

BY GREEN BUILDER STAFF

To arrive at a greener mix of raw materials, manufactured products, and systems for this year's show home, the team had to do its homework.

PRODUCTS:

FROM THE GROUND UP



It's a complaint we often hear from builders. "There's no place where you can go and find all of the green products you need to build a home." That's true, of course. A few companies have attempted the feat. *GreenSpec* puts out an annual guide, but it's limited to about 2,000 products. McGraw Hill's Sweets Network offers a special "green information" option for products in its catalog—but it doesn't break out green products in their own directory.

To complicate product and material selec-

tions for a project such as the 2010 Vision House—green products are often grouped together without regard to how consumers perceive them—or how much they cost.

For example, insulation is typically grouped together, no matter how different the price point or performance. This approach, as builder Gerry Hazelbaker discovered, doesn't always serve the high-end project well. A custom builder working on a million-dollar show home tends to spend more both behind and inside the walls, but he has no simple way to

weed out products that won't satisfy his market.

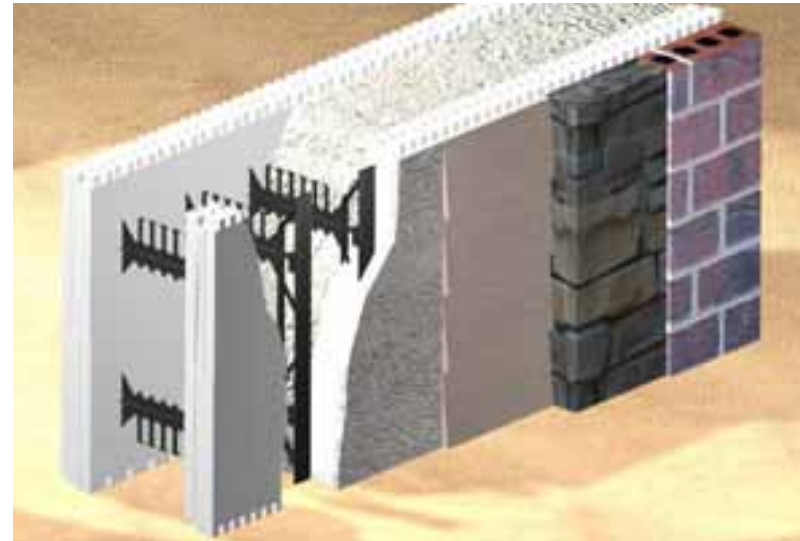
Also, many sustainable products tend to be local in origin—and they may not yet have a place in LEED for Homes or other green building programs.

We broke down this hard-earned list of green products for the VISION House from the ground up—the way a house is built. Given the home's size and luxury, they go a long way in improving its energy performance and long-term durability.

CONCRETE SAVINGS

Below grade, the home's foundation is built with BuildBlock ICFs. These expanded polystyrene forms contain integral plastic reinforcement but were also reinforced with steel rebar. The concrete used to fill the wall cavities contains 20% flyash, reducing the embodied energy of the concrete. Adding ICFs to below-grade concrete increased its performance dramatically. An uninsulated concrete wall has an R-value of zero, but the ICFs add 4" of insulation, for about R-20 (plus the thermal mass advantage), at the same time waterproofing and protecting the concrete. BuildBlock estimates that its system can "furnish the basis" for up to 27 LEED points. That's significant, given that basic LEED certification starts at 65 points total for a home of this square footage (see table at right).

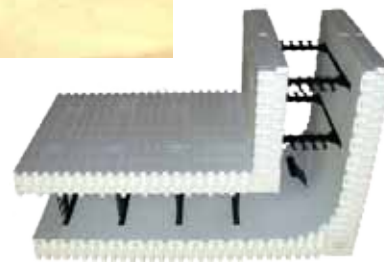
"We got a lot of benefits from this ICF system: energy efficiency, noise dampening, affordability, less construction waste, as well as the ability to recycle the scrap EPS, which we did."—Gerry Hazelbaker



LEED Point Requirements

| | |
|----------------|---------|
| LEED Certified | 65-79 |
| LEED Silver | 80-94 |
| LEED Gold | 95-109 |
| LEED Platinum | 110-136 |

* Based on a home of this size.



FILL AND WRAP

To maximize insulating values, the builder specified different types of insulation, depending on the job at hand. For example, insulating the below-grade foundation was taken care of with ICFs. Most of the engineered frame is sealed with NCFI InsulStar closed-cell blown-in insulation. In addition, the house incorporates several Owens Corning products. These include Pro-Pink Rigid Foam Insulation board, Pinkwrap housewrap, and Bild-R-Tape for sealing joints. As a result the home has excellent resistance to air leakage, good moisture control, and excellent R-values.

