A close-up of a passive solar house

by Joe Baum

For years, my wife Lenore and I dreamed of leading a more simple life in the country in a sustainable house. Our opportunity came when I retired from an engineering career. For Lenore, this was the chance to build her dream kitchen, where she could continue to teach vegetarian cooking in an optimal natural setting with a terraced, organic garden.

The living areas have large southern windows and extensive thermal mass in the tile floors and stone wall for winter solar gain. The teaching kitchen and the remaining first floor have sustainable natural cork flooring. The large range hood employs automatically activated make-up air ducting.

Inspired by a Japanese-style folk house, the Baum residence and cooking school in Weaverville was completed in October 2005. Chris Larson, an Asheville architect, designed the passive solar house. To make the project more affordable, we worked with the builder, Douglas Clark of Greenbrier Builders, every day for 14 months.

Nestled on a south-facing hillside, the home has an open floor plan that capitalizes on the views, daytime solar exposure and easy flow for students in the cooking school. The main living space is on the first floor, with 2,100 square feet. The north side is earth-bermed with insulated concrete form, or ICF, construction. The loft level, with 600 square feet, has space for yoga and meditation, along with my office and storage.

Some of the most rewarding features of the house include living on grade, which gives a sense of grounding and connection with the earth; the cedar-lined master bath with a sunken, Japanese soaking tub; an outside shower set in an Asian garden, protected by a curving, dry-stack, stone retaining wall; and the kitchen, with a 270-degree mountain view, a large pantry and extensive social and work space around a curving island. The many windows and skylights provide transparency and invite the outside in.

In addition to the passive design with large, low-emissivity windows (which block heat), extended overhangs and sizable thermal mass, the house features radiant hot-water heating for all of the domestic hot water and much of the space heating. Solar energy collection is enabled by six hillside-mounted, 4-by-10 hot water panels through a drain-back system. Two solar storage tanks have a capacity of 240 gallons. The domestic tank is 30 gallons and is coupled to the backup, high-efficiency propane boiler, which has its own outside air intake and exhaust pipes. It is so liberating and satisfying to see and hear the system harvesting heat from the sun. Four zones distribute radiant heat to the insulated slab floor and the walls in the loft. A woodstove and gas fireplace are heat sources.

A tight building envelope was ensured by special attention and foaming of joints during framing and with Icynene insulation for non-ICF exterior walls and ceilings. We didn't have plumbing positioned in the outside walls. The structure has received an Energy Star rating.

Ventilation for this airtight home is a focus. A combination of casement and awning windows are positioned to take advantage of the natural site airflow in low to moderate humidity. Ceiling fans and rotating table fans provide efficient cooling where needed. To keep the heat outside, a covered, screened patio off the kitchen is used for summertime cooking and comfortable dining. Active make-up air for the cooking-stove exhaust is automatically engaged through a linked blower-damper system. Using an outside shower keeps unwanted moisture out of the house. In high humidity, a two-stage compressor is used with a variable-speed blower and thermidistat to manage humidity and cool as necessary. To provide make-up air throughout the year, outside air is drawn into the blower through an automatic damper activated electronically on a user-preset schedule. During the winter, passive make-up air is provided at the woodstove, and active circulation of heat flows from the second floor to the first floor.

Other design features include low-maintenance long-life cement siding; lichen-colored metal roofing; heat-reflective, ceramic InsulCote exterior paint, similar to the color of tree bark; sustainable and cushioned cork flooring; a contemporary "root cellar;" solar path lighting and Energy-Star-rated appliances. Native landscaping eliminates the need

for watering, chemical additives and mowing grass. An organic vegetable and herb garden with composting is planned for the spring, and wiring conduits were installed to add a solar-electric system in the future. During construction, we lived on the site in an RV, using solar-oven cooking and solar electric panels.

For years, we read green-building books and attended solar conferences and home tours to develop an idea of what we wanted. Though some people view hiring an architect as an extra expense, we were really glad we did. Chris Larson translated our vision into an amazing, artistic reality which continuously feeds our souls. We feel blessed to have realized our dream and believe it was worth the mental and physical effort we put into it. If you come to a cooking class here, you'll experience it for yourself.

[Joe Baum is retired from an engineering and management career at General Motors and is now consulting. Lenore has more than 30 years of experience in natural-foods cooking and instruction and is author of Lenore's Natural Cuisine and Sublime Soups. They can be reached at 645-1412 or lenorebaum@lenoresnatural.com.]