SECRET SAUCE

BY CATI O'KEEFE

The NAHB Research Center honors builders who incorporate energy efficiency in new homes through its EVHA program. **We picked three of this year's finalists** and **asked for their energy-saving secrets. HERE'S WHAT THEY TOLD US.**

The 20 finalists of this year's EnergyValue Housing Award (EVHA) program are a varied group hailing from each of our country's climate regions—from a SIP house in Washington to a luxury off-the-grid gem outside San Antonio, to an ultra-tight, affordable contemporary in Michigan. EVHA recognizes builders who successfully integrate energy efficiency into all aspects of new-home production. The award promotes increased awareness of the value of energy efficiency among builders and buyers alike. Since its inception in 1996, builders from 41 states and Washington, D.C., have won 225 gold and silver awards. The EVHA is funded primarily through the U.S. Department of Energy Building America program.

An interesting map on EVHA's home page www.nahbrc.com/evha/ shows the number of submissions by state over the years. It's interesting to note that some states have never had a builder submit an entry, while others—like Texas, California, Colorado, and Florida—have had scores of entries. In fact, homes from Texas and Colorado have won a medal for every two entries.

So if you are looking for ideas on how to improve the energy efficiency in your homes, these winners are a good lot to study.

Of the 20 finalists in the 2010 EnergyValue Housing Award program, the editors thought these three had particularly good green information to share. They are built by Sierra Homes (far left), Clifton View Homes (left), and Raymar Homes (top).

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Design in the Lead

This ICF home uses thermal massing and louvers on the south side windows to keep the house cool. The columns are locally felled peeled juniper. The PV panels off the back porch heat the home's water. Other exterior finishes include stucco walls, a Galvalume metal roof, and Texas limestone..

Eco-conscious owners meet time-tested green principles in this off-the-grid home in the Hill country outside San Antonio.

It's not the usual request you get from a home buyer: "Design a building that doesn't use the grid for power, water, or wastewater handling." But that's just what Teresa Fransik of Sierra Homes was tasked with when she agreed to work with a couple who didn't want an electric pole as far as the eye could see.

"We were fortunate with this job because we had some incredible homeowners that drove the process," Fransik says. It's clear she thinks the four years of planning that went into this house played an enormous role in her being able to provide the no-grid product requested.