"By spraying the walls and the interior roof deck with InsulStar foam, the entire home becomes a conditioned space—essentially pushing the dew point outside the house, which eliminated the need for ventilating attic space."

—J. Stace McGee

VISION HOUSE 2010

FRUGAL FRAMING

The choice of iLevel engineered framing from Weyerhaeuser helps lighten the home's ecological footprint above grade. The VISION House incorporates a whole palette of engineered materials, including Strukturwood sheathing, Parallam wall columns and Timberstrand framing. Unlike solid sawn lumber or even finger-jointed framing, these products can be built from thin pieces of lumber that might otherwise be unsuitable for construction, so they ensure that nearly all of the tree is used. In addition, concrete form boards and ICF rigid insulation were diverted from the landfill and used for window headers.

"These framing products are constructed with low-VOC resins, so they're not only straight and strong, but they also preserve indoor air quality."

—Gerry Hazelbaker



GLASS WITH CLASS

Kolbe and Kolbe's windows are manufactured using 50% recycled materials. They're made with high-quality seals and hardware, which not only improve performance but also are essential to meet client expectations in a home of this caliber. All of the home's windows include energy-efficient Low-E glazings, with U values of about .35. For specialty doors and window walls, the builder turned to NanaWall Systems. The NanaWall is a custom-made large opening glass wall system that is energy efficient, weather resistant, and up to 12' tall, with almost unlimited widths possible.

"Our design team was determined to use the highest quality windows available, which is why Kolbe and Kolbe and NanaWall were selected."—J. Stace McGee

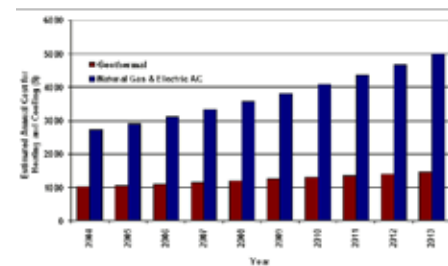
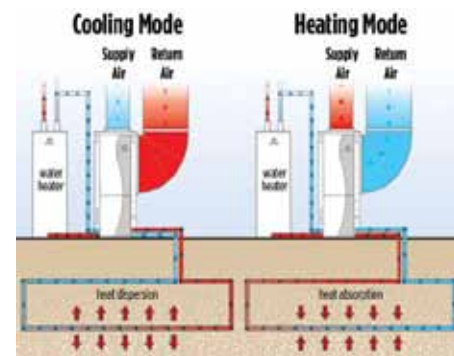
MULTIPLE SOURCES

At a cost of about \$100,000, the home's geothermal system is a major energy upgrade. It consists of 10 holes, more than 400' deep, connected to WaterFurnace Ground Source Heat Pumps. But that's just part of the home's multi-layered, redundant HVAC package. It also has a 125-gallon solar thermal package from Stiebel Eltron. This system supplies domestic hot water, while the geothermal preheats a Uponor radiant floor heating system. Uponor's Climate Control Network ties the complex heating, cooling, and ventilation infrastructure together, making sure that the RenewAire ERVs do their job. To further consolidate control, the Uponor system also connects with a whole-house controller from RTI. The result: a smart system that reduces energy waste and allows a high level of control.

"While the initial price tag for the geothermal system was high, it will eventually pay for itself as it offers efficient, clean heating and cooling over many years." -J. Stace McGee



Estimated savings from geothermal on a 3,792-square-foot home over 10 years amounts to \$25,244, according to Bomar Energy.



Monier Lifetile concrete roof tiles are durable and are produced from locally mined materials at a plant not far from the house.



EXTERIOR ARMOR

In the rapidly changing weather of Aspen, durable products are essential. The builder took special care to "armor" the home against the elements. Along with native Mountain Pine siding cut from forests killed by the pine beetle, the home includes hundreds of square feet of stone veneer—all of it from local quarries. On the roof, the Monier Lifetile concrete roof tiles are produced from locally mined materials at a plant northeast of Denver. To make sure the tiles achieve their maximum lifespan, the builder put Grace Ice & Water Shield over all roof decks. The design also called for standing seam metal roof over some areas, a Bridger Steel product made with 40% recycled content, which is fully recyclable at the end of its long life.

