Pointed

An innovative solar-heating system is the foundation of an artist's small country house, where an equally smart plan accommodates both life and work

BY CHARLES MILLER

"How big a house do you want?" asked the architects. "About 2500 sq. ft.," replied the client.

"OK, we're pretty sure we can get that down a bit," countered the architects.

It wasn't the response that Arianne Dar, the client, expected. But the suggestion wasn't out of character from the architects offering it.

The firm of David Arkin and Anni Tilt, a husband-and-wife architectural partnership in Berkeley, Calif., is known to push the boundaries of sustainable building. For them, that means using materials that are in it for the long haul, catching the sun's energy and putting it to work, creating spaces that can be used for multiple purposes, and most important, designing a house that is no larger than it needs to be.

Arkin and Tilt refined the plan, eliminating redundant spaces and orienting the house for optimum solar exposure. The result is a 1600-sq.-ft. home for Arianne and her teenage son and daughter that uses both active and passive solar strategies to gather electricity and heat.

Catch the light, deposit the energy. *Hard against an oak hedgerow, the curving roofs of the house and studio echo the gentle curves of the Marin Headlands to the east. Photovoltaic panels laminated to the studio roof supplement the home's energy needs. A solar array to the right banks the heat. Photos taken at A and B on floor plan.*

Flexible floor plan 101: no spaces go unused

The house is one of two narrow, rectangular buildings that are parallel to one another but offset a bit (top photo). It shares a roof with a 300-sq.-ft. apartment. Separated from the main house's ground floor by a breezeway (floor plans p. 76), this little getaway is ideal for weekend guests. It's close enough to be a part of the house, yet far enough away to give everybody some privacy.

The kids' bedrooms are over the guest apartment, where they can be reached by way of the primary stair in the center of the house or by an exterior stair along the west end. The outdoor stair gives the kids their own private entrance. If Arianne decides to divide

Bottom photo, facing page: Courtesy of Arkin Tilt Architects

at the Sun

INSIDE A SAND-BED HEAT BANK

Loops of cross-linked polyethylene tubing course through what will eventually be a 2-ft.-thick layer of sand beneath the house's slab floor. The sand is insulated below and at the edges with 2 in. of extruded-polystyrene foam. Glycol heated by the sun shining on the collector panels courses though the tubing, heating the massive layer of sand and the rooms above it.

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Bob Ramlow, a renewable-energy expert, explains how to build a high-mass sandpit for solar-heat storage.

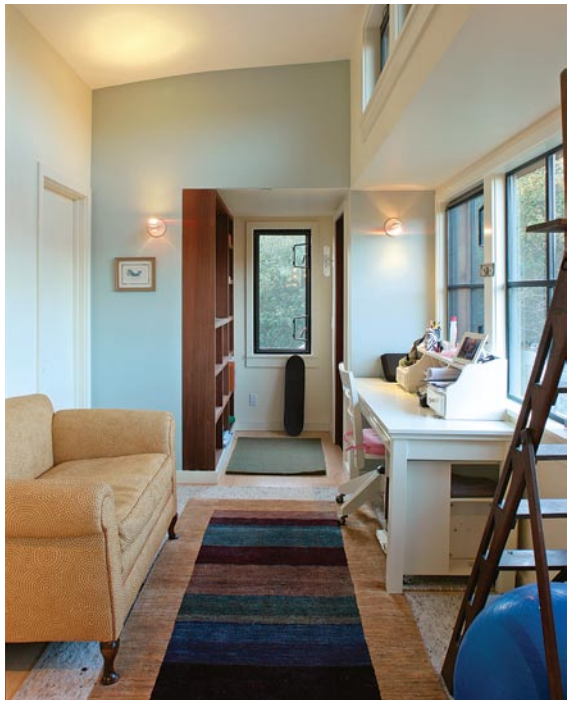
the house into a duplex once her children have moved out, the stair will join the apartment with the two upstairs bedrooms. These rooms open onto a wide space in the upstairs hall that functions as a study or as a small living room for the kids (photo p. 76). Each of the bedrooms includes a sleeping loft tucked in above the hallway. No space goes unused, and closets and shelves turn up wherever a wall that's deep enough is within reach.

The shop/studio is to the south and west of the main house, where it shelters the front yard from the prevailing wind without blocking the sunshine. Arianne is an artist who works with multiple materials, from paper to glass to welded steel. Her studio and shop share a single roof, with an open space between them. The walls of the shop can be opened to the outdoors to let in light and breezes. If Arianne decides she'd like to start keeping her car indoors, the shop and the breezeway are sized to be a garage and a carport, respectively.