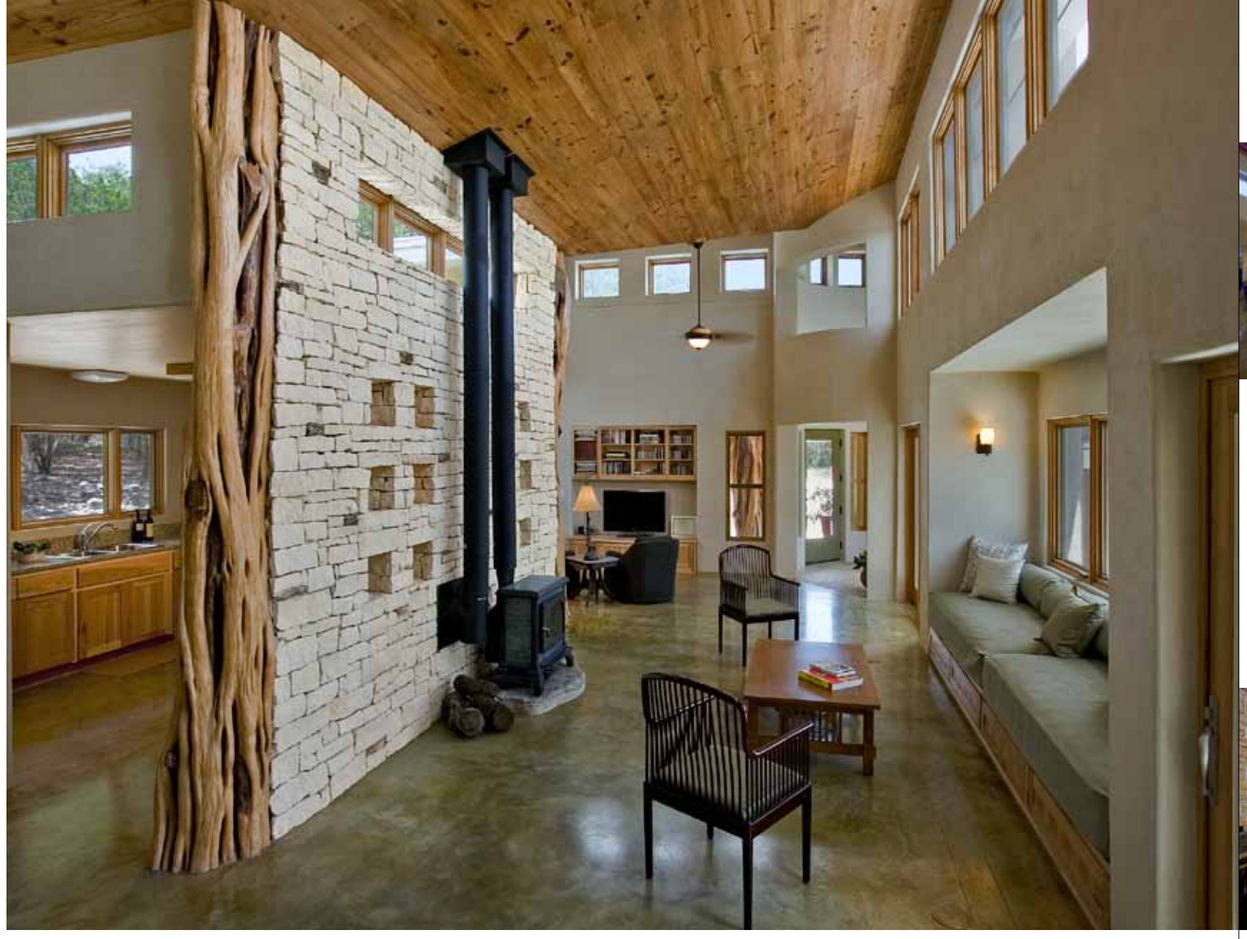
Next, it was the location. "It is a perfectly sited passive solar designed home," Fransik explains. "It's the home's placement on the earth, the piece of property it is on, and the trees surrounding it that makes it work." They opted to put the PV system on the carport to preserve the trees shading the house.

The 2,046-square-foot home has 12" ICF walls for mass. "And we included a rock wall in the southern part of the house," adds Fransik. "That wall is one feature that keeps the home acclimating perfectly. We calculated to the degree the solar angle, and louvers on the windows are placed so not a sliver of sunlight comes through the windows in the summer, but in the winter sunlight beams through, hits the rock wall, and warms the house."

During one of the hottest summers on Texas' record (20 days of above 100 F temperatures) the house never rose above 82 F. The home does not have air-conditioning.

Fransik doesn't think this would have been possible without the concrete walls and floor. In addition, the owners are dedicated to opening and shutting windows and hallways as it makes sense to vent the hot air at different times throughout the day.

Jud Haggard Photography



Because the house runs on a limited 3 kW PV system, the couple is strict about what electronics they will have in their home. They chose the lowest amp TV and shop for electronics that use the smallest amount of energy.

To handle wastewater, the home employs a rainwater catchment plumbed to a graywater tank and composting toilets. Fransik says the toilets work well (but were not cheap at $1,700 apiece) and do require some maintenance. To future-proof the house for new owners, she included a drain under the slab. "If someone wants to 'flush' one day, they can take the toilet off, break the concrete, and add a toilet."

Another area where they saved precious energy is the kitchen. They don't have any electrical cooking. Instead, they installed a wood cookstove. "It's quite amazing," Fransik says of the contemporary-styled unit called The Diva by Hearthstone. "You use three or four small sticks of wood in the fireplace and you can cook up breakfast. And it doesn't heat the house at all."

The home also boasts an outdoor kitchen and shower for use when the weather dictates.

Fransik clearly loves this project, even as she admits that it's not necessarily what people who ask for a green house are looking for—especially those willing to pay for $288-a-square-foot custom home. "People think of off-grid homes and picture cabins and caves, but this is a luxurious home without electric, water, and sewer, and functions perfectly for the two of them."