"All of the stone used on the exterior walls of the home, the interior decorative elements, and the patio walls were harvested well within the LEED for Homes 500-mile 'local' extraction radius." -J. Stace McGee

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WATER SAVING FIXTURES AND FAUCETS

Use of Kohler's latest faucets and fixtures makes water saving a no-brainer. Kohler has made a major commitment in recent years to water conservation, both in its products and its operations. Every toilet in the home is a dual-flush model. Faucets in the home also feature low-flow technology.

"Kohler's world-class styling coupled with their performance made these products a great fit for VISION House Aspen." -Gerry Hazelbaker



The .8 gpf toilet option can save up to 8,000 gallons of water annually.

On average, dual-flush toilets use 20% less water than models that only flush 1.6 gallons.

Integral sanitary guard prevents liquids from collecting under the tank.

Kohler Dual Flush toilets have a skirted design for a smooth, even surface.



A drywall factory near the job site reduced the impact of transporting wallboard.

INTERIOR SURFACES—FLOORS AND WALLS

Fortunately, American Gypsum has a plant 30 miles from the job site, so drywall didn't have to travel far, reducing CO2 (for transportation) and shipping costs. To reduce the embodied energy of flooring materials, the VH team selected reclaimed oak flooring from Renick Millworks. Where carpet was needed to meet market expectations, they put in Mohawk's SmartStrand, with DuPont Sorona, a product that contains both recycled and renewable content. Let's not forget the garage. For today's buyer it's an interior space that must be as well-appointed as the main house. A Gladiator garage system from Whirlpool provides a sleek finish with loads of storage and organizational systems.

"The fact that Mohawk's SmartStrand quality is not diminished by its green attributes, but rather is significantly improved, made it one of the easiest selections in the entire project."

-J. Stace McGee



AIR CARE

Many products in the home contribute to its air quality. For example, the two RenewAire ERVs constantly exchange indoor with outdoor fresh air. These are supplemented by local ventilation in bath areas provided by Panasonic fans. Additional air filters “scrub” air from forced air heating and cooling. To keep VOCs low during construction, local carpenters assembled the custom cabinetry on site, and coated it with low-solvent stains. Walls received treatment with American Clay, a rich, porous texturing material that does not off-gas. Where needed, walls and trim were finished with Sherwin Williams paints that meet LEED-H guidelines. A Beam Serenity IQS Central Vacuum System rids the home of dust and allergens.

“The Panasonic bathroom exhaust fans (bottom, right) are one of the best on the market because they can overcome a poorly installed vent system and compensate for changing pressures. The ability to adjust the CFM and run time are great features.”—Gerry Hazelbaker



OVERALL ENERGY SAVINGS

The use of many energy-saving products and building techniques resulted in measurable improvements. Figures shown are MMBtu/year.

Normalized, Modified End-Use Loads (MMBtu/year)

| | ENERGY STAR | AS DESIGNED |
|-----------------------|--------------|--------------|
| Heating | 132.1 | 93.2 |
| Cooling | 30.3 | 11.0 |
| Water Heating | 15.8 | 0.0 |
| Lighting & Appliances | 56.1 | 66.7 |
| Total | 234.2 | 171.0 |
| HERS Index | 80 | 48 |

Architect's Note: “The lighting and appliances energy use is higher than the reference/base case house. This is due to the appliances, not the lighting. There are numerous options for energy-efficient lighting—cool-looking LED light fixtures. However, the design team had a very difficult time finding high-end appliances that would meet the market requirements for this type of home. The main kitchen does not have Energy Star appliances, and because of this it drove up the average energy use of the appliances. It is our understanding, for the appliances we chose for the main kitchen, that Jenn-Air is working on getting these high-end appliances Energy Star approved.”

| POLLUTION PREVENTED | TYPE OF EMISSIONS | REDUCTION |
|---------------------|-----------------------------|----------------|
| Carbon Dioxide | (CO ₂)—tons/yr. | 11.5 |
| Sulfur Dioxide | (SO ₂)—lbs./yr. | 6.3 |
| Nitrogen Oxides | (NO _x)—lbs./yr. | 30.1 |
| ENERGY | COST SAVINGS (\$/YEAR) | |
| Heating | | \$1,108 |
| Cooling | | \$190 |
| Water Heating | | \$412 |
| Lights & Appliances | | \$68 |
| Total | | \$1,778 |

Architect's Note: “The total amount of energy saved is a little deceiving in the data displayed. Remrate, the energy model software used for the modeling, uses a later year IECC than is approved in Pitkin County. If one was to look at the overall energy cost savings of \$1,778 as part of the estimated total yearly energy cost of \$5,250, and compare it with a typical 7,000-square-foot house in Aspen—with energy costs of \$15,000, this house is already 66% more efficient than typical comparable housing in the area.”