Electricity and warmth from the sun, even when it's foggy

When the fogbank rolls in, coastal California can stay under cloud cover for weeks at a time. Yet solar energy still penetrates this marine layer and is available for harvest. Instead of using a more-familiar flat-panel photovoltaic system, Arkin and Tilt put the newer thin-film technology to work.

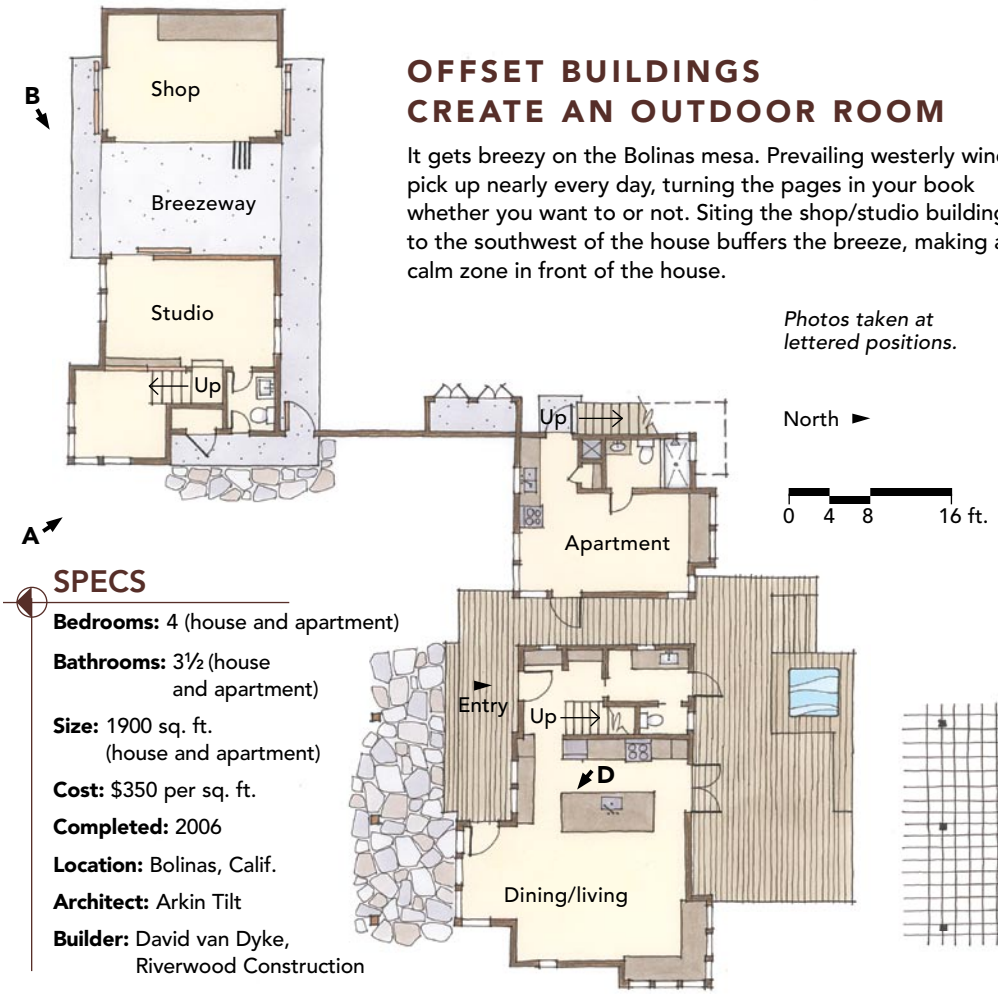
Also known as amorphous film, this type of photovoltaic collector comes in sheets



More than just a wide place in the hall. *Right outside their bedroom doors, the kids' living room includes space for studying and lounging, and has its own outside entry at the end of the hall. Photo taken at C on floor plan.*

OFFSET BUILDINGS CREATE AN OUTDOOR ROOM

It gets breezy on the Bolinas mesa. Prevailing westerly winds pick up nearly every day, turning the pages in your book whether you want to or not. Siting the shop/studio building to the southwest of the house buffers the breeze, making a calm zone in front of the house.



SPECS

Bedrooms: 4 (house and apartment)

Bathrooms: 3½ (house and apartment)

Size: 1900 sq. ft. (house and apartment)

Cost: $350 per sq. ft.

Completed: 2006

Location: Bolinas, Calif.

