



Teamwork built this award-winner

Cannon Beach Cottage

by Ann Grim, Oregon Department of Energy

Above: The great room is flooded in natural light even on overcast days which are common on the Oregon Coast.

The owners and design/building team considered energy efficiency and environmental impact in every decision made in the building process of this sustainable Oregon home. From the choice of Durisol™ building blocks for the wall structure to native vegetation on the eco-roof, the team ensured that their selections passed through an environmental lens.

The process took time — nearly two years to date — and has not ended. The owners want others to study the lessons learned from their sustainable building project so more homes can be built with similar results. They contacted Energy Analyst Charlie Stephens with the Oregon Department of Energy (ODOE) before

designing their home. Stephens is the sustainability lead for the agency. Most of his work involves researching and developing pilot implementation projects for innovative resource-saving technologies.

ODOE recruited students and staff from the Oregon Renewable Energy Center (OREC) at the Oregon Institute of Technology (OIT) in Klamath Falls to design and install numerous sensors in the home that control the house systems and monitor performance. OIT students and ODOE staff will analyze the behavior and performance of the home over time. ODOE will produce a case study documenting the results after the first year.

“This is a great opportunity to see how lead-

ing-edge technology and sustainable building materials work in practice,” said Stephens. “We appreciate the owners’ support along with that of the architect, builder, on-site project manager, solar contractor and all the sub-contractors working on the home. This project would not have been possible without a team effort from the owners on down.”

Design process

Early in the pre-design stage of the project, the owners embraced the idea for an integrated design team.

“The collaboration among the design team was one of the most fascinating ‘behind the scenes’ aspects to the home,” said Nathan Good, the project’s architect. “The owners, architect, interior designer, builder and landscape architect worked collaboratively on all aspects of the home’s design over the period of several months, with few boundaries between disciplines.”

The contractor, Rich Elstrom, joined the design team during the design development stage of the project. Elstrom, who builds only on the Oregon Coast, provided valuable input to a multitude of factors ranging from cost and constructability to the local sourcing of materials and design for durability and low-maintenance in the challenging coastal climate.

Layout

The home has two bedrooms, three baths, a great room, kitchen and office loft area above the kitchen. It is nestled into the hillside over-

looking the ocean. Care was taken to preserve a centuries-old Sitka spruce on the property. The home has two roof levels. The upper roof is an eco-roof and allows neighbors higher on the hillside to see only “green” below. The strawberry vines and tiny native plants provide an effective filter for rainwater and successfully blend the rooftop into the hillside. The lower porch roof serves as the platform for the 5.9 kW (DC input) photovoltaic system.

The 90 Thermomax® evacuated tube solar collectors are placed on the embankment below the front patio. While open to the sun above, the tubes are well hidden at the street level by strategic landscaping.

A “short” basement the owners dubbed “Charlie’s room” houses the mechanical systems and controls where Charlie Stephens and other home system team members spend most of their time.

Daylighting

Much of the home’s glazing faces South down the hill. This alignment not only optimizes the spectacular view of picturesque Haystack Rock, but is critical to the home’s daylighting strategies. The house has more than 600 square feet of window area, much more than normal for a house this size. High performance Cardinal glazing with a U-value less than .32 was used. The high clerestory windows, light shelves, and an 18-foot ceiling in the great room provide excellent interior lighting even on overcast days common at the Oregon Coast. ►

AWARDS

The builder, Rich Elstrom:

Won 2005 National Association of Home Builders’ “Green Project of the Year” in custom home category.

The home:

Received award from Portland Design Festival for contribution to sustainable development.

Was a featured project at the US Green Building Council’s 2004 GreenBuild conference.

Awarded a Platinum certification by the Earth Advantage® Rating System.



Left: The 90 Thermomax® evacuated tube solar collectors are placed on the embankment below the front patio.

Materials

When possible, the owners sought to purchase local, sustainably harvested and recycled material to build their home. The windows, for example, are made by Bergerson Cedar Windows in nearby Warrenton from sustainably harvested cedar. Five large cedar columns from Collins Pine's FSC (Forest Stewardship Council) certified sustainable forest products "anchor" the corners of the home, patio and car "closet." The Douglas fir flooring was salvaged from windfall trees. The unusual stairwell support was fabricated on site from pieces of beech given to the owners from an in-fill project in Portland and spruce branches cut from a tree on the property.

Energy overview

The heating and ventilation system in the Cannon Beach home uses conventional components in a unique way to provide space conditioning for the occupants while minimizing overall energy use. The home was designed to have very low space heating and water heating loads, half as much as a typical home of the same size. It uses a combination of renewable solar and geothermal energy sources for both space and water heating.

Air conditioning is not needed in the coastal climate. The home will rely on passive cooling. Energy Recovery Ventilators (ERVs) and operable windows will bring in fresh air. Natural stack effect will help keep the house cool if summer temperatures rise above comfortable levels.

Insulation

The home is well insulated so energy loss is minimal. Roof insulation is approximately R-50. The 12-inch walls were constructed with Durisol™ sustainable insulated concrete form blocks. The R-value above grade is 25.6

and below grade is R-21. Window U-value averages 0.32.

Space heating

Space heat delivery is provided by a hydronic (hot water-based) forced air system with three multi-functional, high-efficiency ERVs moving warmed ventilation air to each zone. Hot water for the space heating system (and for domestic use), is provided by a combination of an evacuated tube solar collector system, a ground source heat pump system and digital controls. The 90 highly efficient Thermomax® evacuated tubes gather solar energy, which is collected by a water/propylene glycol circulation loop. A heat exchanger transfers the heat from the loop to a 120-gallon storage tank in the basement. When the storage tank is fully charged, the excess solar energy is routed to the two geothermal wells to seasonally store extra energy in the basalt rock formations beneath the home.

Domestic Hot Water

Most of the hot water-using fixtures in the house are served by an insulated 3/4-inch copper loop, with short, small diameter individual branch lines to each fixture. An on-demand circulator system, activated by a combination of wireless remote and push buttons, rapidly delivers hot water to the farthest fixture on the loop when activated. A sensor on the line at that point shuts the circulator pump off when the temperature reaches approximately 85° F. "Instant" hot water is then available to all fixtures on the delivery side of the loop. This system saves thousands of gallons of water each year.

Solar photovoltaic system

A 5.9 kW photovoltaic array on the lower (South) roof efficiently produces energy that goes into the utility grid. Because of the lower amount of insolation available in Oregon's coastal areas (especially compared to Eastern Oregon), an oversized array was needed to provide enough energy to balance the home's draw from the grid. It consists of 36 Sharp 165-watt modules and two Sunny Boy 2500U inverters with an estimated annual output of 5,500 kWh. The solar array qualified for a \$1,500 energy tax credit from ODOE and cash incentives from the Energy Trust of Oregon.

Appliances

The owners carefully selected low energy consumption appliances. The appliances for the Cannon Beach home — a Fisher Paykel DD603 dishwasher, Kenmore 440X clothes washer and Kenmore 72252 refrigerator freezer — qualified for state Residential Energy Tax Credits. The Oregon Department of Energy issues the tax credits to encourage Oregonians to purchase premium efficiency appliances. ■

Below: Neighbors above the home look down on the green eco-roof.