VISION HOUSE 2010

FINISHING TOUCHES

Appliances in the home from Whirlpool and KitchenAid are Energy Star rated. The Jenn-Air products are so new they haven't been rated yet. And the home really goes above and beyond to keep lighting costs down. All lights are LED based—a technology far more efficient than CFLs. And energy waste is kept even smaller with a controller from LiteTouch. That system also integrates with the RTI Whole House Control. Add in the solar photovoltaic package from Sunsense, and from foundation to roof, no chance to save energy, reduce energy, or incorporate LEED criteria has been overlooked.

“Each of the systems has its own unique benefits but together they speak to the great lengths and expenses we have gone to make this home a prime example of green building's convergence with luxury homes.”—Gerry Hazelbaker



Jenn-Air's brand-new high-end kitchen line is used in the home (above). LED lighting is poised to replace CFLs as the energy saving product of choice, especially in luxury homes. Deco Opto-Electrical Products is shown left; LiteTouch (bottom).

THE VISION HOUSE PRODUCT LIST

Here's a comprehensive list of products used in the VISION House.

“It became very apparent during the search for glamorously green finish products that the manufacturing and supply companies have not caught up with need for high-end green finishes,” says J. Stace McGee, the architect. “This fact becomes clear when one looks at the home's score card from the different green building programs, because the ‘Materials and Resources’ category was our lowest scoring category.”

That hole in the industry is quickly being filled by the most forward-thinking manufacturers. The following are the leaders in high-end green who had products suitable for the VISION House's scale and price point. (Note that some products are mentioned more than once because they achieve multiple green criteria.)

Energy-Saving Technologies

- > Building Shell and Exterior
- > Flyash concrete mix
- > Below-grade insulation: ICFs: BuildBlock www.buildblock.com
- > Insulation system: Rigid Insulating Foam: Pinkwrap; Owens Corning www.owenscorning.com
- > Low-E windows: Kolbe and Kolbe www.kolbe-kolbe.com
- > Specialty entryways and window walls: NanaWall www.nanawall.com
- > InsulStar spray-in foam: NCFI www.ncfi.com
- > Timberstrand engineered framing system: iLevel www.ilevel.com
- > Steel standing seam roofing: Bridger Steel www.bridgersteel.com
- > Local stone veneer: Telluride Stone www.telluridestone.com
- > Ice and water shield-continuous: Grace www.graceathome.com
- > Concrete roof tile: Monier www.monier.com
- > Local aggregate for radon mitigation system

HVAC Systems

- > GeoExchange system with ground source heat pumps: Water Furnace www.waterfurnace.com
- > Solar thermal hot water: Stiebel Eltron www.stiebel-eltron-usa.com
- > Solar PV: Sunsense www.sunsensesolar.com
- > Hydronic flooring system: Uponor www.uponor-usa.com
- > Climate control network system: Uponor www.uponor-usa.com
- > Whole house controller: RTI www.rticorp.com
- > Energy recovery ventilators: RenewAire www.renewaire.com

- > Whisper Quiet bathroom fans: Panasonic www.panasonic.com
- > MERV13 air filters

Water Saving

- > Dual-flush toilets: Kohler www.kohler.com
- > High-efficiency irrigation system
- > Low Flow Lavatory Faucets: Kohler www.kohler.com
- > Domestic hot water recirculation loop

IAQ Related

- > Earthen Plaster: American Clay www.americanclay.com
- > Radiant Floor Heating: Uponor www.uponor-usa.com
- > Low-VOC Paint: Sherwin-Williams www.sherwin-williams.com
- > Central Vacuum System: Electrolux www.electrolux.com

Lighting and Appliances

- > Appliances: Whirlpool, Jenn Air, KitchenAid www.insideadvantage.com
- > LED lighting
- > Lighting controls: Lite Touch www.litetouch.com

Other Recycled or Renewable Materials

- > Magnesium Oxide Backer Board: Jet Products www.jet-board.com
- > Smart strand carpet: Mohawk www.mohawk.com
- > FSC cabinetry, trim, doors www.fscus.org
- > Reclaimed FSC oak flooring: Renick Millworks www.renickmillworks.com
- > Rebar and structural beams
- > Leather decorative tile: Ecodomo www.ecodomo.com

Local Products—Manufactured within 500 Miles

- > Wall board: American Gypsum www.americangypsum.com
- > Earthen plaster: American Clay www.americanclay.com
- > Beetle Kill Siding
- > Foundation aggregate
- > Concrete for foundation, footers, patios, & sub floors
- > Stone Siding, Patios, Interiors