Architect: Arkin Tilt

Builder: David van Dyke, Riverwood Construction

Drawings: Martha Garstang Hill

TALL WINDOWS, SKYLIGHTS, AND TRANSOMS PULL LIGHT INTO THE HOUSE

The dining-alcove windows funnel light into rooms upstairs and down, and let the sunshine help to warm the concrete floors. The view to the meadow sails right through two sets of windows, where it can be enjoyed from the master bedroom. Photo left taken at D on floor plan; photo below taken at E.

No exterior walls, but three sources of daylight. *In the bath, a skylight grabs sunshine from above, while a grid of glass blocks admits light from the stairwell. Below the far counter, a panel of corrugated wired glass catches daylight from the transom over the front door. Photo taken at F on floor plan.*

Broken glass makes good. *The concrete counter contains aggregate from defunct stoplight lenses and the occasional gear.*

Bamboo all over. *An abstract forest of ceramic-tile bamboo canes, made by homeowner and artist Arianne Dar, forms the backsplash above the bamboo cabinets. She also made the cast-bronze fish-vertebrae door and drawer pulls.*

that can be adhered directly to metal roofing. Amorphous-film systems don't generate as much electricity as the flat-panel variety, but they perform better in cloudy or partially shaded conditions. Between the standing seams of this roof, the film blends right in. The system, which cost about $24,000, produces 7kwh per day on average, supplying about half the electricity needs of the house.

The house is heated primarily by a solar water-heating system that is a lot like the old warm-rock-in-the sleeping-bag trick used by campers. But instead of a warm rock toasted in a campfire, Arianne's house sits atop a 2-ft.-thick layer of solar-heated sand (photo p. 75). As described in solar pioneer Bob Ramlow's book *Solar Water Heating* (New Society Publishers, 2006), the sand bed is wrapped at the sides and bottom with polystyrene insulation. Polyethylene tubing snakes through the sand, carrying glycol heated at the solar station.

The target is to heat the slab to about 75°F. It, in turn, will keep the temperature of the house in that range. In a typical installation, the heated sand bed accounts for about half the energy necessary to heat a well-insulated house. That's the theory; here's how it played out.

As it got into the heart of the first heating season, the house became colder and colder. Arianne had to rely more and more on the backup systems—a Rais woodstove and electric baseboard heaters—to keep the house comfortable. Something was amiss.

It turned out that the glycol pump's temperature sensor wasn't turning off the pump when it was supposed to. As the sun set and the glycol cooled, the pump kept running, thereby cooling the sand bed. A new sensor solved that part of the problem.

The house's aluminum windows were the other heat-loss culprit. Even though they're dual-glazed, the windows lose heat through their highly conductive frames. Arianne has since installed curtains in the rooms most affected, and that has helped to bring the performance of the sand-bed heating system up to expectations.

Arkin and Tilt estimate that the sand-bed heat bank added about $15,000 to the cost of the house. Besides heating the house, the solar panels also contribute energy to the domestic hot-water system. Arianne estimates that between the photovoltaics and the sandbed, her energy costs have been cut in half. They are currently about $2000 a year.

Combining daylight, art, and a hand-me-down sink

At the southeast corner of the house, the sunspace dining room is like a two-story-tall net that catches winter light and brings it deep into the living room and kitchen (photo pp. 76-77). The light plays across surfaces and fixtures spiced with an inventive mix of found objects, recycled stuff, and totemic Pacific Rim flora and fauna.

The kitchen island includes a stainless-steel sink from Arianne's childhood home, saved from the Dumpster during a 1960s remodel. Its satin finish, big bowl, and integral drain board have come full circle from the day they were deemed out of fashion. The island's countertop is concrete with glass aggregate made from stoplight lenses (inset photo p. 77). It bears on a laminated bamboo cabinet.

Taking her cue from the bamboo, Arianne created a tile backsplash that evokes an abstract stand of bamboo canes rising from the counter behind the cooktop (photo left). The drawer and door pulls below are bronze, cast in molds that replicate fish vertebrae found on a local reef (inset photo).

More custom castings appear in surprising places. In the kids' bathroom, a half-dozen glass blocks featuring high-heeled-shoe shapes tap-dance over the tub (photo bottom right, p. 77).

Daylight from the tall dining-room windows also makes its way into the master bedroom (top photo, p. 77). At the foot of the bed, a bank of old industrial-steel sash windows overlooks the sunspace dining room and the meadow view to the south. □

Charles Miller is the special-issues editor. Photos by the author, except where noted.