water is circulated through a heat exchange coil in an air handler (similar to a furnace) in the basement that delivers warm air in the winter and cool air in the summer through the duct system.

The Zenger air handler is a special one – it also provides fresh air to the house whenever the system runs, and it does so while recovering a significant amount of the energy in the outgoing exhaust air. This fresh air is mixed with the air that the system is delivering when heating or cooling. The combination of the renewably powered heat pump and the very efficient hydronic forced air system minimizes the amount of energy used to heat and cool the farmhouse

## For more information about:

**A Consumer's Guide to Energy Efficiency and Renewable Energy**

<http://www.eere.energy.gov/consumer/>

**LEED (Leadership in Energy and Environmental Design)** [www.usgbc.org/LEED/](http://www.usgbc.org/LEED/)

**Solatubes:** [www.solatubes.com](http://www.solatubes.com)

**The ReBuilding Center:** [www.rebuildingcenter.org](http://www.rebuildingcenter.org)

**PV Systems (solar panels):** <http://www.pvsystems.com/introduction.shtml>

**Rainwater Catchment:** American Rainwater Catchment Systems Association

<http://www.arcsa.org/>

**Cisterns:** Scafco [www.scafco.com](http://www.scafco.com)

**Bathroom flooring:** Floor Factors [www.floorfactors.com](http://www.floorfactors.com)

*Marmoleum:* <http://www.greenbuildingsupply.com/Public/NaturalFlooring/Marmoleum/index.cfm>

**Low-flow Toilets:** <http://www.caromausa.com>

**Countertops:** Canopy [www.canopylifestyle.com](http://www.canopylifestyle.com)

<http://www.canopylifestyle.com/downloads/WyEast20070201.pdf>

**OSB:** APA- The Engineered Wood Association (Oriented strand board is located under the products section) [www.apawood.org](http://www.apawood.org)

**Rainwasher:** N/A

**Heating/cooling System:** Ecoheat [www.ecoheatpdx.com](http://www.ecoheatpdx.com)