The home, designed by Stephen Locte of San Francisco-based Brand + Allen, features a stone wall in the living room, which soaks up the sun's rays in the winter to keep the home warm. Other than that, a couple of wood stoves are the only source of heat.

ENERGY FEATURES » Foundation uninsulated slab on grade; Wall Construction Insulating concrete forms; Wall Insulation R-22 ICF plus R-23 spray foam cavity insulation; Rim Joist Insulation N/A; Roof Construction Rafter construction; Ceiling Insulation R-21 spray foam at roofline; Windows Low-e, gas-filled; U-0.32, SHGC 0.29; HVAC No central HVAC system; 83.5 AFUE wood stove; operable skylight in tower for natural cooling; Ducts none; Water Heating 80 square-foot solar thermal collector with 80-gallon storage tank (SEF 5.7); Lighting 98% Energy Star fixtures; Appliances Energy Star refrigerator and clothes washer; Wood-fired oven and range; On-Site Energy Generation 3.1 kW PV system; solar water heating; off-grid home; passive heating and cooling design; Duct Leakage Test N/A; Blower Door Test 989 cfm at 50 Pa; 2.2 ACH50; HERS Index 56 (without PV); 35 (with PV); Energy/Green Building Programs Energy Star, LEED-H, Austin Energy Green Building, DOE Builders Challenge qualified house

2

Pushing the Limits

Passive solar orientation, a tight, well-insulated building envelope that is well-sealed, and high-performance windows and doors are mainstays at Clifton View Homes..

This custom home in Coupeville, Wash., uses SIP technology, vigilant air sealing, and passive solar orientation to keep energy use down.

Ted Clifton of Clifton View Homes is proud of what he's accomplished as a green builder but quick to point out that he's only just begun. He relies on an ultra-tight building envelope, good insulation practices, and air sealing to make sure his houses keep conditioned air inside.

"We've been building for [energy efficiency] for years, and each house gets a bit better," he says. "This house has a HERS rating of 41. It's partly building on what you've already learned and then adding a little bit better air sealing and spending a little more time choosing appliances that use the least amount of power—not just qualifying for Energy Star."

Many builders think they know how to stay green when choosing appliances: Buy Energy Star. But that's not all there is to it, claims Clifton.

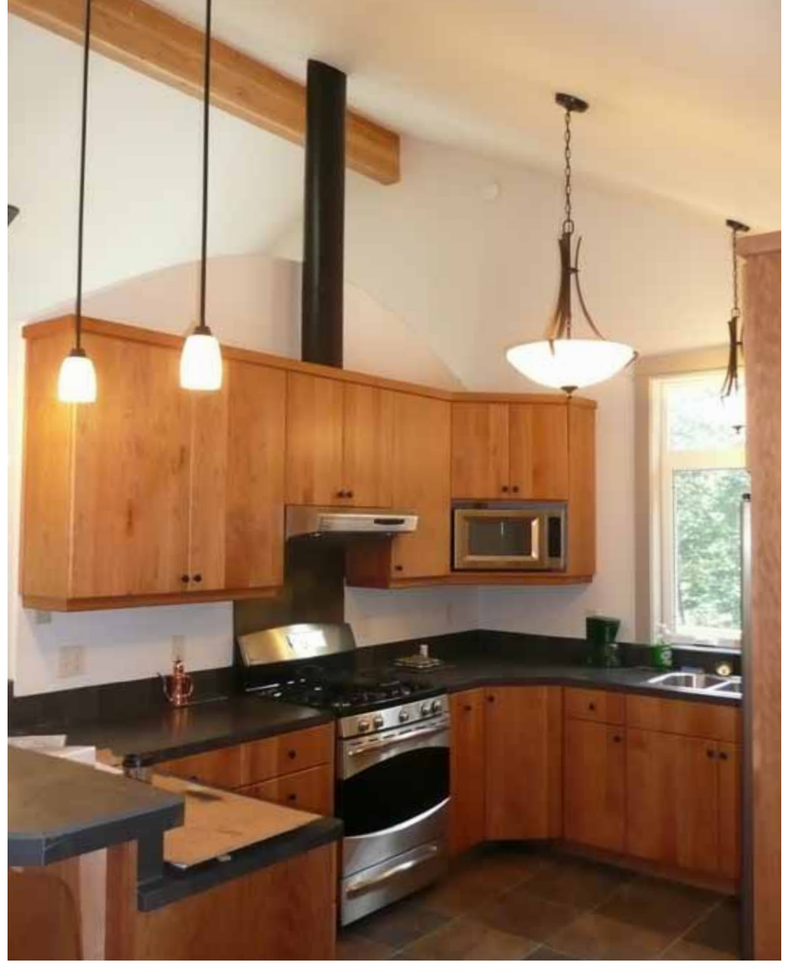
He cites the refrigerator as an example. "A 26-cubic-foot fridge that is Energy Star uses $76 in electricity every year. Another fridge the same size but different design using French doors

with the freezer on the bottom uses $50 a year." While $26 doesn't sound like much, multiply that by the number of other appliances and electronics used in a house, and you can see its relevance. If you are considering PV; you want to power homes with the smallest system possible so everything that uses energy must be efficient.

"You need to go beyond the fridge," adds Clifton. "Keep looking further—like at dishwashers. Go beyond Energy Star."

And that goes for everything in the house. Clifton points to windows.

Deb O'Brien



"Window technology is moving so fast. You need to keep an eye on it and do your homework every time on every house." Clifton stays well-read on green product advancements and uses building-related shows to stay educated. "I go to the Builders' Show and get my card scanned so I can get updates from manufacturers," he says.

An interesting fact about this 2,966-square-foot house is that while it only uses about $970 year in total energy, only 18% of that is for HVAC versus 25% for cooking. "We haven't figured out cooking yet." He notes that induction, radiant energy (microwave), convection, and conduction—and all combinations of those types of cooking in a kitchen—still produce heat. "We need to figure out a better way to cook. They all use some form of energy, and once you've created heat from fossil fuel, it doesn't turn from heat to anything else."

"Smart people are figuring out how to do that kind of stuff," he says. "I am taking stuff off the shelf that some smart guy has created and putting it in the home. ... I'm just looking for a better way to use stuff smartly."

Clifton's last piece of advice? Stay humble: "Don't get too smug because there's someone out there doing better than what you're doing today. While building a tight house is very good, it isn't where we are going; it's just a start to where we are going. Net zero was a great goal five years ago but consider where we are using energy—we use the same on transportation as housing. Is it possible to produce enough energy to power a house and car, too? Never be satisfied."

The builder points out that of the projected annual energy cost of $979 on this house, $614 is for cooking and lights. He suggests builders research the actual energy use of every light fixture and appliance they put in their homes.

ENERGY FEATURES » Foundation Basement R-20 foam insulation and R-21 fiberglass batt in framed wall; Wall Construction structural insulating panels; Wall Insulation R-25 SIPs; Rim Joist Insulation 2" spray foam + R-38 fiberglass batt; Roof Construction structural insulated panels (vaulted ceilings) and raised-heel trusses (flat ceilings); Ceiling Insulation R-38 SIPs (vaulted ceilings); R-50 blown cellulose (flat ceiling); Windows Low-e, gas-filled; U-0.29, SHGC 0.31; HVAC 15 EER, 4.4 COP ductless mini-split geothermal heat pump; multizone radiant distribution; whole-house mechanical ventilation; Ducts N/A; Water Heating Desuperheater + geothermal heat pump (2.97 EF); PEX manifold distribution; Lighting 50% Energy Star fixtures; 50% compact fluorescent lamps; advanced lighting controls; Appliances Energy Star refrigerator, clothes washer, dishwasher; On-Site Energy Generation none; Duct Leakage Test N/A; Blower Door Test 850 cfm at 50 Pa; 1.8 ACH50; HERS Index 41; Energy/Green Building Programs SICBA Built Green, Energy Star, DOE Builders Challenge qualified house

Verifiable Results

3

Since construction began in January, the team used a "modified frost protected shallow foundation." They poured a standard footing and insulated the outside and outside top edge of the footing; installed one row of ICF block and poured the foundation. The modified FPSF was slightly more expensive than a standard FPSF, but still cheaper than a conventional foundation.

They don't just say it's green; they crawl all over it to make *sure* it's green.

It helps that brothers Ray and Mark Pung of RayMar Homes are electrical engineers; their zealous attention to detail and penchant for inspection results in homes that are buttoned up tight. "Our goal is to make sure we are properly inspecting our jobs and that all subs are meeting our high level of expectation," Ray explains.

Just as important as staying on the details is making sure the green products they use will perform as promised. "We set out specs that we have to hit, and the biggest thing in such a tight house was considering types of insulation. We won't just take what the manufacturer claims because you don't know what their baseline for that claim was. Was it slapped up or a quality job? We make sure we're verifying our results in the field and making sure we can get good results that are in the best interest of customer."

Terrien Photography

Insulation is one area where Ray thinks fieldwork and education can result in a superior practice. "It's not always the most expensive option you have to use," he says. "You're told you have to do SIPS, you have to do spray foam, you have to spend all this money. Let's not spend big bucks on technologies, which are great in and of themselves, but that's not for every situation."

For example, in this particular 2,856-square-foot house in Rockford, Mich.—which was built for about $130 a square foot—the team insulated the roof with spray foam in the penetrations, put 1" rigid foam around the can lights then sealed them with foam, and also sprayed all the divider walls. Then, they used cellulose for the rest of the job. "We used spray foam in targeted areas and less expensive cellulose to get the R-value. It's a matter of thinking of the house as a system. Foam is great for air sealing, but it is the same R-value as cellulose. Cellulose doesn't stop air flow but is a good insulation once you've stopped the air with foam."

The builder team opted for a geothermal heat pump for this project, but only because of the tax credits. "With the 30% tax credit [on an approximately $24,500 system] it is only a couple thousand more than a high-efficiency natural gas furnace." The geothermal system with a Desuperheater, also provides 70% of the home's domestic hot water needs. "In the summer, a lower cost electric hot water heater kicks in. That heater is the storage tank for the Desuperheater."

The value engineering the Pungs do on each house takes more work, but saves money for their customers. "If it were me, I would appreciate my builder being stewards of my money and not just using expensive materials in a shotgun approach."

A "hot" roof design for the vaulted ceiling (spray foam insulation applied to the bottom side of the roof) might result in ice damming so the builder attached 1" reflective, rigid foam to the bottom side of the top cord of the joist; filled the cavity with Icynene foam, and installed 1" continuous, rigid foam on the bottom cord of the rafter. This thermal break and vented cavity will reduce the tendency for ice dams.

ENERGY FEATURES » Foundation R-22 insulating concrete form basement + modified frost-protected shallow foundation; Wall Construction 2x4 at 16" o.c.; Wall Insulation R-15 open cell foam + R-5 XPS exterior foam; Rim Joist Insulation R-15 open cell foam + R-5 XPS exterior foam; Roof Construction trusses at 24" o.c.; Ceiling Insulation R-38 open cell spray foam + blown cellulose; Windows Low-e, gas-filled; U-0.31, SHGC 0.43; HVAC 23.7 EER, 5.0 COP geothermal heat pump; energy recovery ventilation system; Ducts All supply ducts and 90% return ducts in conditioned space; Multizone distribution system; Water Heating Desuperheater + 0.92 EF electric auxiliary; Lighting 20% Energy Star fixtures; 80% compact fluorescent lamps; Appliances Energy Star refrigerator, dishwasher, and clothes washer; On-Site Energy Generation None; Duct Leakage Test 0 cfm total at 25 Pa; 0 cfm to exterior at 25 Pa; Blower Door Test 240 cfm at 50 Pa; 0.5 ACH50; HERS Index 53; Energy/Green Building Programs Energy Star, Green Built Michigan, LEED-H, DOE Builders Challenge qualified house